



**BUREAU
VERITAS**

**Type approval of
Non Destructive Testing Equipment
dedicated to
Underwater Inspection of
Offshore Structures**

Guidance Note



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VERITAS**

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Non Destructive Testing Equipment
dedicated to
Underwater Inspection of
Offshore Structures**

NI 422 DTO R00 E

February 1998

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MARINE DIVISION GENERAL CONDITIONS

ARTICLE 1

1.1. - BUREAU VERITAS is a Society, the purpose of whose Marine Division is the classification of vessels, sea and river units, offshore structures and craft of all kinds, collectively hereinafter referred to as "ships".

The Society :

- sets forth and develops Rules, Guidance Notes and other documents,
- publishes Registers,
- issues Certificates, Attestations and Reports following its interventions.

1.2. - BUREAU VERITAS also participates in the application of National or International Regulations or Standards, in particular by delegation from different Governments.

1.3. - BUREAU VERITAS can also carry out Technical Assistance missions and provide special services exceeding the scope of classification, to which Particular Conditions will then apply.

1.4. - BUREAU VERITAS is neither, and may not be considered, as an underwriter, Consulting Engineer, Naval Architect, Shipbuilder or a Shipowner, and cannot assume the obligations incumbent on such functions, even though its experience enables it to answer enquiries concerning matters not covered by its Rules, Guidance Notes or other documents.

ARTICLE 2

2.1. - Classification is the expression of confidence given by the Society to a ship, for a particular use or service and for a certain period of time, by reference to its Rules, Guidance Notes and other documents: this opinion expresses only the strict personal view of the Society. It is represented by a class published in the Register.

2.2. - The documents issued pursuant to surveys carried out by the Society's surveyors according to the methods and modalities mentioned in articles 3 and 4 reflect the condition of the ship at the time of the survey. It is the Owner's or his Agent's responsibility to maintain that condition until the next survey required by the Rules.

ARTICLE 3

BUREAU VERITAS

- appraises specifications and drawings for the construction of ships by reference to its Rules,
- inspects materials, machinery, equipment, fittings and other items used in the construction of ships, by reference to its Rules,
- surveys the construction of ships to ensure that they are built in accordance with the Society's published Rules,
- classes ships in accordance with its Rules and publishes the ships' names in its Register,
- carries out periodic surveys of ships in service in order to ensure that the requirements for the specified class are met. It is the owner's duty to report to the Society any incident or event affecting the condition of the ship or the need for repairs, whatever their nature or extent.

ARTICLE 4

4.1. - The Rules, Guidance Notes and other documents published by the Society endeavour to meet the state of currently available technology at the time they are published.

Committees, consisting of personalities from the International Maritime Industry, contribute to the development of these documents.

The Society is not responsible for any inadequacy or failure of such Rules, Guidance Notes or other documents as a result of future development of techniques which could not reasonably have been foreseen at the time of their publication.

4.2. - BUREAU VERITAS is sole qualified to decide upon the meaning, the interpretation and application of the documents mentioned above. Any reference to them is of no value if it does not involve, accompany or follow a Society's intervention.

4.3. - The Society exercises due care and skill and acts in a professional and workmanlike manner :

- in the selection of its surveyors,
- in the performance of its services, considering the state of currently available technology at the time the services are being performed.

4.4. - Surveys conducted by the Society include, but are not limited to, visual inspection, non-destructive testing, laboratory testing and underwater inspection by divers. Survey practices and procedures are selected by the Society in its sole and absolute discretion based on its experience and knowledge and according to generally accepted professional standards in the Industry.

ARTICLE 5

5.1. - No report, statement, notation on a plan, review, certificate of class or any document or information issued or given as part of the services provided by the Society shall be given any legal effect or implication other than a representation that the ship, structure, item of material, equipment or machinery or any other item covered by such document or information has met one or more of the Society's Rules. Any such representation is issued solely for the use of the Society, its committees and clients or other duly authorized entities and for no other purpose.

5.2. - The classing of a ship, or the issuance of certificate with relation to, or in furtherance of the classification of a ship or the performance of services by the Society, is not a representation, statement or warranty of seaworthiness, structural integrity, quality or fitness for a particular purpose or service of any ship, structure, material, equipment or machinery surveyed by the Society, beyond any representation set forth in the Rules of the Society.

5.3. - Nothing contained herein, or in any information, report, certificate or like document issued in connection with or pursuant to the performance by the Society of its services, shall be deemed to relieve any designer, naval architect or engineer, builder, manufacturer, shipyard, seller, supplier, contractor or subcontractor, repairer, or owner, operator or other entity from any warranty or other contractual obligations express or implied or from any fault whatsoever, nor to create any right, claim or benefit in any third party.

In particular, the Society does not declare the acceptance or commissioning of a ship ; that being the exclusive responsibility of the owner.

The validity, application, meaning and interpretation of a Classification Certificate or any similar document or information issued by the Society in connection with, or in furtherance of the performance of its services, is governed by the Rules of the Society which shall be the sole judge thereon, in its absolute discretion.

ARTICLE 6

6.1. - In providing services, information or advice, neither the Society nor any of its servants or agents warrants the accuracy of any information or advice supplied. Furthermore, all express and implied warranties are specifically disclaimed. Except as set out herein, and also in the case of the surveys mentioned in Article 1.2., neither the Society, nor any of its servants or agents, shall be liable for any loss, damage or expense of whatever nature sustained by any person, in tort or in contract, due to any act or omission or error of whatever nature, whether or not negligent, and howsoever caused in any information or advice given in any way whatsoever by or on behalf of the Society.

6.2. - Nevertheless, if any person uses the Society's services, and suffers loss, damage or expense thereby, which is proved to have been due to any negligent act, omission or error of the Society, its servants or agents, or any negligent inaccuracy in information or advice given by or on behalf of the Society, then the Society will pay compensation to such person for his proved loss, up to, but not exceeding, five times the amount of the fee - if any - charged by the Society for the particular service, information or advice and, if no fee is charged, FRF 50,000.

Where the fees are related to a number of services, the amount of fees shall be apportioned for the purpose of the calculation of the maximum compensation, by reference to the estimated time involved in the performance of each service. Any liability for consequential damages is specifically excluded.

In any case, whatever the amount of the fees, the maximum damages payable by the Society shall be not more than FRF 5,000,000.

6.3. - Any claim for damages of whatever nature by virtue of the provisions set forth herein must be made in writing, and notice must be provided to the Society within three months of the date the services were first supplied or the damages first discovered. Failure to provide such notice within the time set forth herein will constitute an absolute bar to the pursuit of such claim against the Society.

ARTICLE 7

Requests for interventions shall, in principle, be submitted in writing. They entail the acceptance without reservation, of the present General Conditions and of Particular Conditions which may be attached thereto.

ARTICLE 8

8.1. - Any intervention of BUREAU VERITAS, whatever its nature, whether completed or interrupted for any cause whatsoever, shall involve the payment of fees upon receipt of the invoice and the reimbursement of the expenses incurred. Interests may be demanded in case of late payment.

8.2. - The class of a ship may be withheld or, if granted, suspended or withdrawn, in the event of non-payment of fees.

ARTICLE 9

9.1. - All plans, drawings, specifications and information provided to the Society, or of which the Society may become reasonably aware in connection with the performance of its services, shall be treated as confidential by the Society and shall not, without the prior consent of the party furnishing such document, be used for any purpose other than that for which they are furnished.

9.2. - Records and other documents whatsoever relating to ships classed with the Society shall not be disclosed or communicated by the Society to any third party but with the prior approval of the owner, unless it is in pursuance of an order of the flag authorities or an injunction of a Court having jurisdiction.

ARTICLE 10

Should a technical disagreement arise between the requesting party and the BUREAU VERITAS surveyor, the Society may, at the request of that party, designate another of its surveyors.

ARTICLE 11

11.1. - Any dispute over the interpretation, or the enforcement of these General Conditions except as regards article 8, or the performance of BUREAU VERITAS' services, shall be submitted to arbitration in London. Arbitration proceedings will be conducted according to the English law on arbitration. The arbitrator shall be selected by the parties and, in case they could not reach an agreement, he would then be nominated by the President of the Law Society of England and Wales upon request of any party.

11.2. - Disputes arising out of the enforcement of the provisions of the article 8 shall be submitted to the Court of Nanterre - France.

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SECTION 1. | INTRODUCTION

1.1. Scope

The present Guidance Note describes how Manufacturers of Non Destructive Testing (NDT) Tools for Underwater Inspection of metallic structures and units, can achieve Type (or Basic) Approval of their products and in which conditions such products will be assessed by Bureau Veritas.

This assessment does not intend to consider the human factor, and it is the Manufacturer's responsibility to provide suitably trained and qualified personnel for the Type Tests.

The present Guidance Note is based on the experience gained by Bureau Veritas during the ICON Project (Inter Calibration Of Non destructive testing), carried out with IFREMER, UCL, TSC, TECNOMARE, and CYBERNETIX (complementary information is given in Appendix 4).

1.2. Objectives

The objectives of Type Approval for such equipment are:

- a) to certify that an equipment complies with the Society's requirements, as applicable for its intended purpose, and with the Manufacturer's specifications and stated performances;
- b) to publish a list of Type Approved equipment in order to assist possible customers and/or users in their choice;
- c) to assist the Society's Surveyor in his task, while assessing or witnessing an underwater Non Destructive Inspection work;
- d) to enlarge the available data in the ICON Data Base, with the agreement of Manufacturer.

1.3. Responsibilities - Intervention of Bureau Veritas

1.3.1. Manufacturer's responsibilities

It is the Manufacturer's responsibility to ensure that his equipment retains the properties on which the Approval is based.

The Manufacturer is not to make reference to the Type Approval unless the equipment is identical in characteristics with the Type (or Basic) Approved specimen.

It is the Manufacturer's responsibility to report immediately to Bureau Veritas any major change in the equipment or in the approved conditions of use.

1.3.2. Intervention of Bureau Veritas

1.3.2.1. Legal conditions

Bureau Veritas Surveyors will intervene or act within the context of the General Conditions of the Marine Division of Bureau Veritas.

1.3.2.2. Confidentiality

Unless summoned legally to do so, Bureau Veritas will not undertake to show or divulge documents to a third party without the written permission of the Manufacturer. Bureau Veritas will undertake not to reproduce or copy any of these documents, in full or in part, except for the purpose of performing its services.

1.4. Definitions

The following definitions apply:

Certificate of approval: written statement of conformity with certain standard or statutory provisions, for a given application, issued within the framework of the General Conditions of the Marine Division of Bureau Veritas, and certifying type approval or basic approval.

Type Approval: status conferred by Bureau Veritas on a particular and clearly identified item of equipment shown by design assessment and type tests to meet all the requirements of Bureau Veritas Rules for the specified application(s).

Basic Approval: status conferred by Bureau Veritas on a particular and clearly identified item of equipment, shown by design assessment to conform "basically" with the relevant requirements of Bureau Veritas Rules for the intended use, but for which the Society reserves the right to require additional type tests before any effective use.

The main purpose of basic approval is to mark completion of a stage in the comprehensive type approval process of a product.

Type Test: a test, or a series of tests, carried out to determine whether an item of equipment is capable to meet the Society's requirements for the specified application(s).

Type Test Validation: the fact either of confirming type test results announced by the applicant by a check test performed in the presence of the Bureau Veritas Surveyor, or of accepting the results as having been established under conditions satisfactory to Bureau Veritas.

BV: "Rules for the Classification of Offshore Units"
NR 320 DNC R01 "Approval and Inspection at Works of Materials and Equipment for the Classification of Ships and Offshore Installations - Principles and Procedures"

BSI: PD6493: 1991 - "Guidance on some methods for the derivation of acceptance levels for defects in fusion welded joints"

1.5. References

AODC: "Code of Practice for Safe Use of Electricity Underwater" (last issue)

SECTION 2. | TYPE APPROVAL

2.1. Field of application

The present Guidance Note applies only to Underwater Non Destructive Testing equipment dedicated to sub sea inspection of steel or concrete structures (fixed or mobile), and their appurtenances, in particular Offshore structures related to Oil & Gas Industry.

It applies to either diver or ROV deployed NDT equipment, as well as to equipment deployed through an ROV-based Computer Assisted Telemanipulation (CAT) system. CAT systems as such, are beyond the scope of the present Guidance Note.

2.2. Steps for approval

2.2.1. Application for Type Approval

Any Manufacturer willing to submit a candidate equipment for Type Approval should preferably apply by filling the dedicated form, which is available on request from Bureau Veritas Ocean Engineering Management (DTO). A form specimen is given in Appendix 1.

Application may also be made on Manufacturer's headed paper, provided all the necessary information is suitably provided.

The present scheme for type approval of non destructive testing equipment is based on the assessment of one specimen, considered as representative of the production. The Manufacturer is to issue a written statement specifying his undertaking to maintain satisfactory reproducibility of the approved prototype in mass production (see Appendix 2).

Inspection at works is not required within the frame of this scheme, unless expressly required by the Manufacturer.

2.2.2. Design appraisal

In order for the Society to proceed to the design appraisal, the Manufacturer of the candidate equipment is to provide at least the following documentation:

- folder 1 - General Principles and State of the Art of the technique used;
- folder 2 - Technical Specifications of the candidate equipment;
- folder 3 - Set of drawings, including at least:
 - general arrangements;
 - electrical safety details (if any);
 - detailed drawings of main parts of the equipment;
- folder 4 - Set of procedures, including at least:
 - calibration Procedure (where applicable);
 - operational Procedure (for existing equipment);
 - intended Procedure (for equipment under development);
 - emergency Procedure.
- folder 5 - Related Standards, Codes of, or Recommended Practices used for design, fabrication and operation of the candidate equipment;
- folder 6 - Previous tests results or existing approvals.

The Society reserves the right to request any supplementary items deemed necessary to complete design appraisal to its satisfaction.

2.2.3. Type tests

Type tests are carried out to determine whether an equipment is capable of meeting the Society's requirements for the specified application(s). They are to be designed and planned to properly demonstrate the ability of the equipment to operate in a safe and effective manner, and to obtain results to the Society's satisfaction.

Type Tests are normally carried out using the ICON samples (available from IFREMER and UCL), so that performance can be evaluated through an Oil & Gas Industry recognised scheme. Where application on ICON samples is not possible or when these samples are not available, the Manufacturer may propose suitable arrangements to Bureau Veritas, like the use of other type of samples.

Tests plans, sites and schedules will be agreed upon between the Manufacturer and Bureau Veritas. In any case, tests are to reflect as closely as possible the real operating conditions.

2.3. Minimum requirements

2.3.1. Crack detection and sizing techniques for steel welded structures

The criteria to be taken as a basis for Probability Of Detection (POD), and for the Reliability Operating Characteristic (ROC) are given in Diagrams and Tables 2.3.-I and 2.3.-III.

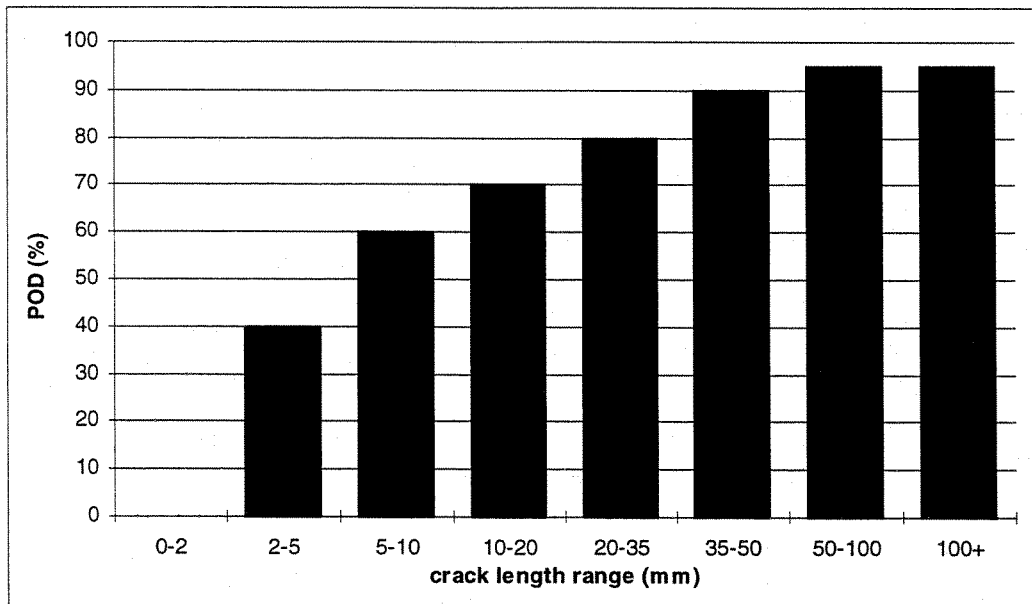
Detection criterion is based on defect length, as per ICON B1 crack classification, with a spacing of 50 mm (see Appendix 3).

For depth sizing of surface breaking flaws, criterion varies with the actual depth, as illustrated in Diagram and Table 2.3.-II. No more than 5% of the results are to stand out of the zone delimited by the higher and lower bounds.

Note: actual depths for defects in ICON samples have been obtained by a combination of techniques, including laboratory ACPD, Eddy current and ACFM. These values have been correlated to destructive testing measurements carried out on a selection of specimens.

DIAGRAM AND TABLE 2.3.-I

Bureau Veritas minimum requirements for crack detection



Note 1: partial POD represents the POD on the considered range of crack length;

Note 2: based on the techniques improvements and its up-to-date experience, the Society reserves the right to change values provided in the table and graph without prior notification. The Manufacturer is advised to ensure that he is aware of the latest issue of this document. Changes have no retroactive effect on already delivered Type Approvals, until renewal is required.

crack length (mm)	0-2	2-5	5-10	10-20	20-35	35-50	50+
partial POD (%) (see note)	N/A	40	60	70	85	90	95

For embedded defects, the criteria may be alleviated upon request from the Manufacturer. The Certificate will be amended in accordance.

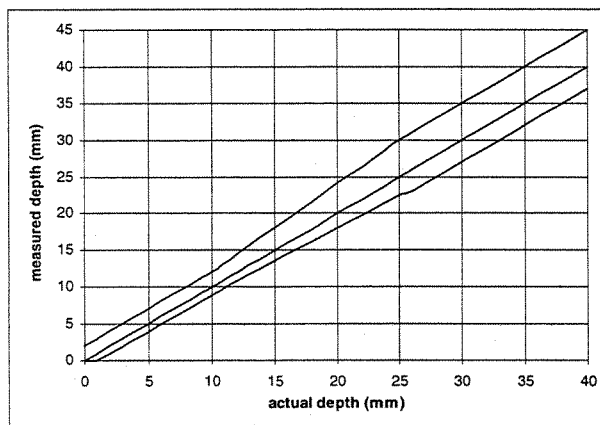
The Reliability Operating Characteristic is defined by the amount of spurious indications obtained during Type Tests compared to the total amount of characterised detected defects, and the overall POD (i.e.: no length range consideration). Results are considered satisfactory when included in the highlighted zone of Diagram 2.3.-III.

The obtained results (graphs) will be joined in appendix of the Type Approval Certificate.

The Manufacturer can ask for a Type Approval based on another type of classification (A or PD6493, see Appendix 3) or on a minimum flaw size detection. The Type Approval will then be limited accordingly.

DIAGRAM AND TABLE 2.3.-II

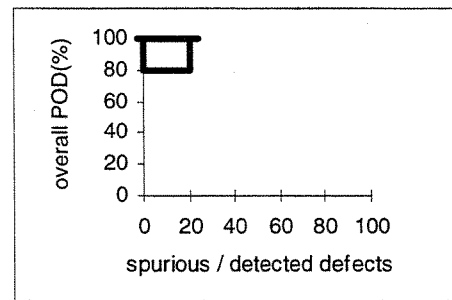
Bureau Veritas minimum requirements for crack sizing



crack depth (d) in mm	0-10	10-25	> 25
required accuracy	d - 1 mm to d + 2 mm	d - 10 % to d + 20 %	d - 3 mm to d + 5 mm

DIAGRAM 2.3.-III

Bureau Veritas minimum requirements for ROC



overall POD > 80%
ratio of spurious indications > 20

2.3.2. Flooded Member Detection

Type tests of Flooded Member Detection (FMD) equipment will be conducted on dedicated samples, at various positions (horizontal, vertical and vertical diagonal) in order to reflect most of the offshore structures possible geometries, and at various levels of flooding (from 0 to 100% in volume). Results will be expressed as a function of the minimum detectable level of flooding (percentage in volume) by the equipment for each position.

2.3.3. Other types of techniques

For Type Approval, and as far as possible, ICON scheme and samples should be used. Bureau Veritas will advise the Manufacturer on the available options. In other cases, the Manufacturer and the Society will agree on procedures and criteria on a case by case basis, prior to testing the equipment.

2.4. Validity of certificates

2.4.1. Validity period

Certificates delivered within the frame of the present Guidance Note are valid for a maximum period of time of 5 (five) years. During this period, such a Certificate may become invalid in case of:

- change in design or in procedure of use of the concerned equipment;
- changes in the applicable rules or test method;
- any other major change.

2.4.2. Certificate renewal

Several cases may occur:

- a) no major changes have occurred on the equipment or procedures:
The Manufacturer is to provide the Society with a sufficient track record of industrial applications of the concerned equipment, with references and results. Bureau Veritas will then evaluate the possibility to extend the validity of the Certificate, for a period of time not exceeding another 3 years. The validity of one Certificate will not be extended more than twice through this option. For any additional extension, case b) will apply.
- b) significant improvements have been implemented:
The Manufacturer is to document these improvements by completing the appropriate folder(s), as defined in 2.2.2., thus allowing Bureau Veritas to evaluate whether supplementary type tests are necessary to extend the Certificate.

2.5. Publicity

The Manufacturer may be licensed to use the logo given on Figure 2.5.-I on any equipment granted with a Type Approval.

This license is also applicable to the documentation and brochures related to the approved equipment, provided these have been submitted to the Society for agreement.

This license is valid for the same period as the Certificate, and during the transition period until renewal. Any unauthorised use of this logo is prohibited, and will lead to the immediate cancellation of all Certificates issued for the Manufacturer.

FIGURE 2.5.-I

Logo allowed for equipment having received a Type Approval



TYPE APPROVED
3871H / ...

Certificate
number

Application for a license should be made to Bureau Veritas - Ocean Engineering Management, Bureau Veritas Head Office.

APPENDIX 1

REQUEST FOR TYPE/BASIC* APPROVAL OF NON DESTRUCTIVE TESTING EQUIPMENT

* Delete as appropriate

We, _____, hereby request Bureau Veritas to proceed to the Design and, where applicable, Type Test assessment(s) of the equipment mentioned hereunder, with a view to its Type/Basic Approval, as per Society's Requirements and Marine Division General Conditions.

Manufacturer:

Office address:

Equipment designation and/or description:

Field of application / Special operational limitations:

Other comments:

We agree to give the Society Surveyors every facility to carry out their duties and agree to pay the fees and expenses incurred for their services. Drawings, specifications, test reports, etc. which document the equipment to be approved are sent by separate mail (or enclosed), as per the attached list.

In _____, _____ (Date)

Signature: _____
(Name and position in the Company)

The present form is to be sent to Bureau Veritas Marine Division, Ocean Engineering Management (DTO), - 92077 Paris-La-Défense Cedex

APPENDIX 2 MANUFACTURER'S STATEMENT FORM

DECLARATION FROM MANUFACTURER

for type approved products,
with respect to BUREAU VERITAS requirements
as per Guidance Note NR 422 R00

Manufacturer name & address:

Product description:

Type-approved by BUREAU VERITAS under reference(s):

We certify that the definition as well as the manufacturing & testing process of the above referenced product(s), including, where relevant, the purchased materials and/or components, will be kept strictly under our control in order to maintain the reproducibility of the whole mass-production with the type(s) which has/have been approved by BUREAU VERITAS.

We are well aware that any departure from this could make invalid the type approval certificate(s) issued by BUREAU VERITAS.

In:

on:

Signature:

Name/Position in the Company:

The present form is to be sent to Bureau Veritas Marine Division, Ocean Engineering Management (DTO), - 92077 Paris-La-Défense Cedex

APPENDIX 3

ICON DEFECT CLASSIFICATION B1

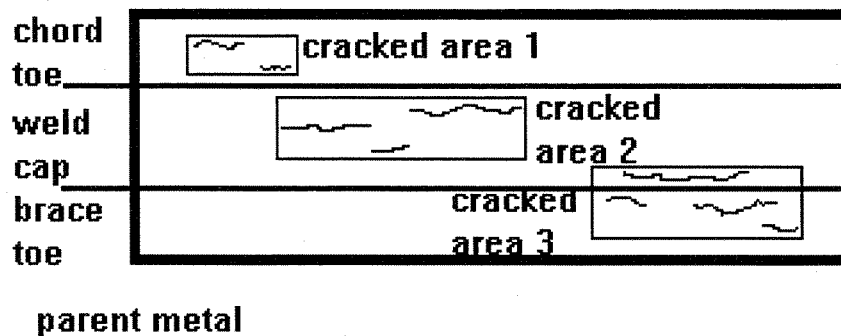
When inspecting welds for cracks, inspection results can be of three types: detection, no detection, spurious indication. The actual result mainly depends on the classification of defects as characterised in the sample. ICON uses three types of classifications, namely A, B1 and PD6493.

Classification A considers each individual crack as a separate entity. This classification represents a too heavy tool for the purpose of the present Guidance Note.

Classification PD 6493 is issued from and fully described in document BSI "Guidance on some methods for the derivation of acceptance levels for defects in fusion welded joints" - PD6493:1991. It considers interaction between individual cracks from a fracture mechanics aspect, and deals with "acceptability" of cracks more than with "detectability".

Classification B1 appears to be the most adapted system. It considers a "cracked area" as the zone including cracks separated by less than a specified distance. For the purpose of the present Guidance Note, this distance is taken as 50 mm, and the weld is separated into three parts: Brace Toe, Weld Cap and Chord Toe. Any indication featuring within a characterised area is considered as a detection, provided more than 20% of the detected length is included within the zone. The Figure A3-1 illustrates classification B1.

Figure A3-1
B1 Classification



APPENDIX 4 ICON PARTNERS

Name	Address	Country	Telephone	Fax
IFREMER Centre de Brest	BP 70 29280 PLOUZANE	FRANCE	(33).02.98.22.40.40	(33).02.98.22.45.35
TSC	6 Mill Square - Featherstone Rd Wolverton Mill MK12 5RB MILTON KEYNES	UNITED KINGDOM	(44).1908.220.255	(44).1908.220.959
UCL - NDE Centre Dept of Mechanical Engineering	Torrington Place WCE1 7JE LONDON	UNITED KINGDOM	(44).171.380.7184	(44).171.383.0831
CYBERNETIX	Domaine de l'Annonciade Rue Albert Einstein BP 94 Technopole de Château Gombert 13382 Marseille Cedex 13	FRANCE	(33).04.91.66.10.00	(33).04.91.61.41.09
TECNOMARE	San Marco 3584 30124 VENICE	ITALY	(39).41.79.67.11	(39).41.523.03.63
BUREAU VERITAS	92077 PARIS LA DEFENSE Cedex	FRANCE	(33).01.42.91.52.91	(33).01.42.91.53.45