

NEPALESE CIVIL AIRWORTHINESS REQUIREMENTS

SECTION D

APPROVAL PROCEDURES

CHAPTER D.6

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WELDERS

1. GENERAL

- 1.1 This chapter is applicable to persons who weld parts which are essential to the Airworthiness of an aircraft where the making of a sound joint by the welding process depends largely on the competency of the operator.
- 1.2 Welders will be approved in accordance with the requirements of this Chapter and Appendix 1.
- 1.3 This Chapter prescribes also the responsibilities of the approved welders and of the approved organizations employing them.

2. WELDER'S APPROVAL

- 2.1 An applicant for the issue or renewal of a welder's approval shall:
 - a) be employed by an approved organization who shall ensure that the applicant has passed School Leaving Certificate examination, is able to read, write and converse in the English language and not suffering from any disability likely to affect his technical skill or judgement.
 - b) provide evidence of his qualifications and practical experience in welding.
 - c) satisfactorily complete the appropriate test samples and meet the examination requirements specified in Appendix 1.
- 2.2 Applicants for the issue or renewal of welder's approval shall be made and submitted to the Airworthiness Division, Aviation Safety Directorate, Civil Aviation Authority of Nepal. Details of the qualifications and practical experience in welding shall be submitted with the application.
- 2.3 Approvals are granted with specific ratings of metal groups and welding processes and with restrictions prescribing the type of welding work that may be undertaken (e.g. sheet to sheet, tube to tube). The metal groups and welding processes are given in Appendix 1.
- 2.4 Approvals are granted with a validity period of twelve months maximum.
Note: The approvals granted to a welder when in the employ of an Approved Organization will be invalidated automatically if the welder leaves that organization. The Approved Organization shall inform the Airworthiness Division whenever an approved welder leaves the Organization.

- 2.5 The holder of a welder's approval is approved to certify for completion of work provided:
- a) the approval is valid and appropriate for the type of material and welding process used.
 - b) the work consists solely of welding.
 - c) that where necessary the welding process followed and the material used comply with approved data or design documents specified for the work.
 - d) the certification is only made in respect of the quality of the welding and of the fact that an approved process has been followed.

Note: an approved welder is not permitted to certify the welded parts unless approved as a person competent to issue a Certificate of Compliance.

3. PROCEDURES FOR THE ISSUE OF APPROVAL

- 3.1 The approved organization employing the welder shall make arrangements for the welder to prepare and weld test samples in accordance with the requirements specified in Appendix 1.
- 3.2 The approved organization shall arrange to submit the test samples to an Approved Test Organization for examinations together with full particulars of the welder concerned, materials and welding processes used, test sample figure numbers and identification marks on the test samples.
- 3.3 When the welder has made an application and after the test results furnished by the Approved Test Organization are found satisfactory the Civil Aviation Authority of Nepal may then issue a Welder's Approval to the welder for the materials and welding processes used and prescribing any restriction.

4. PROCEDURES FOR THE RENEWAL OF APPROVAL

Note: Should approval be sought for a rating (material and welding process used) or restriction different from that already granted, the procedures for the issue of approval as detailed in paragraph 3 shall be followed.

- 4.1 The approved organization employing the welder shall arrange for renewal examinations of the welder's competency for each of the approved rating/restriction combination.
- 4.2 To ensure continuity of a welder's approval the renewal examination should be carried out before the expiry date of the approval, but not more than two months before the expiry date. The examination should be scheduled so that the results can be known before the approval expires.
- 4.3 At each renewal examination, the approved organization shall make arrangement for the welder to prepare and weld an appropriate test sample in accordance with the requirements specified in Appendix 1.

- 4.4 The approved organization shall arrange to submit the test sample to an Approved Test Organization for examination together with full particulars of the welder concerned material and welding process used, test sample figure number and identification marks on the test sample.
- 4.5 When the welder has made an application and after the test results furnished by the Approved Test Organization are found satisfactory, the Civil Aviation Authority of Nepal may then renew the welder's approval.
- 4.6 If the test results are unsatisfactory the approved organization employing the welder shall arrange for the renewal examination to be repeated immediately and the test sample sent to an Approved Test Organization for examination. After these unsatisfactory test results are known and before the results of the repeated renewal examination are known the welder shall not weld parts that are essential to the Airworthiness of an aircraft. If the test results of the repeated renewal examination are satisfactory, the welder's approval may than be renewed.

Note: If however, the test results of the repeated renewal examination are again unsatisfactory the welder's approval shall be suspended until further training and/or experience has been gained to the satisfaction of the approved organization, and a further examination has been satisfactorily completed.

5. TEST REPORTS FROM APPROVED TEST ORGANIZATIONS

- 5.1 The Approved Test Organization examining the test samples shall send a copy of all test reports to the Airworthiness Division of Civil Aviation Authority of Nepal. The test reports shall detailed the test results and indicate also the date of receipt of the test samples and the date when testing is completed.

6. RECORDS

- 6.1 The approved organization employing approved welder's shall maintain a register of the welder's approvals as well as the records required in paragraphs 6.2 and 6.3 and shall keep copies of all test reports.
- 6.2 In relation to each approval (rating/restriction combination) issued, records shall be kept to indicate:
 - a) the date of preparation of the test sample.
 - b) the name of the authorized person supervising the preparation.
 - c) the name of the Approved Test Organization to which the test sample has been sent for examination.
 - d) the data the test sample has been sent to the Approved Test Organization.
 - e) the date the test report was received.
 - f) the test report reference.

6.3 In relation to the renewal of approvals, records shall be kept for the information required in paragraph 6.2 and, in addition, to indicate:

- a) the scheduled date for the next renewal examination.
- b) the period of suspension of approval, if any.

Note: Records for all renewal examinations whether satisfactory or unsatisfactory, shall be kept.

6.4 All records shall be made available to the Airworthiness Division of the Civil Aviation Authority of Nepal. |

7. CHECKS BY THE CIVIL AVIATION AUTHORITY OF NEPAL |

7.1 The Civil Aviation Authority of Nepal may select samples of approved welder's work at any time for additional check examination purposes. |

Civil Aviation Authority of Nepal. |

EXAMINATION REQUIREMENTS

1. Metal Groups and Welding Processes

- 1.1 Welder's approvals are granted for the following metal groups and welding processes:

Metal Groups

- 1 - Aluminum alloys
- 2 - Magnesium alloys
- 3 - Low carbon steels
- 4 - Corrosion and heat resisting steels
- 5 - Nickel alloys
- 6 - Copper alloys
- 7 - Titanium alloys

Welding Processes

- 1 - Gas (Oxy - acetylene, etc.)
- 2 - Braze welding (Oxy - gas)
- 3 - Metal arc (flux coated consumable electrode)
- 4 - TIG (tungsten - arc inert gas shielded)
- 5 - MIG (metal - arc inert gas shielded - consumable electrode)
- 6 - Plasma - arc

- 1.2 Other metal groups and welding processes may be considered by the Civil Aviation Authority of Nepal.

2. Type of Test Samples

- 2.1 The standard test samples are as follows:

- A. Sheet to sheet butt weld.
- B. Sheet to tube tube weld.
- C. Tube to tube weld.

Note:

1. *Approval will be limited to welding material from the specified metal group using the specified process. The selection of test samples to be welded by the applicant will further determine any restrictions to an approval in respect of the type of work to be undertaken.*
2. *On application to the Civil Aviation Authority of Nepal other test samples may be used if they would be more relevant to the work normally undertaken.*

- 2.2 The test sample shall be prepared by the applicant under the direct supervision of a supervisor. The supervisor will examine the dimensions, preparation and fitting of the test samples, and ensure that the required materials and process are used and that the test samples are completed in accordance with the requirements of paragraph 3.3.

Note: The supervisor shall be a person authorized by the Approved Organization to supervise welder's preparation of test specimens.

- 2.3 Additional test samples may be used if the applicant is not satisfied with the quality of the weld. The test samples shall be submitted complete and suitably identified to an Approved Test Organization for examination.

3. Welding of Test Samples

Note: Irrespective of the type of test samples, completed welds shall not be dressed, hammered or sand blasted. Light tapping with a hammer to remove scale deposits is acceptable. Flux shall be removed by standard procedures.

3.1 A Test Sample:

The edges of the sheet to be welded may be chattered when thicker than 1.5 mm sheet is used. Edge preparation is not necessary for aluminium alloys thinner than 2.5 mm. The welding shall be performed with the test piece flat and by forehand welding from one side only using the correct filler rod, flux or shielding gas as applicable.

3.2 B Test Sample:

A 12 mm diameter hole shall be drilled in the centre of each end plate prior to welding. The end plates may be positioned by tack welds. The first weld shall be completed by working around the test piece with the end plate flat on the bench and the tube vertical. The second weld shall be completed by working under and over the test piece with the tube horizontal and not moved during the welding process.

3.3 C Test Sample:

The tubes shall be prepared, assembled in a jig and tack welded. The assembly is then to be removed from the jig and mounted in a vertical position with the 150 mm long tube vertical and 75 mm long tube (at 45 degree) at the top. The welding shall not be moved from this position until all welds are completed. The welding of the lower tube shall not be made until all welds are completed. The welding of the lower tube shall be made by working around the test piece and the other welds by overhead welding and working around the test piece.

4. Cutting Test Specimens

- 4.1 Test specimens shall be cut from test samples by an Approved Test Organization in accordance with the appropriate figures.

5. Specimen Examination

- 5.1 Assessment of a weld shall be based on consideration of the sample weld as a whole, including the results obtained by visual, microscopical, and where applicable, mechanical testing. If any doubt exists regarding the quality of the weld, or any defect revealed is thought to be of a local character, further sections should be examined and final assessment shall be based on all the specimens examined.

Note: "A" test specimens shall be subjected to tensile and bend tests "C" test specimens shall be subjected to tensile test.

- 5.2 The micro test specimen shall be examined at suitable magnifications in the unetched and etched conditions.
- 5.3 The presence of intergranular oxide films is considered to be detrimental to be weld due to their embrittling effect, but the extent of these films is very difficult to determine in etched specimens. If the area of intergranular oxide is only very slight and satisfactory results are obtained by mechanical testing, further sections of the weld shall be examined before a decision is reached.
- 5.4 Where fillet welds are concerned, unless complete fusion is required by the drawing, a certain degree of lack of fusion is permissible at the roots:
- a) For fillet welds of 45° or more, the maximum lack of fusion which can normally be accepted is that revealed by a line of oxide extending from the root of the weld for a distance not greater than one-third of that between the root and the lips of the weld. Provided the amount of weld material used has been adequate, this method of assessment should ensure that the effective throat thickness of the weld is not less than the thickness of the sheets or tubes used for the specimens.
 - b) For fillet welds at acute angles as 30°, complete penetration in the root of tubular sections is difficult to achieve and there is a danger of collapse of the tube walls if excessive penetration is attempted. The presence of a fairly large cavity, or corresponding lack of fusion, is permissible at the root of such welds but there should be a bridge of weld metal and reasonable throat depth, showing satisfactory fusion to the basic metal.

5.5 Sheet to Sheet Butt Welds:

The section must be free from excess oxidation, burning cracks, cavitation, porosity, scale and slag. The specimen must show adequate penetration when the underside of the weld is examined. If excessive penetration occurs along the entire length of the weld the specimen must be rejected, but isolated excrescences on the underside are permissible, provided the weld itself is free from cavities, oxide films, and other defects.

5.6 Tube to Sheet and Tube Welds:

The specimen must show adequate penetration and freedom from excess oxidation, cracks, cavitation, porosity, scale and slag.

6. Mechanical Testing of Specimens

6.1 Tensile Test:

6.1.1 Tensile test specimens shall be tested to destruction in direct tension. The ultimate stress (calculated on the minimum area of cross section of the specimen, i.e. ignoring the increase in thickness due to welding) and the location of the break shall be recorded. Tube to tube weld specimens shall be broken in a tensile test machine fitted with suitable shackles and pins, the pins being passed through the top and bottom cross tubes of the specimens, so that the tensile load may be applied without bending the specimens.

6.1.2 A weld will be considered satisfactory when the failure occurs in the parent metal. A test piece failing at the toe of the weld or in the weld material can only be considered satisfactory if the ultimate stress is found to exceed the minimum tensile strength of the parent metal as given in the appropriate material specification, and if the fracture surfaces are free from defects such as cracking, blow holes, excessive porosity or inclusions. No evidence of lack of adhesion such as the peeling away of the filler metal shall be apparent.

6.2 Bend Test:

6.2.1 Bend test specimen shall be tested in bending so that the weld lies along the centre line of the bend and the weld face (the side from which the welding was performed) is on the outside of the bend.

6.2.2 To ensure the close contact of the specimen to the bar about which it is bent, the side of the specimen away from the weld face should be dressed down by filing or grinding until the weld is level with the parent metal. The edge of the specimen in the vicinity of the weld should be given reasonable radii.

6.2.3 Austenitic steel specimens must be given the "weld decay" pickling test prescribed in the relevant specification or in accordance with British standard 5903 prior to the bend test.

Note:

- 1. In the event the bend test details exceed distortion limits of the parent material, the bend limitations of the parent material shall be used.*
- 2. Special test requirements may be specified by the Director General.*

6.2.4 A bend test will be considered satisfactory if the test specimen with-stands the bending without developing cracks visible to the unaided eye.

Note: If interpretation of the bend test results is in doubt, comparison may be made with the bend test performance of a separate sample of the parent material from which the test specimens were prepared.

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