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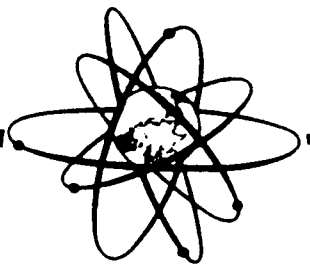
CATALOGUE OF TEST SPECIMENS FOR NON-DESTRUCTIVE EXAMINATION

Prepared by the
CSNI Task Group on NDE Reliability

MAY 1985



COMMITTEE ON THE SAFETY OF NUCLEAR INSTALLATIONS
OECD NUCLEAR ENERGY AGENCY
38, boulevard Suchet, 75016 Paris, France

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NUCLEAR SAFETY DIVISION

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The NEA Committee on the Safety of Nuclear Installations (CSNI) is an international committee made up of scientists and engineers who have responsibilities for nuclear safety research and nuclear licensing. The Committee was set up in 1973 to develop and coordinate the Nuclear Energy Agency's work in nuclear safety matters, replacing the former Committee on Reactor Safety Technology (CREST) with its more limited scope.

The Committee's purpose is to foster international cooperation in nuclear safety amongst the OECD member countries. This is done in a number of ways. Full use is made of the traditional methods of cooperation, such as information exchanges, establishment of working groups, and organization of conferences. Some of these arrangements are of immediate benefit to member countries, for example by enriching the data base available to national regulatory authorities and to the scientific community at large. Other questions may be taken up by the Committee itself with the aim of achieving an international consensus wherever possible. The traditional approach to cooperation is increasingly being reinforced by the creating of cooperative (international) research projects, such as PISC and LOFT, and by a novel form of collaboration known as the international standard problem exercise, for testing the performance of computer codes, test methods, etc., used in safety assessments. These exercises are now being conducted in most sectors of the nuclear safety program.

The greater part of the CSNI cooperative program is concerned with safety technology for water reactors. The principal areas covered are operating experience and the human factor, reactor system response during abnormal transients, various aspects of primary circuit integrity, the phenomenology of radioactive releases in reactor accidents, and risk assessment. The Committee also studies the safety of the fuel cycle, conducts periodic surveys of reactor safety research programs, and operates an international mechanism for exchanging reports on power plant incidents.

The Committee has set up a Subcommittee on Licensing which examines a variety of nuclear regulatory problems, provides a forum for the free discussion of licensing questions, and reviews the regulatory impact of the conclusions reached by CSNI.

Requests for additional copies should be addressed to:

Nuclear Safety Division
OECD Nuclear Energy Agency
38 boulevard Suchet
F-75016 Paris
France

Foreword

One of the key elements in assuring the integrity of reactor primary circuits is the availability of trustworthy non-destructive methods for detecting dangerous defects that may be present.

Various approaches to making such examinations are being developed, including the use of ultrasonic (U/S) and radiographic techniques. To demonstrate their capability and reliability, they must be tested on steel specimens reproducing the various types of faults which may arise in real primary circuit vessels and piping.

Such specimens are costly to fabricate. It is therefore clearly desirable that existing specimens should be made accessible to as many organisations as possible for testing.

This catalogue contains detailed information on forty-odd deliberately flawed plates, blocks, vessels, etc. which have been produced in OECD countries, along with the name of a contact person to whom inquiries should be directed in each case.

The catalogue was prepared by the CSNI Task Group on Non-destructive Examination (NDE) Reliability. The Group was created in late 1982 by CSNI Principal Working Group no. 3, with the general objectives of: examining the long-term effectiveness of NDE, moving towards establishing an international clearing house for test specimens, and providing a forum for informal discussions on how NDE effectiveness could be improved. Contributors to the work of the Task Group are listed on pages 66 to 69.

Activities of the Group were brought to a close at the end of 1984. In addition to this catalogue, the Group has produced a state-of-the-art report on near-surface U/S inspection. Two other projects - an exercise on modelling U/S inspection, and a round-robin trial on U/S inspection of austenitic steels - are to continue as elements of a third Programme of Inspection of Steel Components (PISC-III), which will be carried out from 1985 to 1988 under the auspices of the OECD Nuclear Energy Agency and the Joint Research Centre of the Commission of the European Communities.

CONTENTS

Index to Specimen Descriptions

Specimen Identity	Specimen Type	Type of Flaw	Specimen Size mm	Weight	Availability	Contact	Drawing No (Ref Document)
F7	Austenitic flat plate weldment	5 natural 5 artificial	300 x 500 x 80	-	-	J P Launay	QED/78/0073 QED/79/0043
F9	Cast austenitic flat plate weldment	3 natural	250 x 500 x 80	-	-	J P Launay	QED/78/0075
F10	Cast austenitic plate weldment	3 natural	500 x 500 x 80	-	-	J P Launay	QED/78/0075
F21	Curved block with bimetallic weld	9 natural	787 ID 932 OD thickness 100 to 150	-	-	J P Launay	QED/78/0059
F90	Ferritic plate unclad	18 natural	800 x 800 x 200	-	-	J P Launay	QED/79/0100
F91	Ferritic plate unclad	14 natural 22 artificial	1200 x 1200 x 300	-	-	J P Launay	QED/80/0003
F92	Curved austenitic weldment	3 natural 4 artificial	950 OD thickness 74	-	-	J P Launay	QED/80/0009
F94	Cast austenitic elbow Weld	10 natural	932 OD 787 ID thickness 100 to 150	-	-	J P Launay	QED/79/0049
F96	Clad plate with sleeves	3 natural	654 x 654 x 70	-	-	J P Launay	QED/78/0033
F131	Ferritic plate	lack of penetration	270 x 270 x 150	-	-	J P Launay	-
F153	Ferritic plate	natural	660 x 700 x 190	-	-	J P Launay	(TM/LTU 82.458)
F243	Clad plate	natural	304 x 94 x 80	-	-	J P Launay	(TM/QUGF 75.3142)
RTD	Nozzle and girth welds	Range of geometrical	3040 x 2500 x 160	8T	For hire	J. de Sterke	OP191-114-00 -A2
AC-58/ 80(101)	Unclad flat plate weldment	13 artificial 7 natural	500 x 800 x 94	300kg	By negotiation	Mr. Cereceda	AC-58/80(101)
AC-58/ 80(102)	Unclad flat plate weldment	10 artificial	500 x 500 x 94	188kg	By negotiation	Mr. Cereceda	AC-58/80(102)

(continued on next page)

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(continued from previous page)

Specimen Identity	Specimen Type	Type of Flaw	Specimen Size mm	Weight	Availability	Contact	Drawing No (Ref Document)
3576/24/1	Flat austenitic plate weldment	Lack of sidewall fusion and slag	289 x 161 x 18	-	-	B Hemsworth	-
3576/24/2	"	Lack of sidewall fusion	238 x 158 x 18	-	-	"	-
3576/24/3	"	Linear slag entrapment	240 x 160 x 18	-	-	"	-
3576/24/4	"	Isolated slag entrapment	235 x 158 x 19	-	-	"	-
3576/24/5	"	Porosity	"	-	-	"	-
3576/24/6	"	Weld metal cracking	239 x 156 x 17	-	-	"	-
3576/24/7	"	Lack of root penetration	238 x 158 x 17	-	-	"	-
3576/24/8	"	Fatigue crack	240 x 156 x 17	-	-	"	-
3576/24/9	"	Fatigue crack	238 x 155 x 17	-	-	"	-
R7	Clad flat plate	Underclad EDM	360 x 360 x 50	50 kg	A	B Watkins	R7
R8	Clad flat plate	Underclad EDM	300 x 300 x 50	35 kg	A	B Watkins	R8
R27	Clad flat weldment	Range of 20 flaws	1500 x 1500 x 250	4.4T	From March 84	B Watkins	IAE 431493
R28	Clad curved plate	Underclad	1300 ⌀ x 275	2.8T	A	B Watkins	IAE 431625
R30	Simulated inlet nozzle	Near surface defects	1300 OD x 880 ID x 275	1.5T	A	B Watkins	R30
R31	Simulated outlet nozzle	Near surface defects	1254 OD x 744 ID x 232	1.4T	A	B Watkins	R31
H13	Simulated nozzle clad	Underclad	1485 ⌀ x 275	2.7T	A	B Watkins	EH1/5146
H14	Simulated nozzle unclad	Underclad	1485 ⌀ x 275	3.1T	A	B Watkins	EH1/5285

A = AVAILABLE

(continued on next page)

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(continued from previous page)

Specimen Identity	Specimen Type	Type of Flaw	Specimen Size mm	Weight	Availability	Contact	Drawing No (Ref Document)
FWN-1	Feedwater nozzle	Isolated thermal fatigue cracks	2133 x 2133 x 513	7127 kg	By negotiation	R Stone	FWN-1
CE-1	Ferritic flat plate weldments	Chemically induced sub-surface flaws	1213 x 610 x 173	1050 kg	By negotiation	R Stone	CE-1
SB-1	Flat ferritic plate Stainless steel clad	Semi elliptic notches and fatigue cracks	600 x 490 x 90	215 kg	By negotiation	R Stone	SB-1
SB-2	Flat ferritic plate Stainless steel clad	Semi elliptic notches and fatigue cracks	600 x 490 x 90	215 kg	By negotiation	R Stone	SB-2
SB-3	Flat ferritic plate Stainless steel clad	Semi elliptic notches and fatigue cracks	600 x 490 x 90	215 kg	By negotiation	R Stone	SB-3
SB-4	Flat ferritic plate Stainless steel clad	Semi elliptic notches and fatigue cracks	600 x 490 x 90	215 kg	By negotiation	R Stone	SB-4
SB-5	Flat ferritic plate Stainless steel clad	Semi elliptic notches and fatigue cracks	800 x 500 x 90	340 kg	By negotiation	R Stone	SB-5
SB-6	Flat ferritic plate Stainless steel clad	Semi elliptic notches and fatigue cracks	800 X 500 X 90	340 kg	By negotiation	R Stone	SB-6
SB-7	Flat ferritic plate stainless steel clad	Semi elliptic notches notches and fatigue	800 x 500 x 90	340 kg	By negotiation	R Stone	SB-7

(continued on next page)

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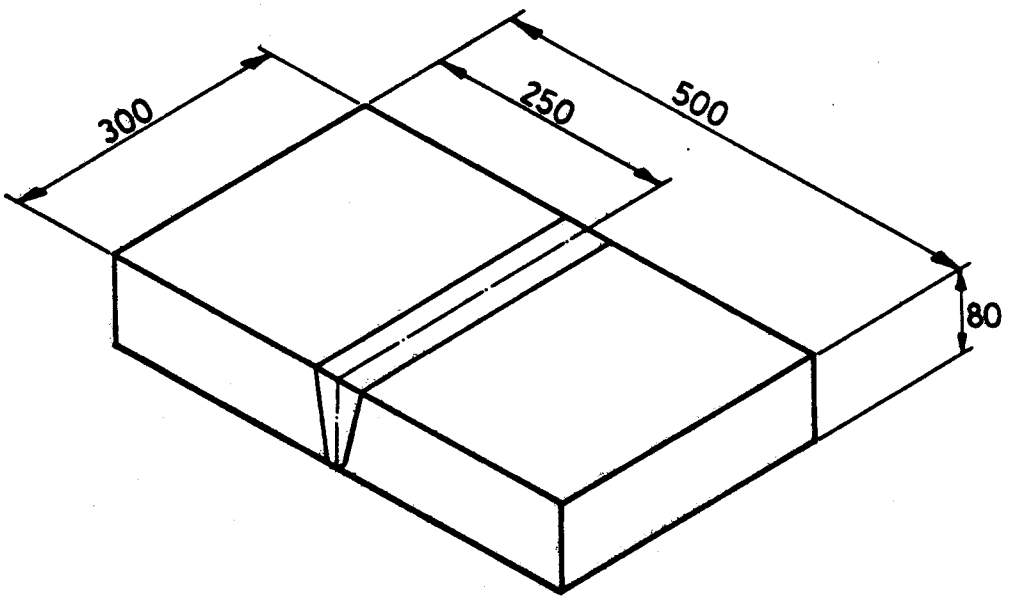
(continued from previous page)

Specimen Identity	Specimen Type	Type of Flaw	Specimen Size mm	Weight	Availability	Contact	Drawing No (Ref Document)
PISC -II Plate 3	Inlet Nozzle	Slag inclusions, lack of fusion, smooth and rough cracks	2620x2300x250	16000 kg	By negotiation	E.Borloo S.Crutzen	81-1192-00G- a
EDC-1-0 -3	Flat plate	Re-entrant machined slots	650x300x195	300 kg	" " "	" "	81-1192-00E EDC-2-F
EDC-2-0 -9	Flat plate	Re-entrant machined holes, spark eroded holes	450x300x195	205 kg	" " "	" "	81-1192-00E EDC-2-G
EDC-3-0 -10	Flat plate	Re-entrant machined holes	650x300x195	300 kg	" " "	" "	81-1192-00E EDC-3G
EDC-4-0 -16	Flat plate	Re-entrant machined holes	650x300x195	300 kg	" " "	" "	81-1192-00E EDC-4-H
EDC-40- 6-2	Flat plate	Shrink-fit hole	600x300x195	275 kg	" " "	" "	84-1275-0C
EDC-40- 5	Flat plate	Shrink-fit hole	570x300x190	255 kg	" " "	" "	84-1275-0B
EDC-40- 8	Flat plate	Shrink-fit holes	650x300x195	275 kg	" " "	" "	84-1275-0A
EBC-45	Flat plate	Machined holes	400x280x190	170 kg	" " "	" "	84-1275-0B
EEC-60	Flat plate	Machined holes	375x300x150	132 kg	" " "	" "	81-1192-EEC-60
EDC-70	Flat plate	Machined holes	275x200x99.5	43 kg	" " "	" "	81-1192-EEC-70
EBC-S	Flat plate	Machined slots	215x175x50	15 kg	" " "	" "	81-1192-EEC-S
EEC-T	Flat plate	Machined holes	530x400x195	325 kg	" " "	" "	81-1192-EEC-T
EDC-C1- d	Flat plate	Machined holes	570x250x195	218 kg	" " "	" "	81-1192-EDC-C1-d

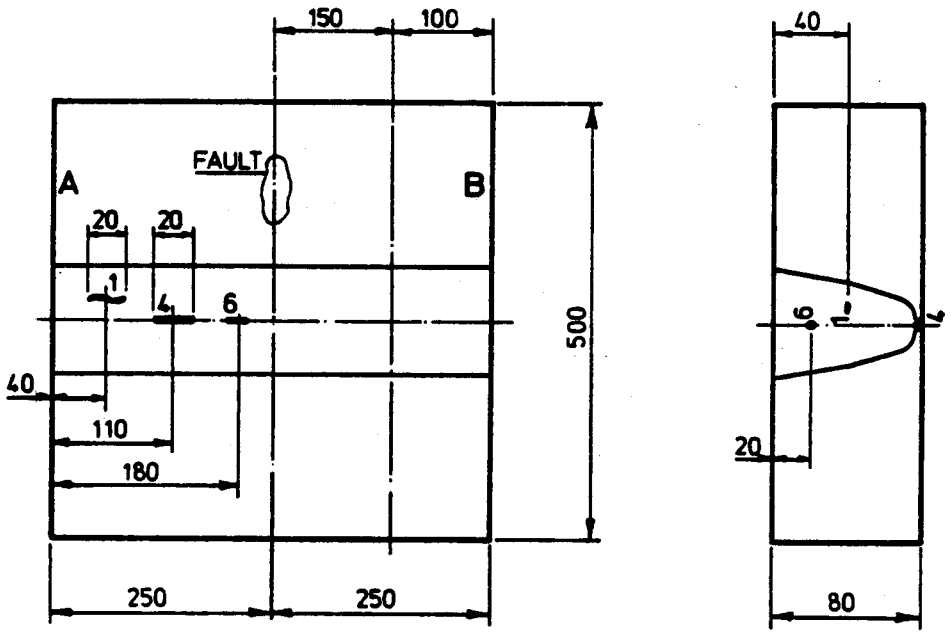
SPECIMEN IDENTITY	FRAMATOME F7 - AUSTENITIC FLAT PLATE WELDMENT
DRAWING	QED 78/0073 QED 79/0043



MATERIAL	AUSTENITIC (Z3 CND 1712 FORGED)
CLADDING	N/A
TYPES OF FLAW	5 NATURAL (LONGITUDINAL CRACKS AND INCLUSIONS) 4 CROSS-DRILLED HOLES ϕ3 PARALLEL WITH WELD SEAM ℄ 1 NOTCH 3x3x75 ALONG WELD ℄
CONTACT	M. J P LAUNAY FRAMATOME CHALON

SPECIMEN IDENTITY — FRAMATOME F9 - CAST AUSTENITIC FLAT PLATE WELDMENT

DRAWING — QED 78/0075



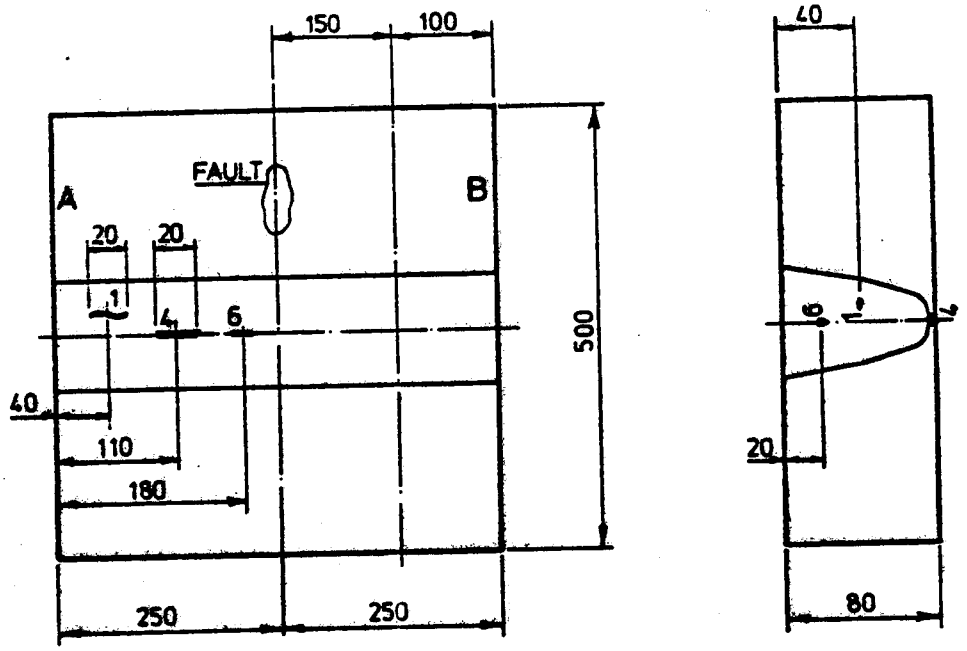
MATERIAL — AUSTENITIC (Z5 CN 19.9 - Z3 CND 1910 CAST)

CLADDING — N/A

TYPES OF FLAW
3 NATURAL
1 LONGITUDINAL CRACK
1 LACK OF ROOT PENETRATION
1 INCLUSION

CONTACT
M. J P LAUNAY
FRAMATOME
CHALON

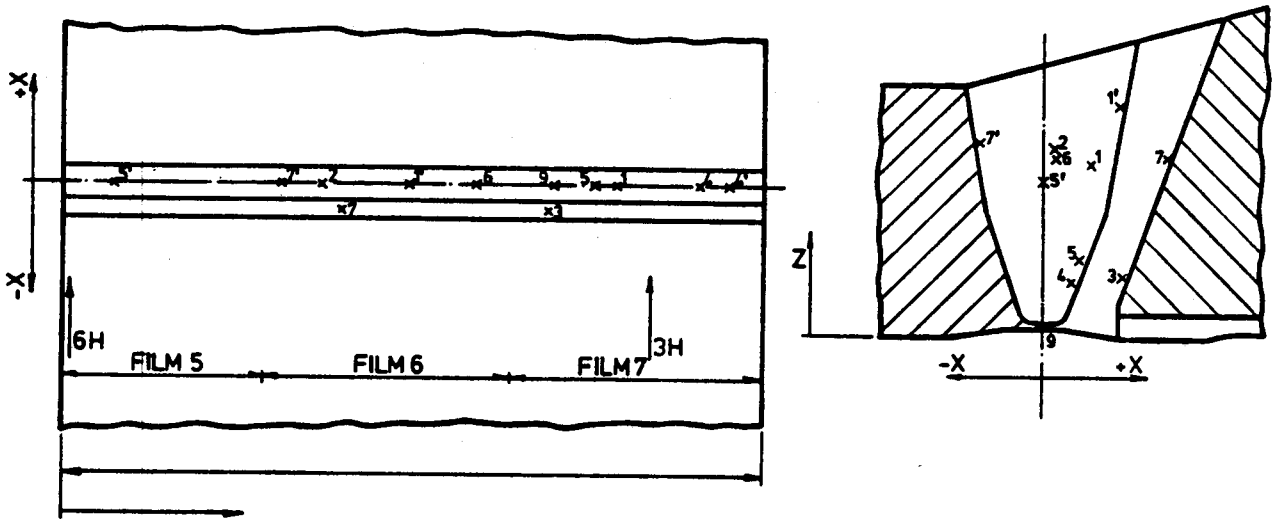
SPECIMEN IDENTITY	FRAMATOME F10 CAST AUSTENITIC FLAT PLATE WELDMENT
DRAWING	QED 72/0075



MATERIAL	AUSTENITIC (Z5 CN19.9 - Z3 CND1910 CAST)
CLADDING	N/A
TYPES OF FLAW	3 NATURAL 1 LONGITUDINAL CRACK 1 LACK OF ROOT PENETRATION 1 INCLUSION
CONTACT	M. J P LAUNAY FRAMATOME CHALON

SPECIMEN IDENTITY FRAMATOME F21 - CURVED BLOCK WITH TRANSITION WELD

DRAWING QED 78/0052



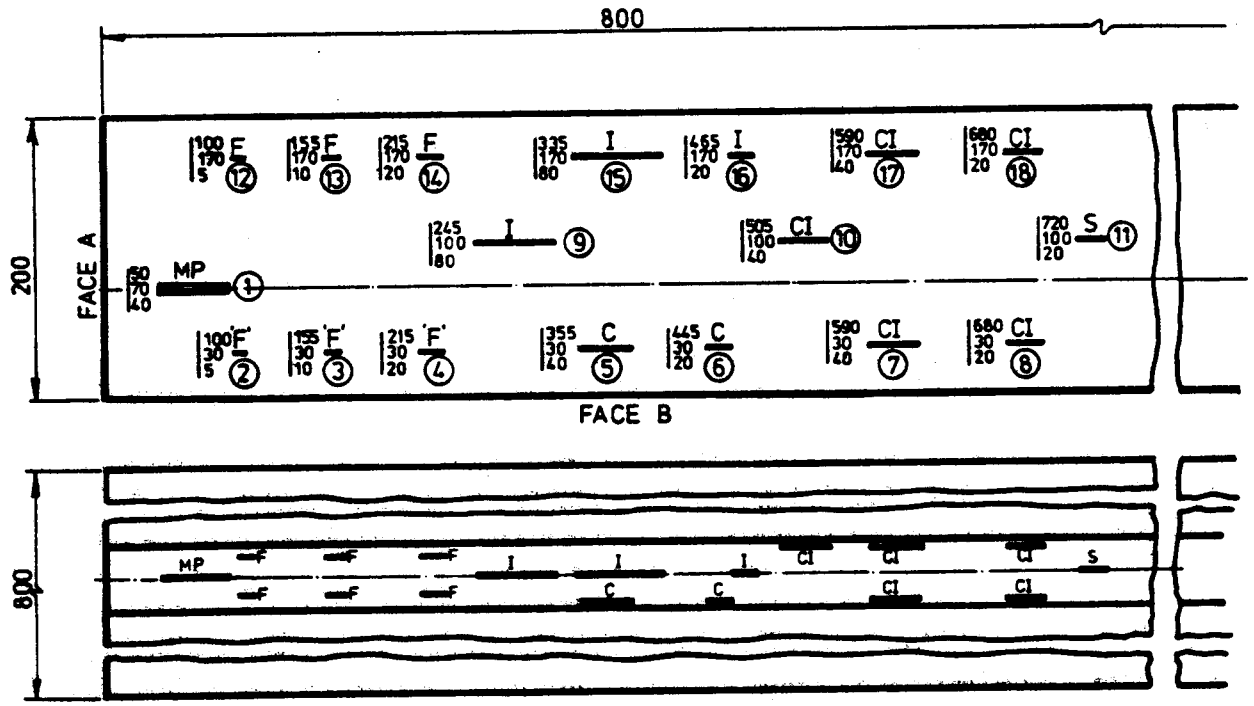
MATERIAL TRANSITION AUSTENITIC/FERRITIC
Z3 CND 19.10 - SA 216 WCC CAST
WELD ELECTRODES OK 16.30 & OK 63.25

CLADDING

TYPES OF FLAW NATURAL WELD DEFECTS

CONTACT M. J P LAUNAY
FRAMATOME
CHALON

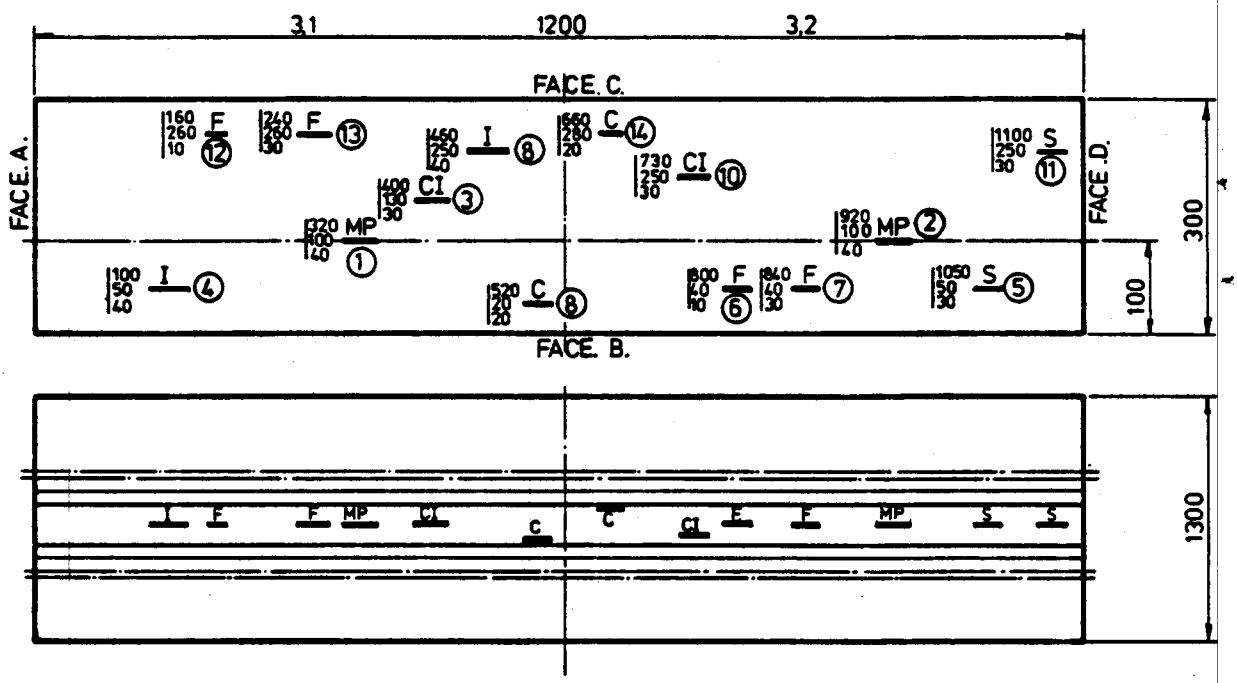
SPECIMEN IDENTITY	FRAMATOME F90 WELD JOINTED FERRITIC PLATE CONTAINING NATURAL DEFECTS
DRAWING	QED 79/0100



MATERIAL	A533B C1.1
CLADDING	N/A
TYPES OF FLAWS	18 NATURAL WELD FLAWS INCLUDING CRACKS, POROSITY, INCLUSIONS, LACK OF PENETRATION, SLAG
CONTACT	M. J P LAUNAY FRAMATOME CHALON

SPECIMEN IDENTITY — FRAMATOME F91 WELD JOINT CONTAINING NATURAL WELD FLAWS IN UNCLAD FERRITIC PLATE

DRAWING — QED 80/0003



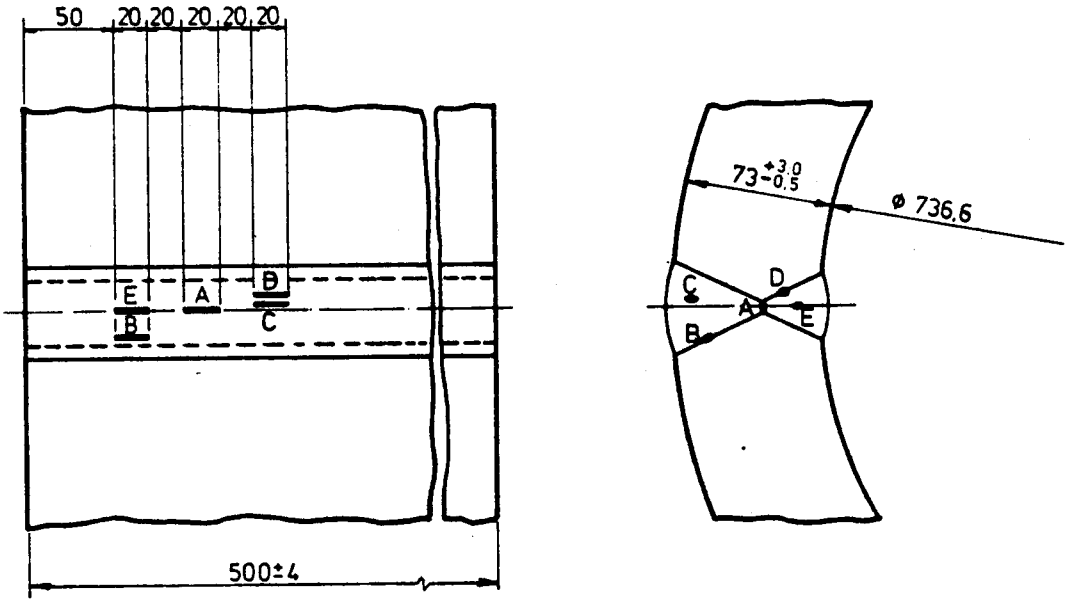
MATERIAL — A533B CLASS 1

CLADDING — N/A

TYPES OF FLAWS — 14 NATURAL WELD FLAWS INCLUDING
CRACKS (4), POROSITY (2), INCLUSIONS (2),
LACK OF PENETRATION (2), SLAG (2), SLAG AND INCLUSIONS (2)
22 ARTIFICIAL FLAWS 2mm DIA CROSS-DRILLED TO HOLES

CONTACT — M. J P LAUNAY
FRAMATOME
CHALON

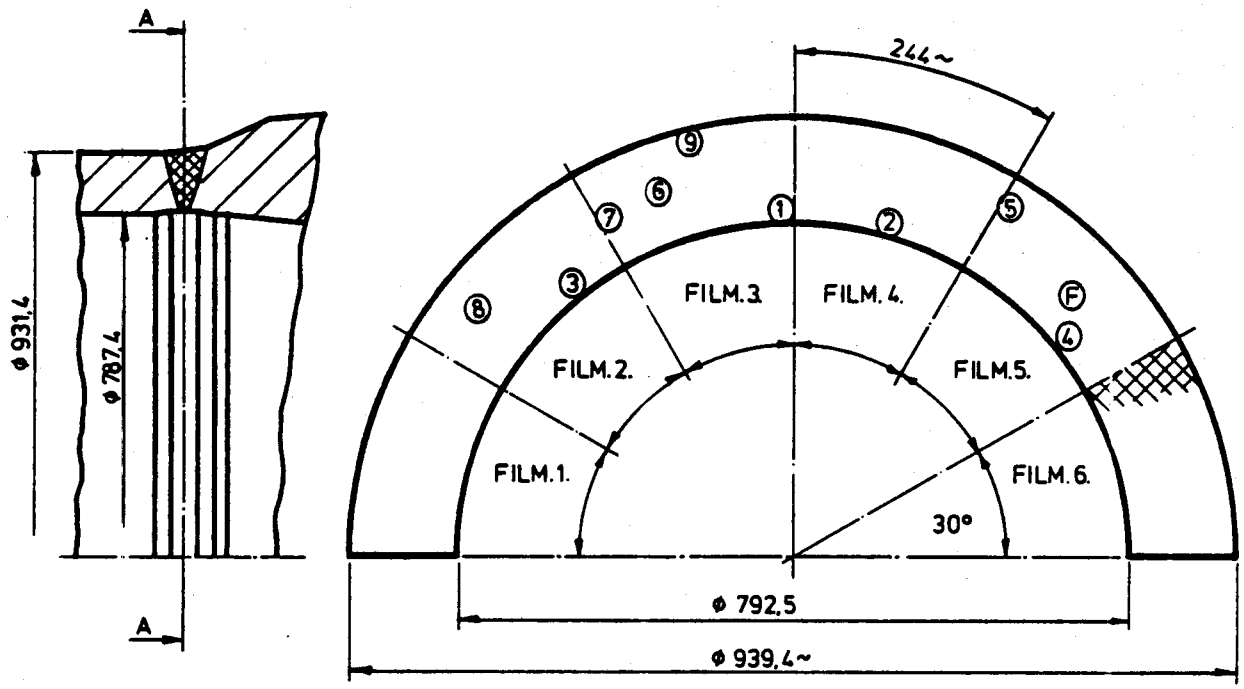
SPECIMEN IDENTITY	FRAMATOME F92 SEAM WELD IN CURVED AUSTENITIC SECTION
DRAWING	QED 80/0009



MATERIAL	Z3 CND 17-12 (AUSTENITIC)
CLADDING	N/A
TYPES OF FLAWS	3 NATURAL WELD FLAWS INCLUDING ROOT DEFECT, SLAG OR INCLUSIONS AND LONGITUDINAL CRACKING. 4 ARTIFICIAL FLAWS INCLUDING 3mm DIA HOLES AND A FATIGUE CRACK
CONTACT	M. J P LAUNAY FRAMATOME CHALON

SPECIMEN IDENTITY FRAMATOME F94

DRAWING QED 79/0049



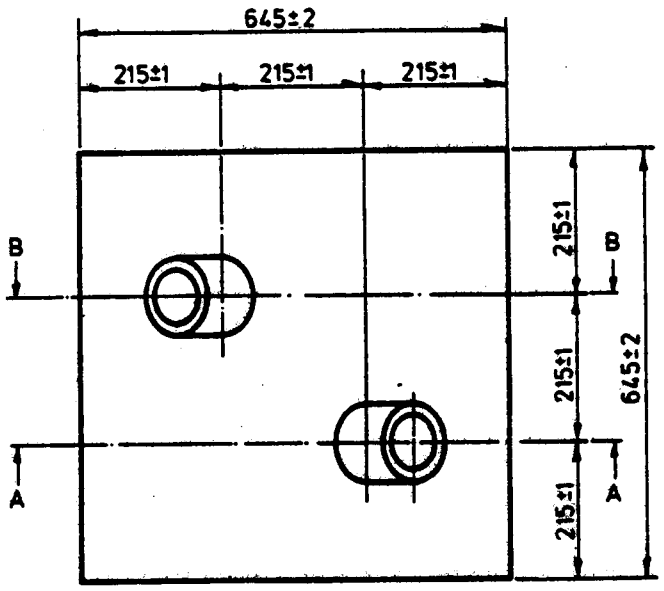
MATERIAL Z3 CND 19.10 & Z5 CN 19.9

CLADDING N/A

TYPES OF FLAW WELD FLAWS INCLUDING LACK OF ROOT PENETRATION, INCLUSIONS, LACK OF FUSION AND LONGITUDINAL AND TRANSVERSE CRACKS

CONTACT M. J P LAUNAY
FRAMATOME
CHALON

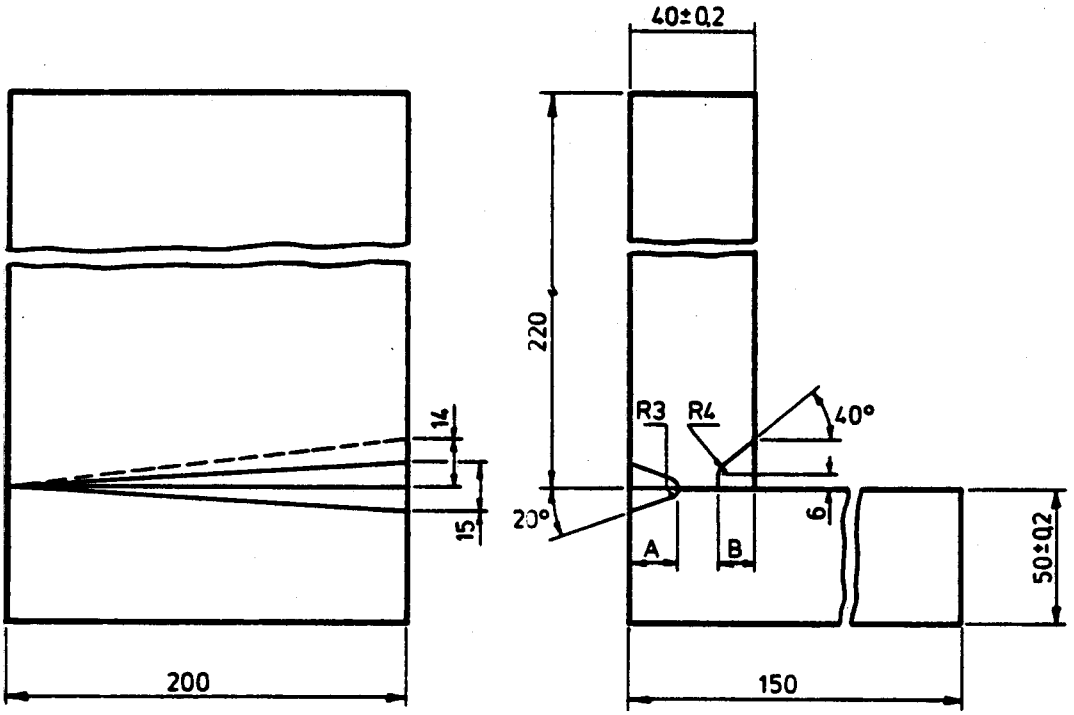
SPECIMEN IDENTITY	FRAMATOME F96 - CLAD PLATE WITH SLEEVES
DRAWING	QED 78/0033



MATERIAL	LOW ALLOY STEEL - INCONEL
CLADDING	STAINLESS STEEL
TYPES OF FLAW	WELD FLAWS INCLUDING 2 INCLUSIONS AND 1 LONGITUDINAL CRACK
CONTACT	M. J P LAUNAY FRAMATOME CHALON

SPECIMEN IDENTITY FRAMATOME F131 - SKIRT TO FOOT JOINT

DRAWING



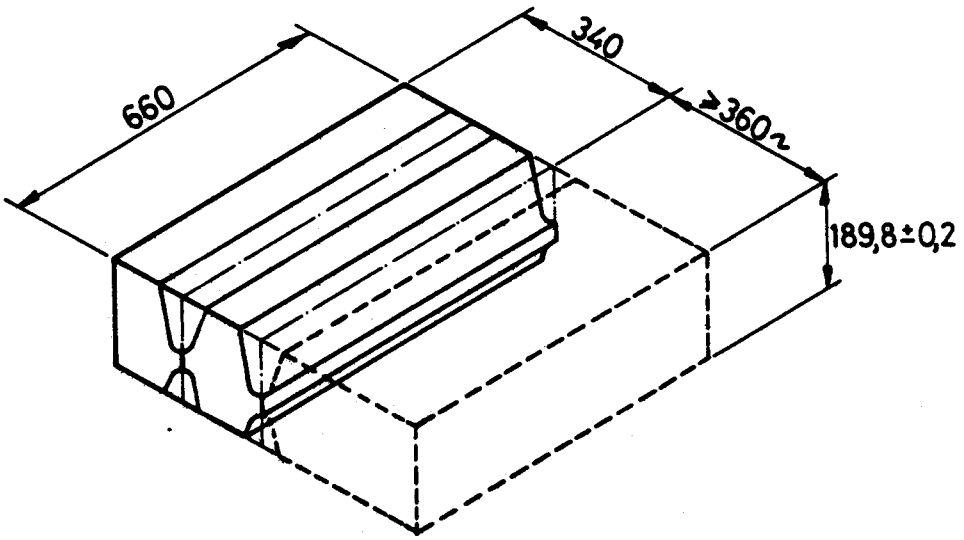
MATERIAL A533

CLADDING N/A

TYPES OF FLAW LACK OF WELD PENETRATION

CONTACT M. J P LAUNAY
FRAMATOME
CHALON

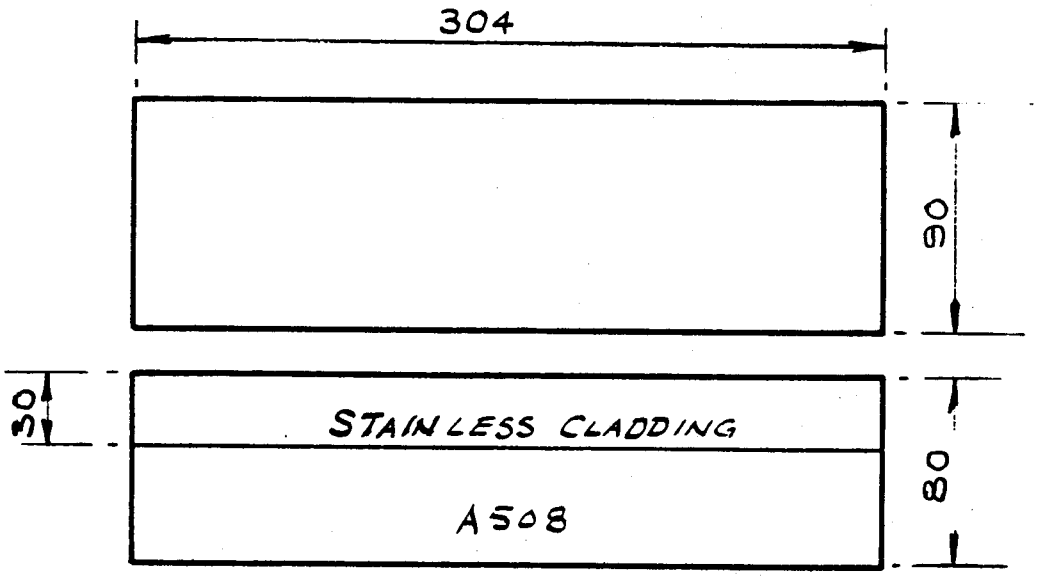
SPECIMEN IDENTITY	FRAMATOME F153 WELDED FERRITIC PLATE
DRAWING	TM/LTU 82.458 PAGE 2



MATERIAL	A533
CLADDING	N/A
TYPES OF FLAW	NATURAL
CONTACT	M. J P LAUNAY FRAMATOME CHALON

SPECIMEN IDENTITY FRAMATOME F243 - CLAD PLATE

DRAWING



MATERIAL A508

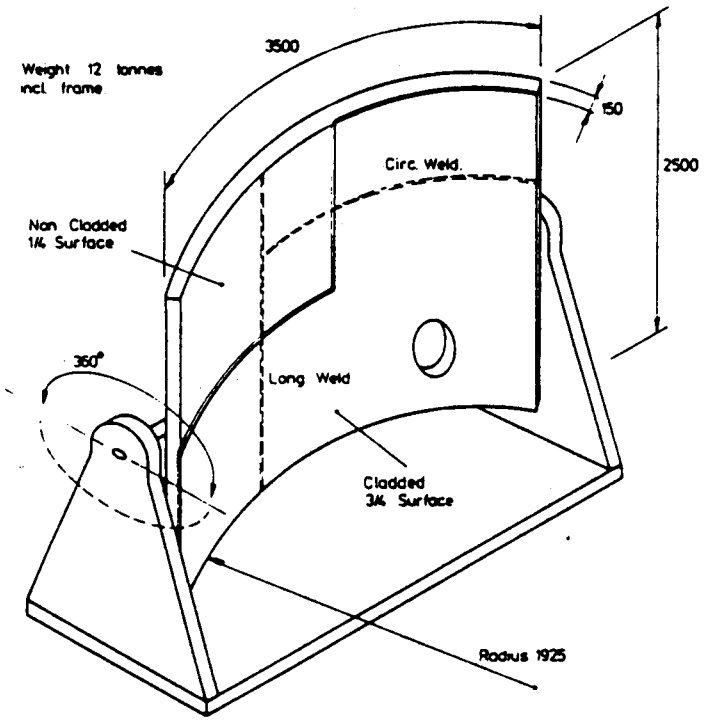
CLADDING STAINLESS STEEL

TYPES OF FLAW NATURALLY OCCURRING REFLECTORS

CONTACT M. J P LAUNAY
FRAMATOME
CHALON

SPECIMEN IDENTITY: RTD test plate assembly

weight 12 tons
incl. frame.



MATERIAL : STEEL ASME SA 533 Gr.B. Cl. 1
with one circumferential and one
longitudinal weld, both partly cladded

CLADDING : For ¾ cladded with 2-layer strip clad
60x05 SANDVIK 3RE15
Nozzle area = manual cladded.

TYPES OF FLAWS : circular planar reflectors, with
surface of broken tensile test bar.

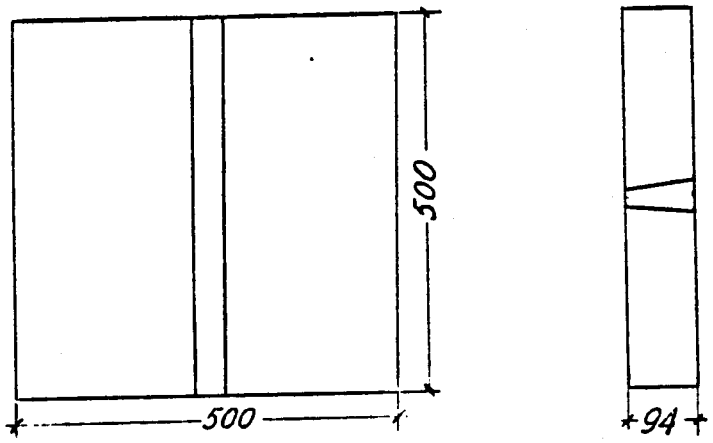
depth range : through out thickness-range embedded "defect coin" at weldpreparation.

- 14 defects in longitudinal weld
- 23 " " circumferential weld 6Ø and 10Ø
- 6 inner radius defects
- 4 undercladding cracks
- calibration reflectors according to:
  ASME I-3000
  KTA 3201-3

CONTACT : J.A. de Raad or R.van Agthoven
RTD, Röntgen Technische Dienst B.V.
Delftweg 144, 3046 NC Rotterdam.
Telex 23366, Telephone 010-150200

SPECIMEN IDENTITY: AC - 58/80 Weight: 188 kg.

(102)



Material: SA-533 Gr.B CL:2

Cladding: N.A.

One Weld: SAW

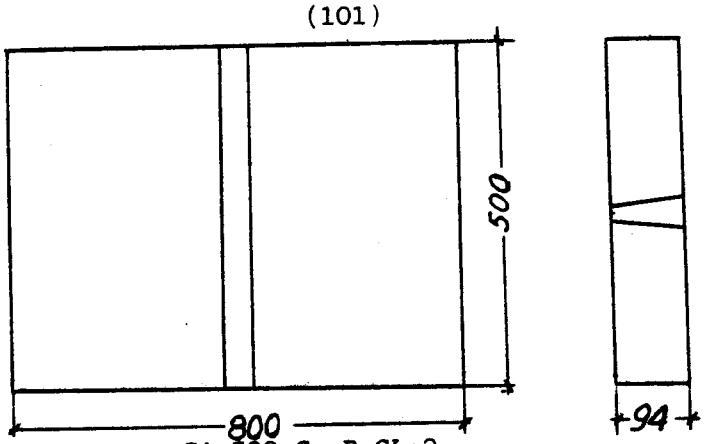
Types of flaw: 1: Simulated lack of fusion: 7
Depth range: 20 to 60 mm
Length range: 10 to 24 mm

2: Simulated slag inclusions: 3
Depth: 20 mm
Length range: 2.5 to 20 mm

Contact: Mr. Cereceda
Tecnatom, S.A.
C.N.-I, km. 19, Madrid-Irún
S. Sebastián de los Reyes
MADRID - SPAIN

SPECIMEN IDENTITY: AC - 58/80 Weight: 300 kg.

(101)



Material: SA-533 Gr.B CL:2

Cladding: N.A.

Two welds: SAW

Types of flaw:

1: Simulated lack of fusion: 7
Depth range: 26 to 66 mm.
Length range: 10 to 20 mm.

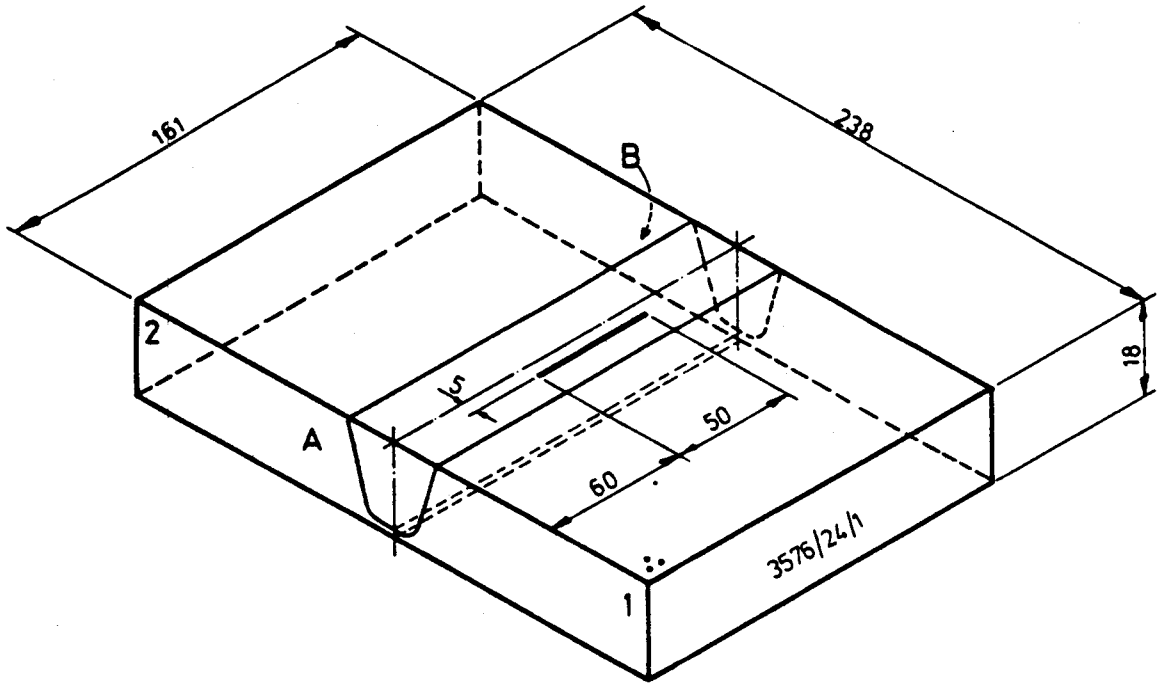
2: Simulated slag inclusions: 6
Depth range: 23 to 63 mm.
Length range: 2.5 to 25 mm.

3. Fatigue Crack. Inserts: 7
Depth range: 18 to 59 mm.
Length range: 3.2 to 32 mm.

Contact: Mr. Cereceda
Tecnatom, S.A.
C.N.-I, km. 19, Madrid-Irún
S. Sebastián de los Reyes
MADRID - SPAIN

SPECIMEN IDENTITY 3576/24/1 AUSTENITIC FLAT PLATE WELDMENT

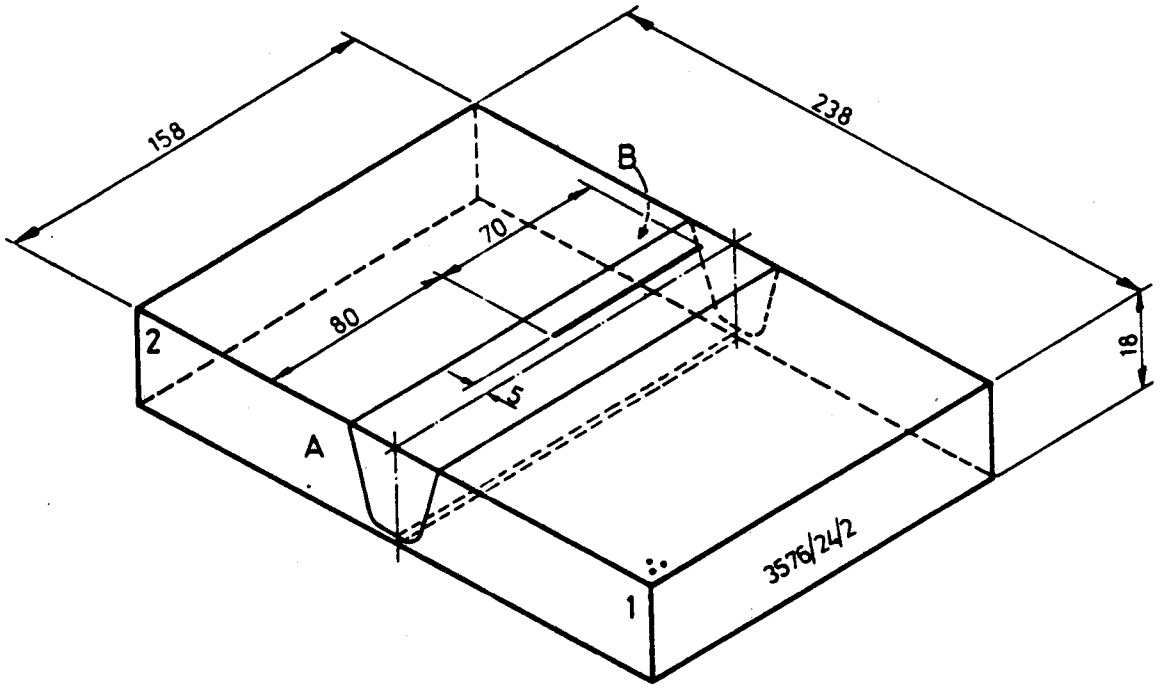
DRAWING



MATERIAL	AISI GRADE 316 AUSTENITIC STAINLESS STEEL
CLADDING	N/A
TYPES OF FLAW	LACK OF SIDEWALL FUSION AND SLAG
CONTACT	MR B HEMSWORTH HEALTH & SAFETY EXECUTIVE THAMES HOUSE NORTH MILLBANK LONDON SW1P 4QJ

SPECIMEN IDENTITY 3576/24/2 AUSTENITIC FLAT PLATE WELDMENT

DRAWING



MATERIAL AISI GRADE 316 AUSTENITIC STAINLESS STEEL

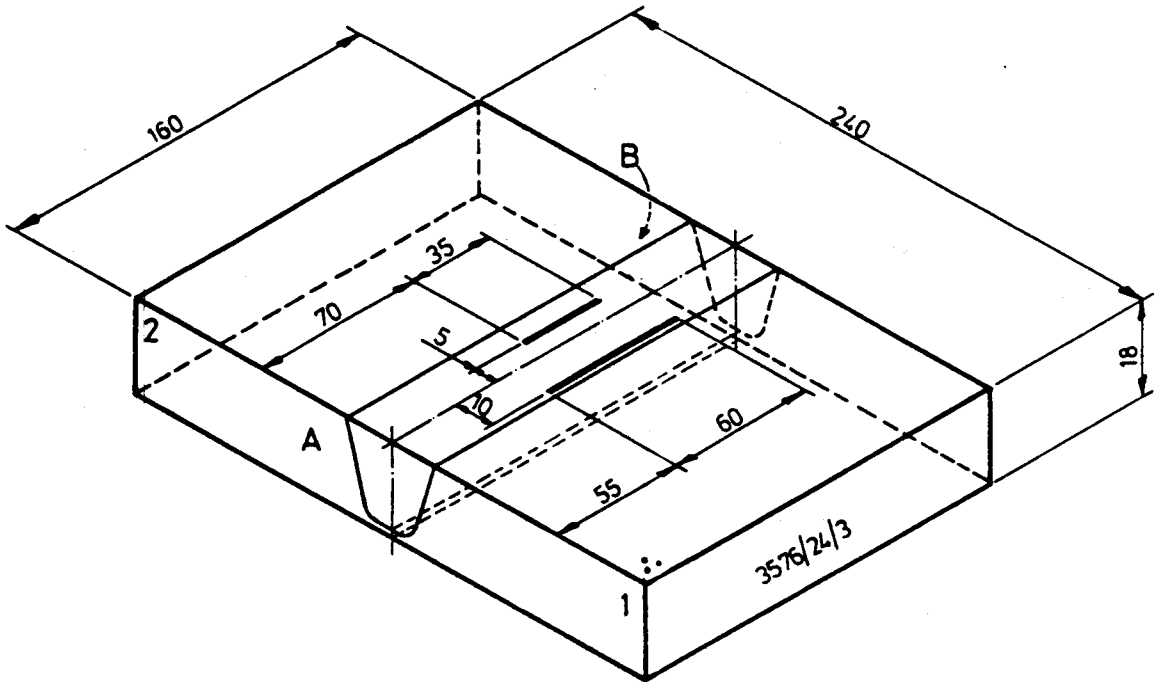
CLADDING N/A

TYPES OF FLAW LACK OF SIDEWALL FUSION

CONTACT MR B HEMSWORTH
HEALTH & SAFETY EXECUTIVE
THAMES HOUSE NORTH
MILLBANK
LONDON SW1P 4QJ

SPECIMEN IDENTITY 3576/24/3 AUSTENITIC FLAT PLATE WELDMENT

DRAWING



MATERIAL AISI GRADE 316 AUSTENITIC STAINLESS STEEL

CLADDING N/A

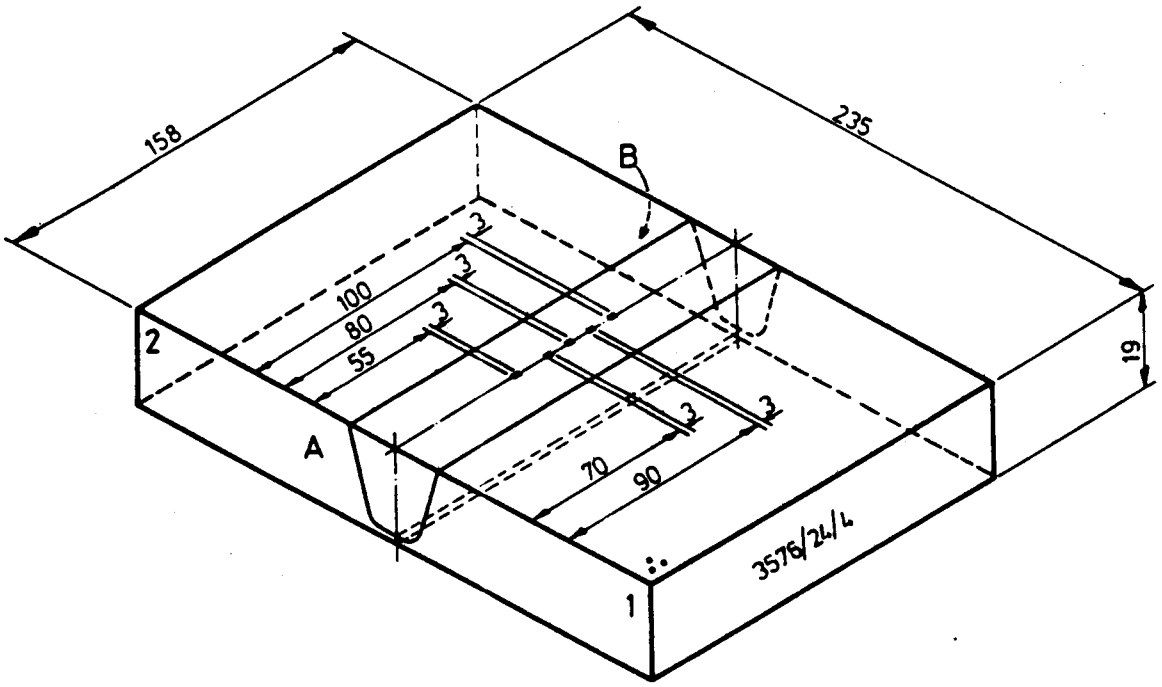
TYPES OF FLAW LINEAR SLAG ENTRAPMENT

CONTACT

MR B HEMSWORTH
HEALTH & SAFETY EXECUTIVE
THAMES HOUSE NORTH
MILLBANK
LONDON SW1P 4QJ

SPECIMEN IDENTITY 3576/24/4 AUSTENITIC FLAT PLATE WELDMENT

DRAWING



MATERIAL AISI GRADE 316 AUSTENITIC STAINLESS STEEL

CLADDING N/A

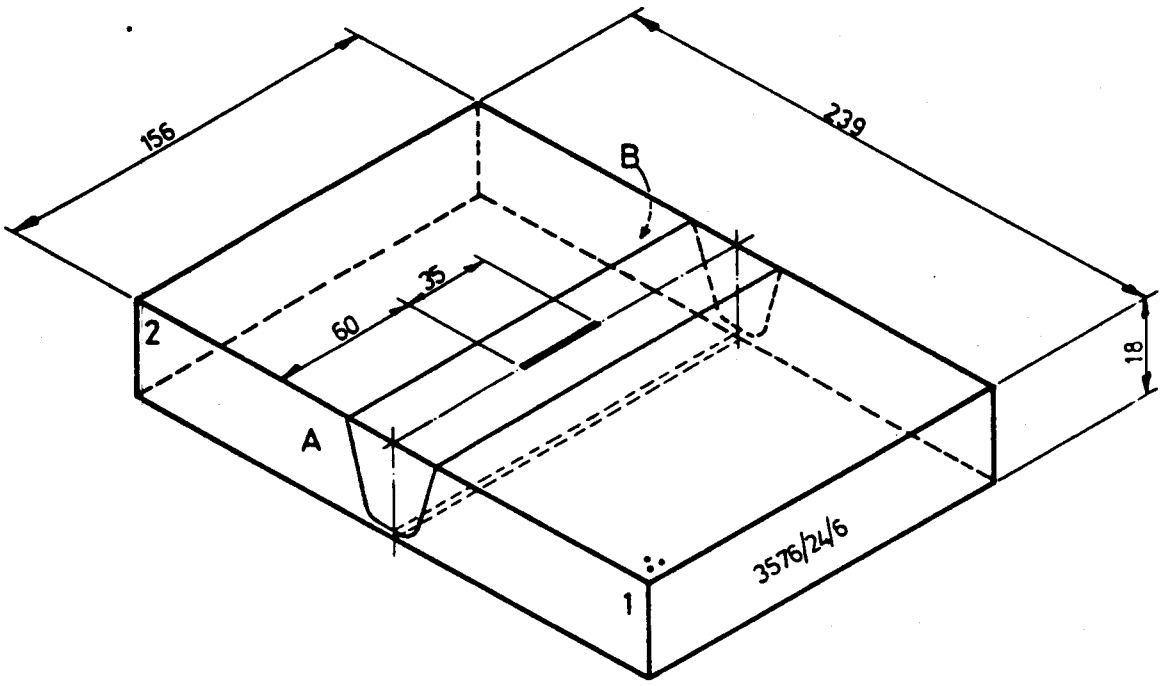
TYPES OF FLAW ISOLATED SLAG ENTRAPMENT

CONTACT

MR B HEMSWORTH
HEALTH & SAFETY EXECUTIVE
THAMES HOUSE NORTH
MILLBANK
LONDON SW1P 4QJ

SPECIMEN IDENTITY 3576/24/6 AUSTENITIC FLAT PLATE WELDMENT

DRAWING



MATERIAL AISI GRADE 316 AUSTENITIC STAINLESS STEEL

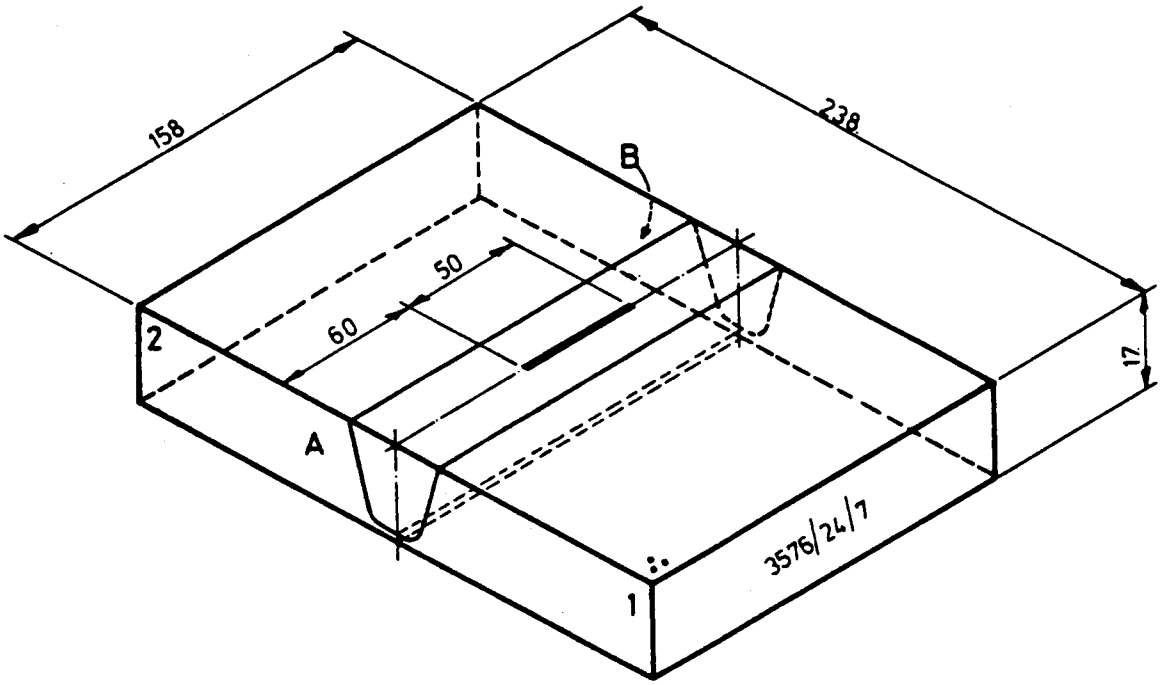
CLADDING N/A

TYPES OF FLAW WELD METAL CRACKING

CONTACT MR B HEMSWORTH
HEALTH & SAFETY EXECUTIVE
THAMES HOUSE NORTH
MILLBANK
LONDON SW1P 4QJ

SPECIMEN IDENTITY 3576/24/7 AUSTENITIC FLAT PLATE WELDMENT

DRAWING



MATERIAL AISI GRADE 316 AUSTENITIC STAINLESS STEEL

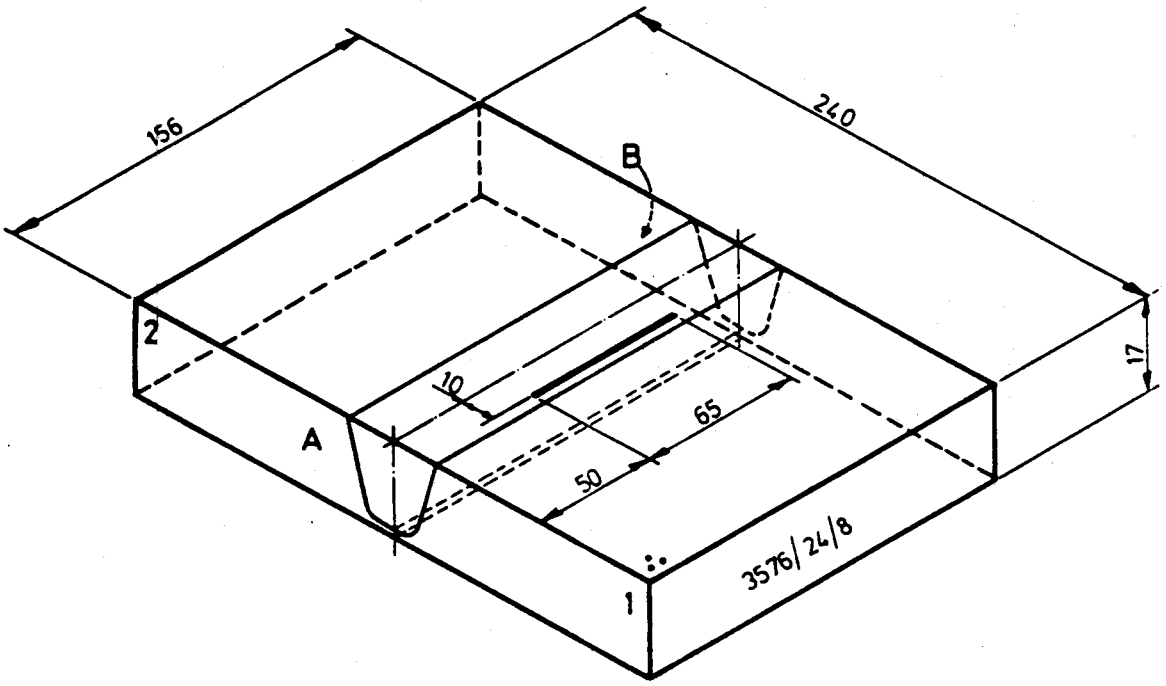
CLADDING N/A

TYPES OF FLAW LACK OF ROOT PENETRATION

CONTACT MR B HEMSWORTH
HEALTH & SAFETY EXECUTIVE
THAMES HOUSE NORTH
MILLBANK
LONDON SW1P 4QJ

SPECIMEN IDENTITY 3576/24/8 AUSTENITIC FLAT PLATE WELDMENT

DRAWING



MATERIAL AISI GRADE 316 AUSTENITIC STAINLESS STEEL

CLADDING N/A

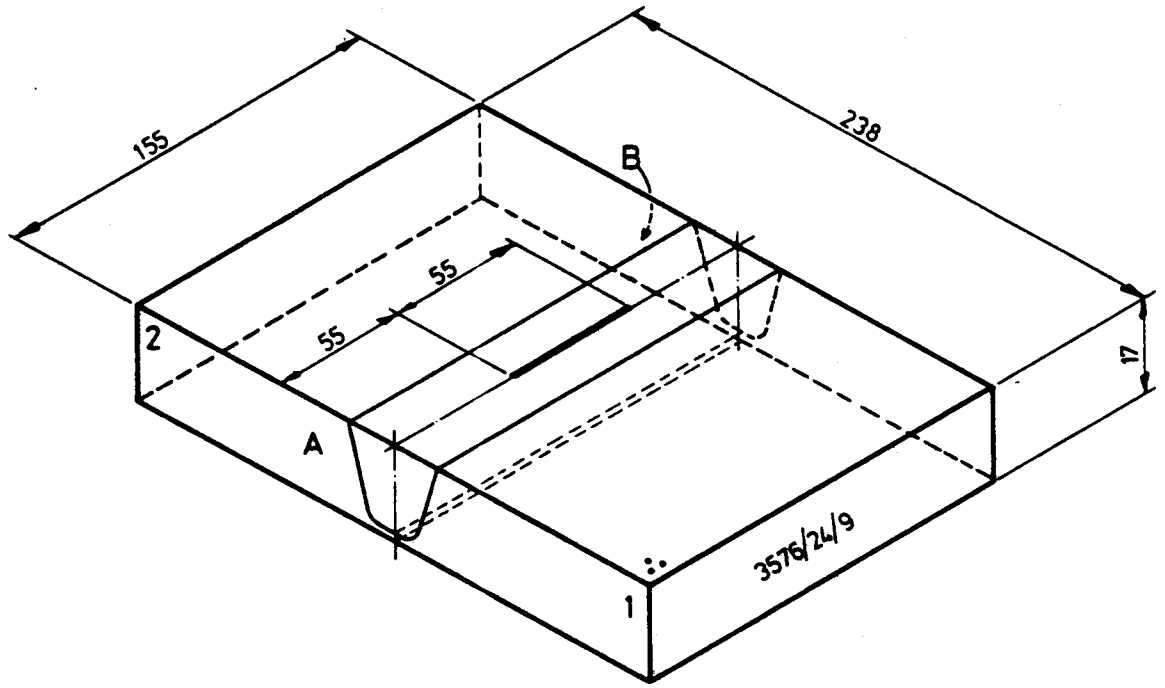
TYPES OF FLAW FATIGUE CRACK GROWN FROM WELD TOE AND IS ENTIRELY IN PARENT PLATE

CONTACT

MR B HEMSWORTH
HEALTH & SAFETY EXECUTIVE
THAMES HOUSE NORTH
MILLBANK
LONDON SW1P 4QJ

SPECIMEN IDENTITY 3576/24/9 AUSTENITIC FLAT PLATE WELDMENT

DRAWING



MATERIAL AISI GRADE 316 AUSTENITIC STAINLESS STEEL

CLADDING N/A

TYPES OF FLAW FATIGUE CRACK (ONLY SMALL INDICATIONS SEEN ON RADIOGRAPH)
VIRTUALLY DEFECT FREE

CONTACT MR B HEMSWORTH
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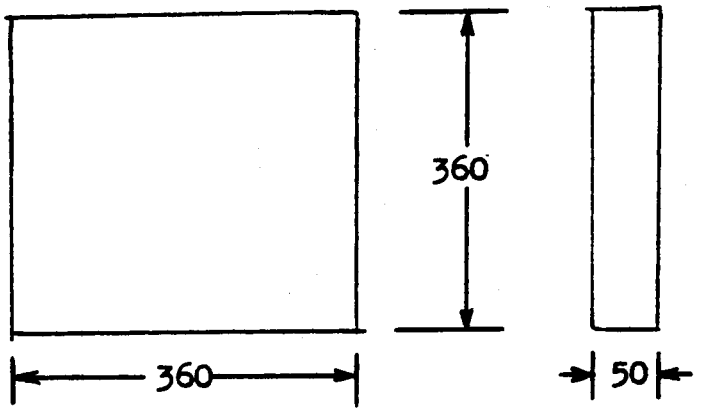
THAMES HOUSE NORTH
MILLBANK
LONDON SW1P 4QJ

SPECIMEN IDENTITY UKAEA R7

Drawing R7 Weight 50 Kg



Material Mild steel

Cladding 2-layer stainless steel strip clad, 7 mm thick (as clad)

Types of Flaw
Rectangular EDM notches
Depth range 5 to 20 mm from clad interface
Length 10 to 20 mm
Inclination, varied 0° to $20^{\circ}C$
Some of the defects are isolated clusters but others are in clusters
Defects are either parallel or normal to the weld deposition axis

Contact
Mr B Watkins
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United Kingdom Atomic Energy Authority
(Northern Division)
Risley
Warrington WA3 6AT
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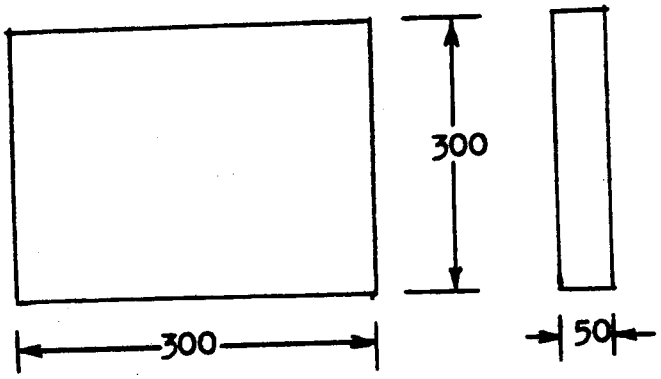
Tel No: Warrington (0925) 31244, extension 2881
Telex No: 629301

SPECIMEN IDENTITY UKAEA R8

Drawing R8 Weight 35 Kg



Material Mild steel

Cladding 2-layer stainless steel, 7 mm thick (as clad)

Types of Flaw
Elliptical shaped EDM notches
Depth range 3 to 25 mm from clad/base plate interface
Length 10 to 60 mm
Inclination to clad direction, normal, 15° and 25°
Inclination surface waves 0-15°
Isolated and cluster of defect

Contact

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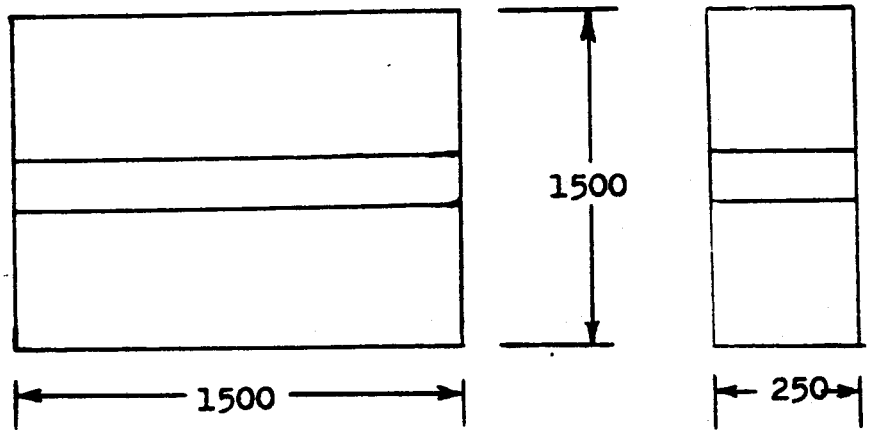
ENGLAND

Tel No: Warrington (0925) 31244, extension 2881
Telex No: 629301

SPECIMEN IDENTITY UKAEA R27

Drawing IAE 431493 Weight 4.4 Tonne



Material A508 Class III

Cladding 2-layer stainless steel strip clad
7 mm thick, ground to 0.5 mm on 50 mm

Types of Flaw Coupon inserts, carbon and copper cracking, slag, lack of penetration and porosity
Cluster of flaws
Depth range 0 to 250 mm from clad/base metal interface
Flaw height 3 to 50 mm
Flaw length 10 to 50 mm
Flaw orientation parallel to weld direction
Clad orientation perpendicular to weld

Contact

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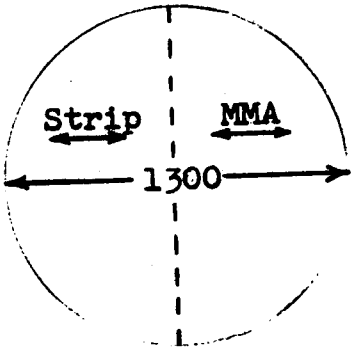
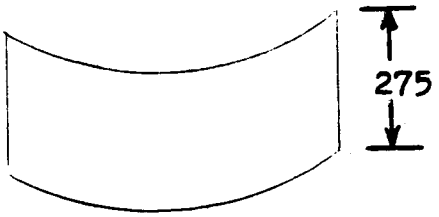
Tel No: Warrington (0925) 31244, extension 2881
Telex No: 629301

SPECIMEN IDENTITY UKAEA R28

Drawing 1AE 431625 Weight 2.8 tonne





Material A508 Class II

Cladding 2-layer stainless steel strip clad, 7 mm thick (as clad)
2-layer MMA, 7 mm, smooth ground

Types of Flaw Elliptical EMD notches
Solidification cracks
Depth range 3 to 30 mm from clad/base plate and interface
Length 10 to 30 mm
Inclination to clad direction, normal
Inclination to surface, normal
Isolated and clusters of flaws

Contact

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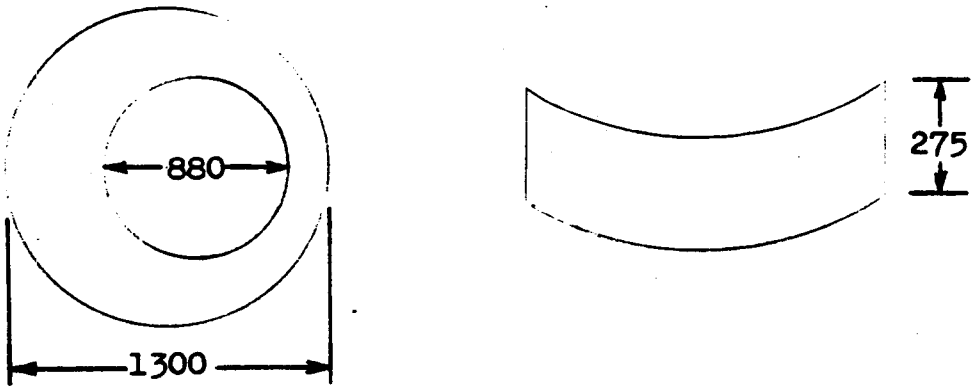
Telex No: 629301

SPECIMEN IDENTITY UKAEA R30

Drawing R30 Weight 1.5 tonne



Material A508 Class II

Cladding
MMA on nozzle corner
2-layer strip clad on bore
7 mm thick, smooth ground

Types of Flaw
Elliptical EDM notches
Solidification cracks
Depth range 2 to 30 mm from clad/base metal interface
Length 6 to 30 mm
Orientation, radial and circumferential
Inclination to surface, normal

Contact
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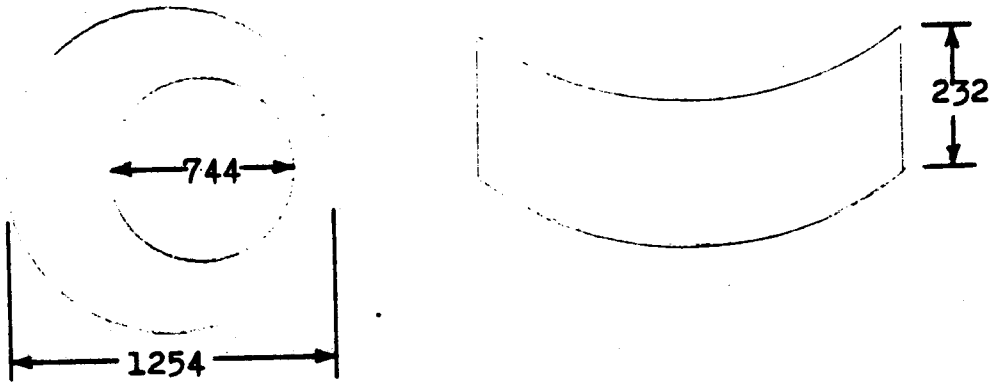
Telex No: 629301

SPECIMEN IDENTITY UKAEA R31

Drawing R31 Weight 1.4 tonne



Material A508 Class II

Cladding
MMA on nozzle corner
Two layer strip clad on bore
7 mm thick, smooth ground

Types of Flaw
Elliptical EDM notches
Solidifcation cracks
Depth range 2 to 30 mm from cald/base metal interface
Length 6 to 30 mm
Orientation, radial and circumferential
Inclination to surface, normal

Contact

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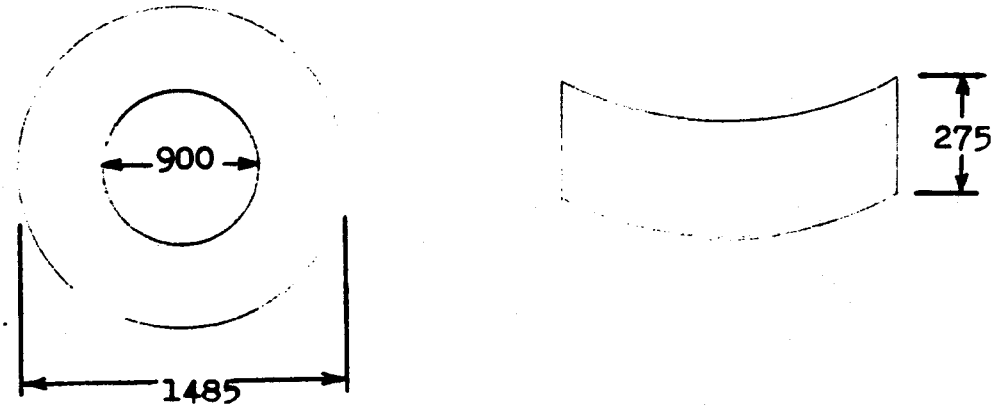
Telex No: 629301

SPECIMEN IDENTITY UKAEA H13

Drawing EH1 5146 Weight 2.7 tonne



Material A508 Class II

Cladding MMA clad, smooth ground on corner
Strip clad on bore
6 mm thick

Types of Flaw Elliptical EDM notches
Depth range 2.5 to 25 mm from clad/base metal interface
Length 5 to 30 mm
Orientation, radial
Inclination, normal to surface

Contact

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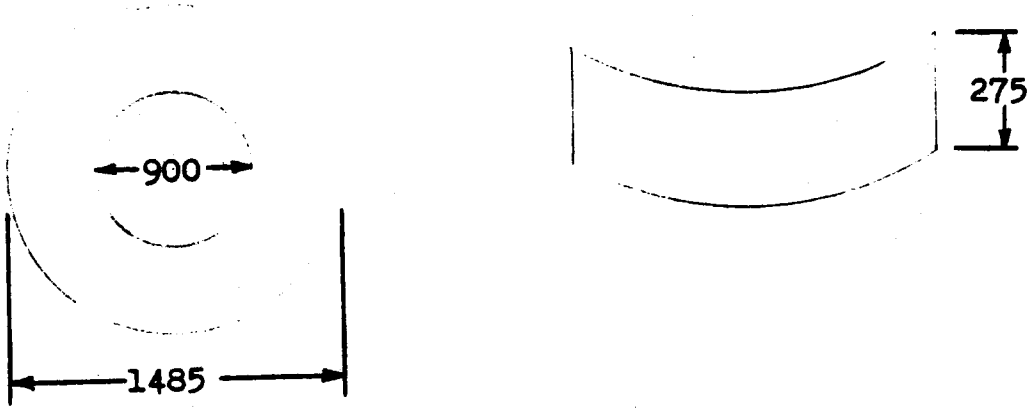
Telex No: 629301

SPECIMEN IDENTITY UKAEA H14

Drawing EH1 5285 Weight 3.1 tonne



Material A508 Class II

Cladding Unclad

Types of Flaw
Elliptical EDM notches
Depth range 3 to 30 mm from surface
Length 9 to 30 mm
Orientation, radial and skewed up to circumferential
Inclination, normal to surface

Contact
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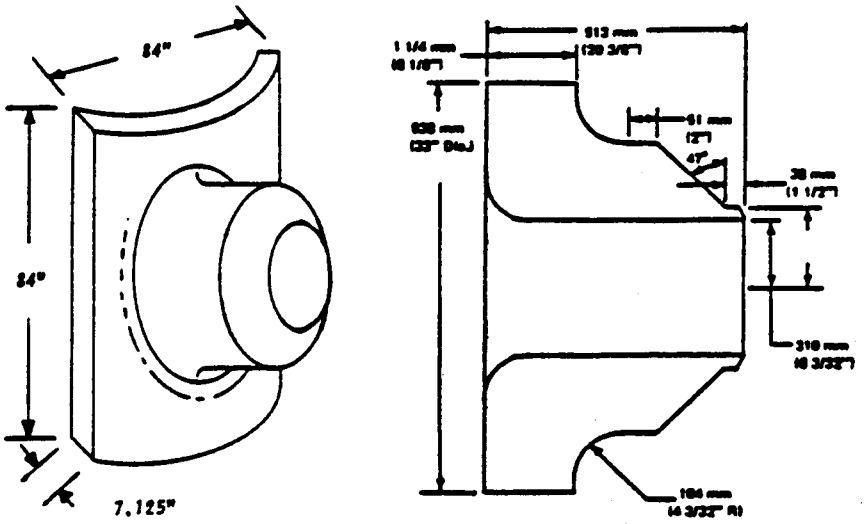
ENGLAND

Tel No: Warrington (0925) 31244, extension 2881
Telex No: 629301

SPECIMEN IDENTITY FWN-1 (Feedwater Nozzle)

DRAWING FWN-1

WEIGHT 7 tons



MATERIAL Nozzle - SA508
Plate - SA533B

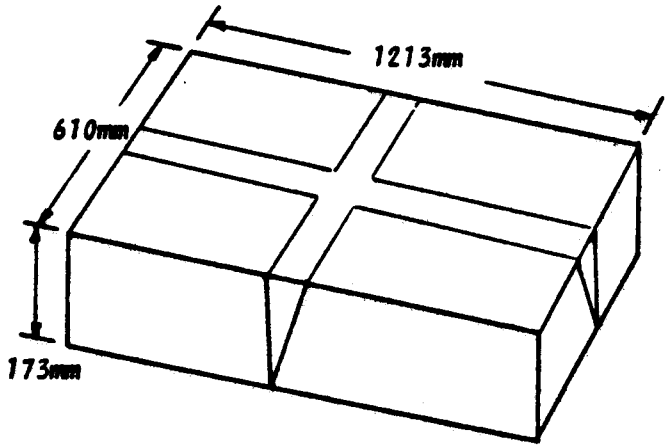
CLADDING Three-wire submerged arc, 6mm thick, on plate only

TYPES OF FLAWS Thermal fatigue cracks, isolated
Depth - 1mm to 8mm from nozzle ID
Length - 12mm to 37mm
Inclination to ID surface - Normal
Orientation - Axial

CONTACT Mr. Robert Stone
J.A. Jones Applied Research Company
EPRI NDE Center
P.O. Box 217097
Charlotte, NC 28221
Telephone (704) 597-6125

SPECIMEN IDENTITY CE-1

DRAWING CE-1 WEIGHT 1,050 Kg



MATERIAL SA533B

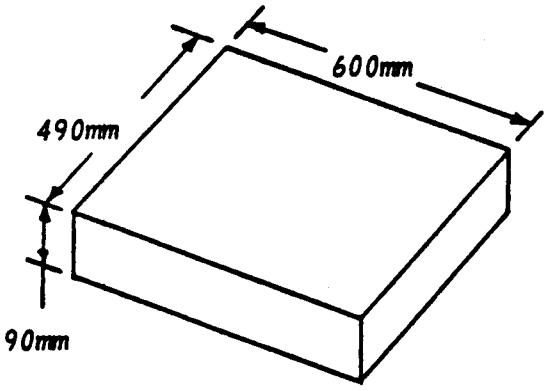
CLADDING Three-wire submerged arc, 7mm thick

TYPES OF FLAWS Chemically induced sub-surface flaws
approximately 6-25mm high and 75mm long
Inclination to surface is normal
Flaw direction is parallel to weld disposition

CONTACT Mr. Robert Stone
J.A. Jones Applied Research Institute
EPRI NDE Center
P.O. Box 217097
Charlotte, NC 28221

SPECIMEN IDENTITY SB-1

DRAWING SB-1 WEIGHT 215 Kg



MATERIAL SA533B

CLADDING 3-wire submerged arc, stainless steel, 7mm thick

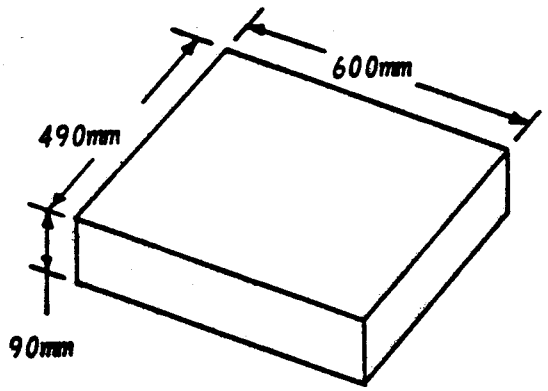
TYPES OF FLAWS Semi-elliptical notches and fatigue cracks, isolated
Flaws range from 3mm to 13mm in depth with aspect ratios of 3 to 5:1
Inclination to surface is normal
Flaw orientations are 0°, 15°, 30°, 45° and 90° to clad direction

CONTACT
Mr. Robert Stone
J.A. Jones Applied Research Company
EPRI NDE Center
P.O. Box 217097
Charlotte, NC 28221
Telephone (704) 597-6125

SPECIMEN IDENTITY SB-2

DRAWING SB-2

WEIGHT 215 Kg



MATERIAL SA533B

CLADDING Manual SMAW, stainless steel, 7mm thick

TYPES OF FLAWS Semi-elliptical notches and fatigue cracks, isolated
Flaws range from 3mm to 13mm in depth with aspect ratios of 3 to 5:1
Inclination to surface is normal
Flaw orientations are 0°, 15°, 30°, 45° and 90° to clad direction

CONTACT
Mr. Robert Stone
J.A. Jones Applied Research Company
EPRI NDE Center
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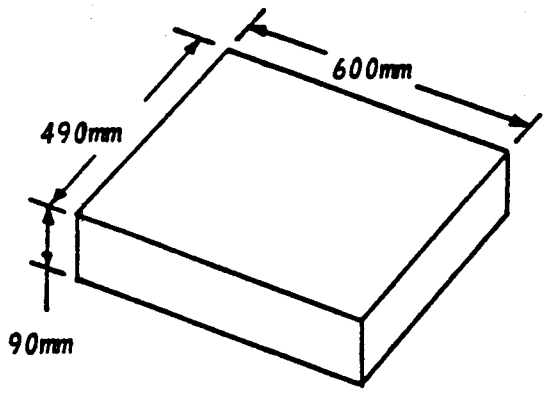
Charlotte, NC 28221
Telephone (704) 597-6125

SPECIMEN IDENTITY SB-3

DRAWING SB-3 WEIGHT 215Kg



MATERIAL SA533B

CLADDING 3-wire submerged arc, stainless steel, 7mm thick

TYPES OF FLAWS Semi-elliptical notches and fatigue cracks, isolated
Flaws range from 3mm to 13mm in depth with aspect ratios of 3 to 5:1
Inclination to surface is normal
Flaw orientations are 0°, 15°, 30°, 45° and 90° to clad direction

CONTACT
Mr. Robert Stone
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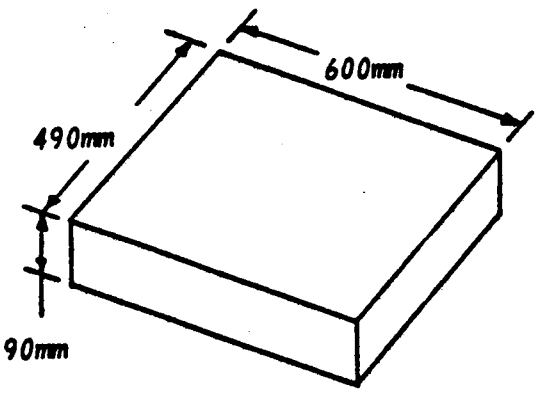
EPRI NDE Center
P.O. Box 217097
Charlotte, NC 28221
Telephone (704) 597-6125

SPECIMEN IDENTITY SB-4

DRAWING SB-4 WEIGHT 215 Kg



MATERIAL SA533B

CLADDING Manual SMAW, stainless steel, 7mm thick

TYPES OF FLAWS Semi-elliptical notches and fatigue cracks, isolated
Flaws range from 3mm to 13mm in depth with aspect ratios of 3 to 5:1
Inclination to surface is normal
Flaw orientations are 0°, 15°, 30°, 45° and 90° to clad direction

CONTACT
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J.A. Jones Applied Research Company
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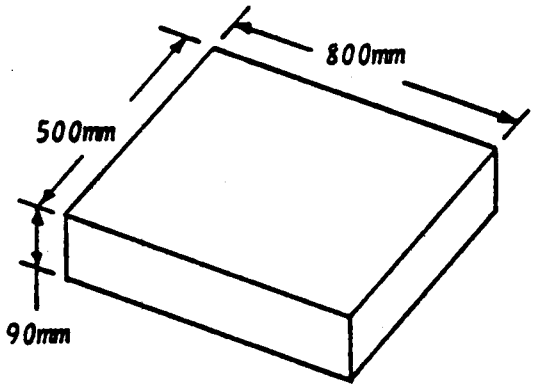
Telephone (704) 597-6125

SPECIMEN IDENTITY SB-5

DRAWING SB-5 WEIGHT 340 Kg



MATERIAL SA533B

CLADDING Thick manual SMAW, stainless steel, 13mm thick

TYPES OF FLAWS Semi-elliptical notches and fatigue cracks, slag inclusions, isolated
Flaws range from 3mm to 13mm in depth with aspect ratios of 3 to 5:1
Inclination to surface is normal
Flaw orientations are 0°, 15°, 30°, 45° and 90° to clad direction

CONTACT
Mr. Robert Stone
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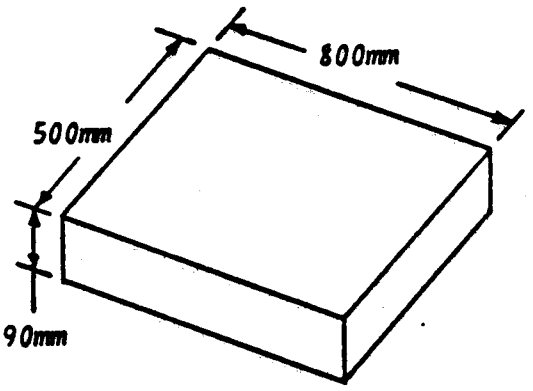
Telephone (704) 597-6125

SPECIMEN IDENTITY SB-6

DRAWING SB-6

WEIGHT 340 Kg



MATERIAL SA533B

CLADDING Thick 3-wire submerged arc, stainless steel, 13mm thick

TYPES OF FLAWS Semi-elliptical notches and fatigue cracks, slag inclusions, isolated
Flaws range from 3mm to 13mm in depth with aspect ratios of 3 to 5:1
Inclination to surface is normal
Flaw orientations are 0°, 15°, 30°, 45° and 90° to clad direction

CONTACT
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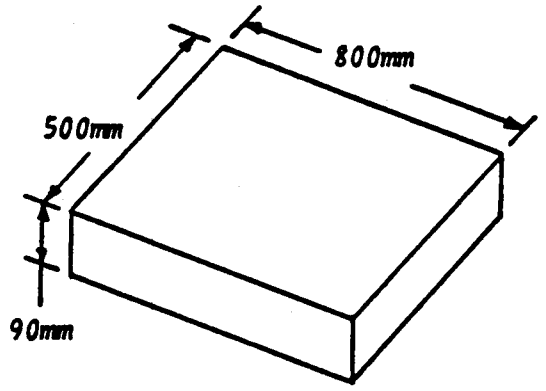
SPECIMEN IDENTITY SB-7

DRAWING SB-7 WEIGHT 340 Kg



MATERIAL SA533B

CLADDING Thick manual SMAW, stainless steel, ground smooth but not level, 12mm thick

TYPES OF FLAWS Semi-elliptical notches and fatigue cracks, slag inclusions, isolated
Flaws range from 3mm to 13mm in depth with aspect ratios of 3 to 5:1
Inclination to surface is normal
Flaw orientations are 0°, 15°, 30°, 45° and 90° to clad direction

CONTACT
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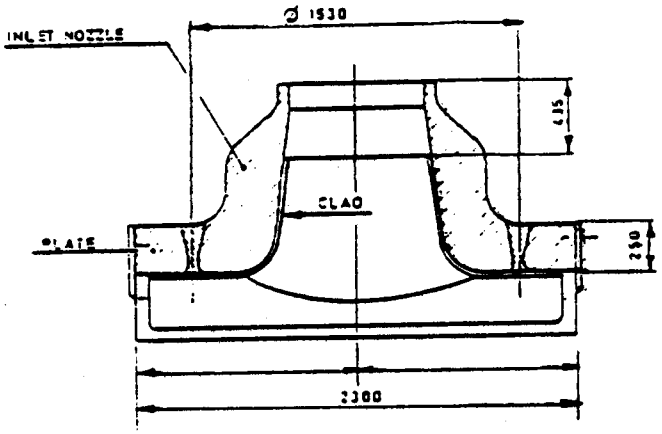
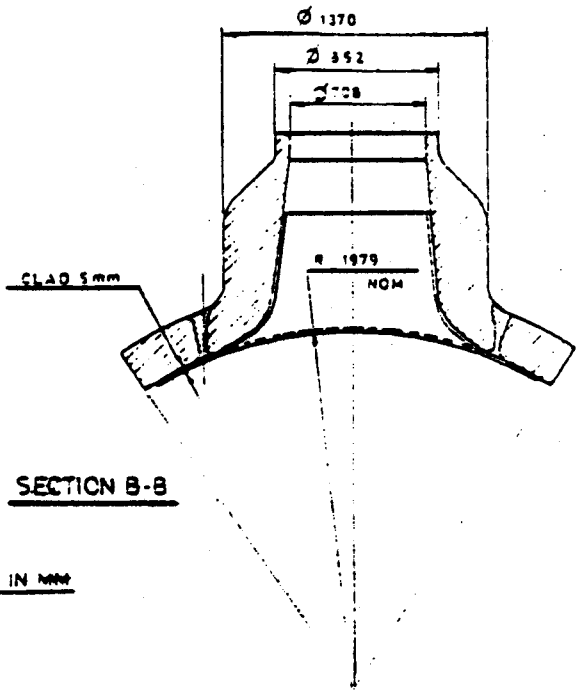
SPECIMEN IDENTITY PISC-II PLATE 3

DRAWING 81-1192-00G-a

WEIGHT ~16 000 Kg



SECTION A-A



SECTION B-B

ALL DIMENSIONS IN mm

MATERIAL PLATE ASME-SA 533 B cl.1

NOZZLE ASME-SA 508 cl.2

CLADDING PLATE 1 layer stainless steel strip clad, more than 3,2 mm thick

NOZZLE 1 layer stainless steel wire clad, more than 3,2 mm thick

WELD ZONE covered with manual clad more than 3,2 mm thick

TYPES OF FLAW Slag inclusions - Lack of fusion - Smooth and Rough cracks (see Table 1)

CONTACT

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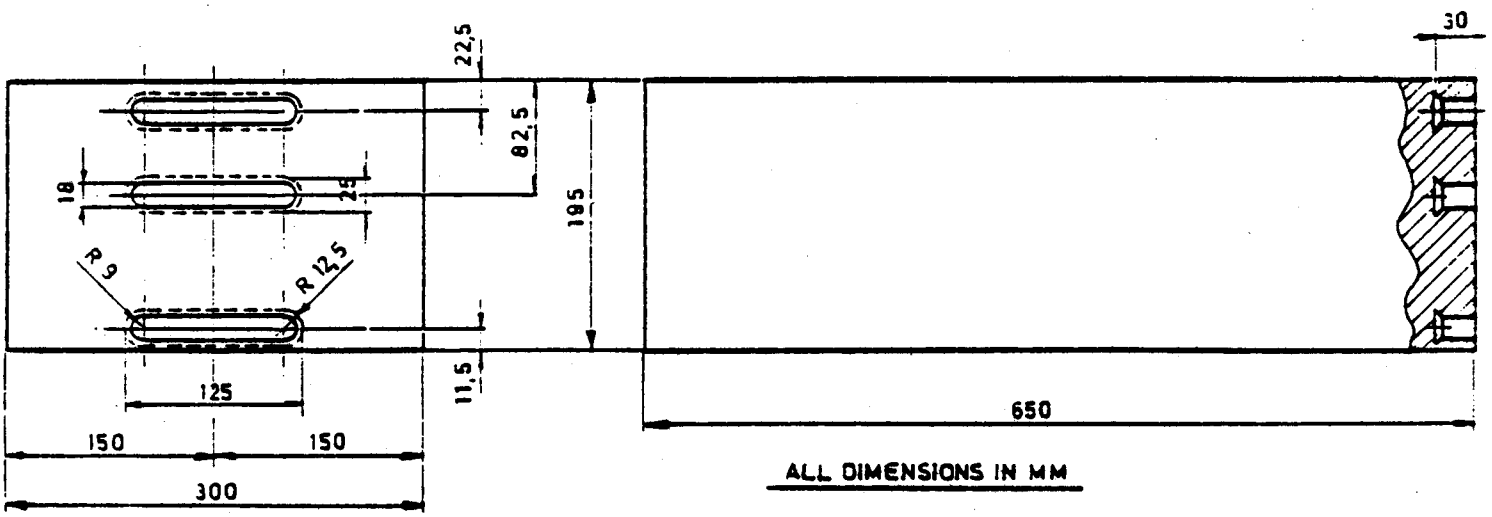
Joint Research Centre, Non Destructive Testing
Lab. - I-21020-Ispra, (Varese) Italy
Tel. : + (332) 789793 - 789789
Telex : 380042 - 380058 EUR I

DEF.	SERVICE-INDUCED TYPE FLAWS						WELDING FLAWS					
	Circ.	Rect.	Comp.	Ir.	Near Surf.	Sub Surf.	L.F.	Slag I	L.Bond	Manuf.	Dimen. mm	REMARKS
1						x		x		BREDA	5x230	
2	x					x				IKE	Ø 10	Smooth crack
3		x				x				IKE	60x60	Smooth crack
4		x				x				IKE	17x85	Smooth + starter
5		x				x				IKE	17x85	Rough crack
6			x			x				IKE	3 - 18	Random Cloud
7			x			x				IKE	3 - 18	Random Cloud
8			x		x					IKE	10/40	Shadow
9			x		x					IKE	10/40	Shadow
10								x		BREDA	4x85	
11		x				x				IKE	10x50	Smooth + starter
12		x				x				IKE	10x50	Rough crack
13		x			x					CETIM	3x12	Smooth modified
14		x			x					CETIM	3x12	Smooth by
15		x			x					CETIM	6x24	Smooth welding
16		x			x					CETIM	6x24	Smooth process
17								x		BREDA	6x33	
18	x				x					IKE	Ø 25	Rough crack
19	x				x					IKE	Ø 25	Smooth crack
20	x					x				IKE	Ø 17	Rough crack
21	x				x					IKE	Ø 17	Smooth crack
22								x		BREDA	5x106	
23		x					x			BREDA	3x20	Smooth
24		x					x			BREDA	3x20	"
25		x					x			BREDA	10x40	"
26		x					x			BREDA	20x60	"
27	x				x					IKE	Ø 10	Smooth crack
28	x				x					IKE	Ø 10	Rough crack
29								x		BREDA	3x60	
30	x				x					IKE	Ø 3	Smooth crack
31					x				x	BREDA	25x60	
A				x	x					JRC		
B				x	x					JRC		
C				x	x					JRC		
	Defects with circular shape	Defects with rectangular shape	Composite defects	Inner Radius Crack	In near-surface area Z = 0 to Z = 50 mm	In sub-surface area Z superior to 50 mm	Lack of fusion	Slag inclusions	Lack of Bonding	Manufacturer	Dimensions in mm	

Main characteristics of the intended defects in PISC-II Plate No. 3

SPECIMEN IDENTITY PISC EDC-1-0-3

DRAWING 81-1192-00E-EDC-2-F WEIGHT ≈ 300 Kg



MATERIAL ASME SA 533 B cl. 1

CLADDING NONE

TYPES OF FLAW
RE-ENTRANT MACHINED SLOTS
25 mm THROUGH-THICKNESS SIZE
0 DEGREES TILT
SMOOTH SURFACE

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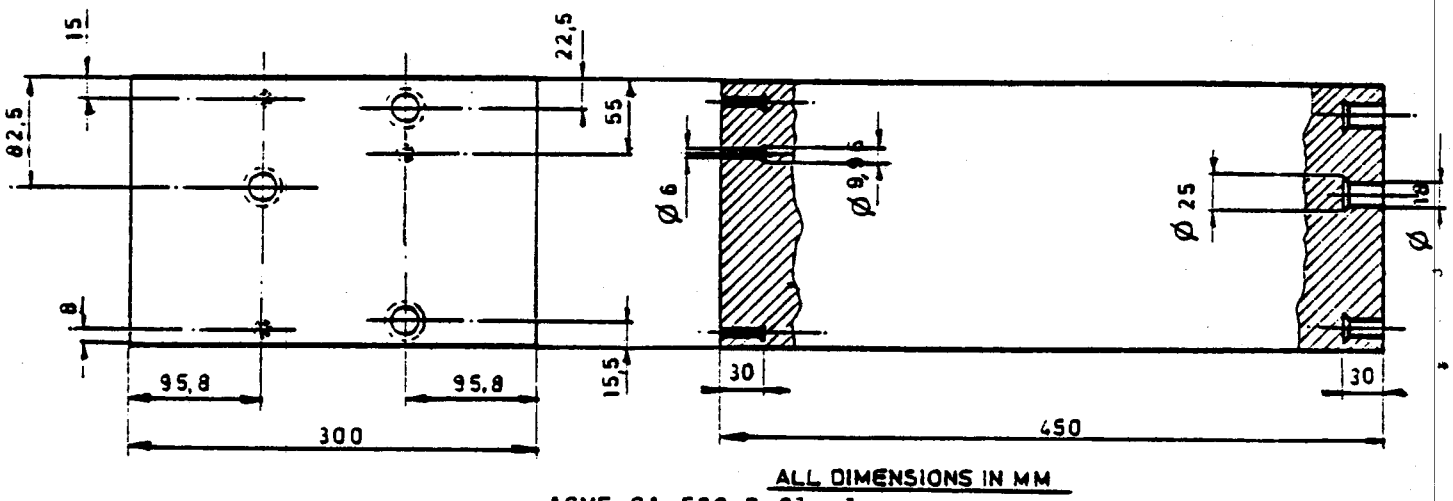
SPECIMEN IDENTITY PISC EDC-2-0-9

DRAWING 81-1192-00E-EDC-2-G **WEIGHT** ~ 205 Kg



ALL DIMENSIONS IN MM

MATERIAL ASME SA 533 B Cl. 1

CLADDING NONE

TYPES OF FLAW

- 25 mm Through Thickness Size Re-Enterant Machined Flat-Bottomed Hole 0 Degree Tilt - Smooth Surface
- ~ 10 mm Through Thickness Size Re-Enterant Spark-Eroded Flat-Bottomed Holes 0 Degrees Tilt- Smooth Surface

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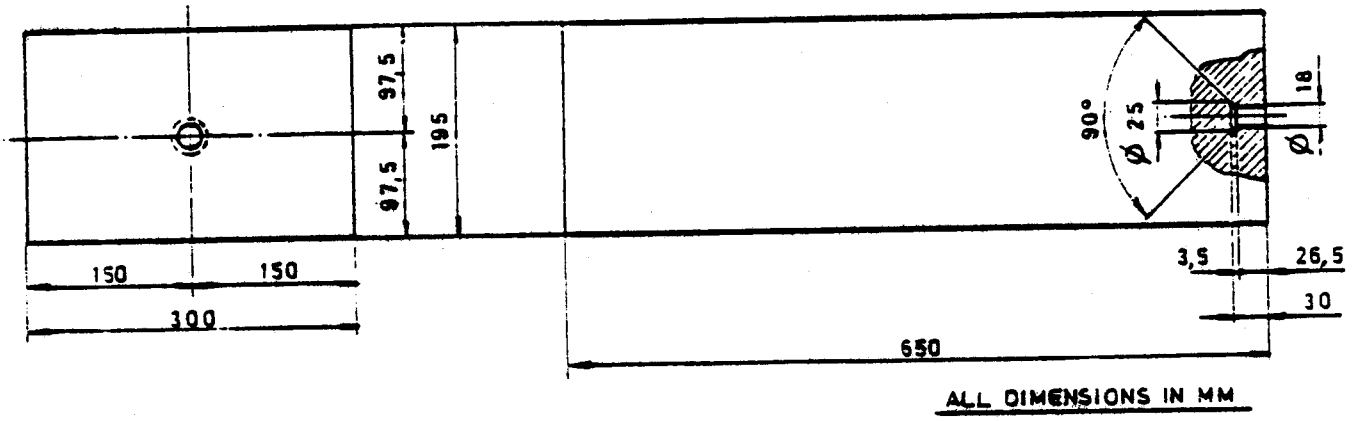
SPECIMEN IDENTITY PISC EDC-3-0-10

DRAWING 81-1192-00E-EDC-3G WEIGHT 300 Kg



MATERIAL ASME SA 533 B Cl. 1

(Attention this block contains a lot of segregations)

CLADDING NONE

TYPES OF FLAW

Re-Entrant Machined Flat-Bottomed Hole
25 mm Through-Thickness Size
0 Degree Tilt
Smooth Surface

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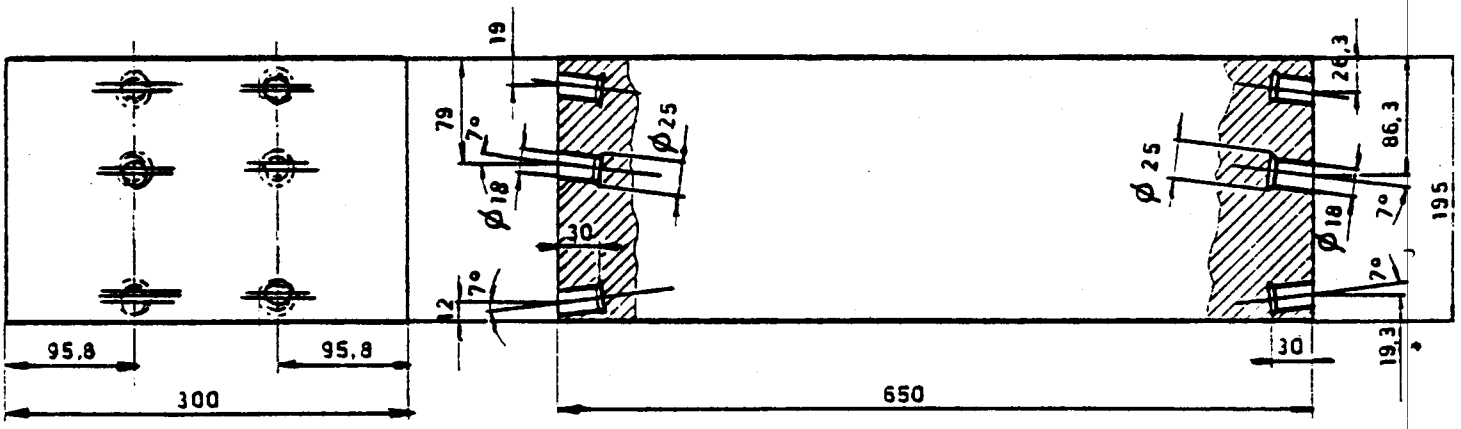
SPECIMEN IDENTITY PISC EDC-4-0-16

DRAWING 81-1192-00E-EDC-4-H **WEIGHT** ~ 300 Kg



ALL DIMENSIONS IN MM

MATERIAL ASME SA 533 B Cl. 1

CLADDING NONE

TYPES OF FLAW

Re-Entrant Machined Flat-Bottomed Holes
25 mm Through-Thickness Size
+ 7 and - 7 Degrees Tilt
Smooth Surface

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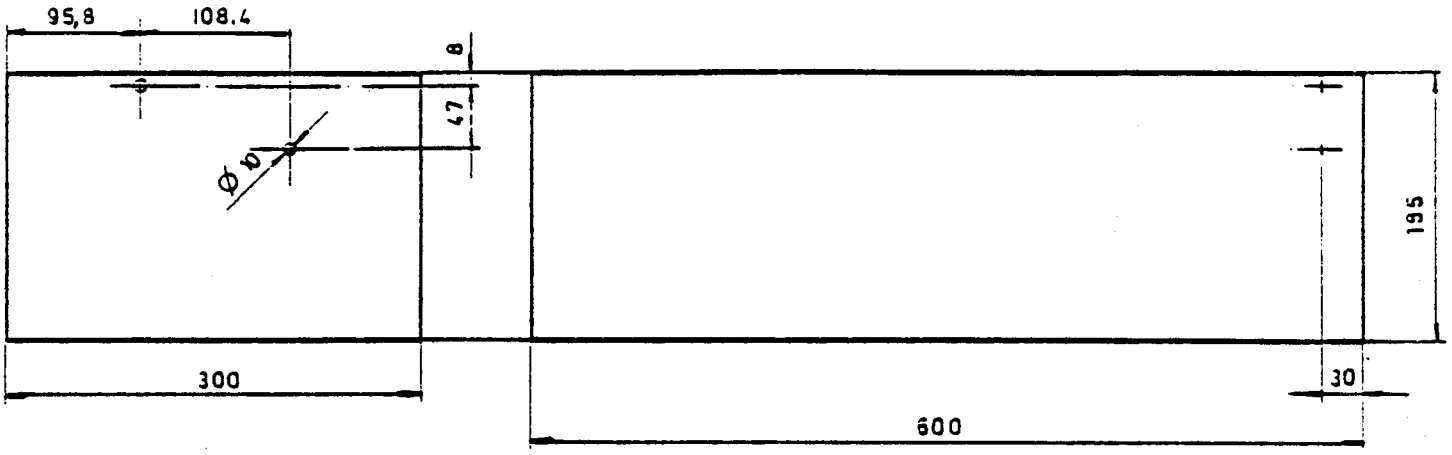
SPECIMEN IDENTITY

PISC EDC-40-0-2

DRAWING 84-1275-0C

WEIGHT ≈ 275 Kg



ALL DIMENSIONS IN MM

MATERIAL ASME SA 533 B cl. 1

CLADDING NONE

TYPES OF FLAW SHRINK-FIT, FLAT-BOTTOMED HOLE
10 mm THROUGH THICKNESS SIZE
0 DEGREE S TILT
SMOOTH SURFACE

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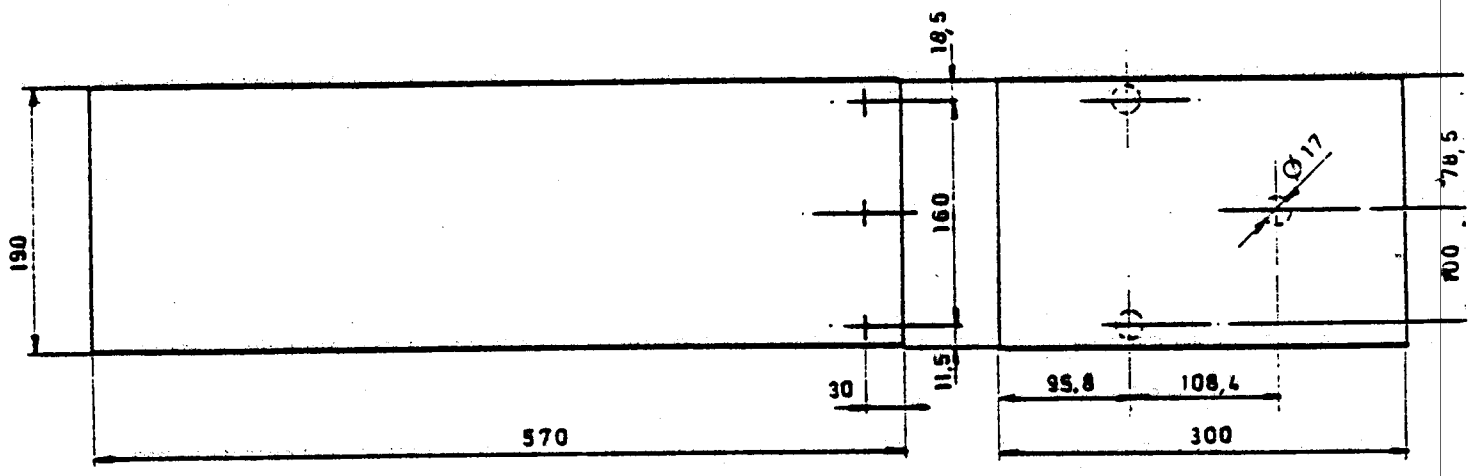
SPECIMEN IDENTITY

PISC EDC-40-5

DRAWING 84-1275-0B

WEIGHT ~ 255 Kg



ALL DIMENSIONS IN MM

MATERIAL ASME SA 533 B Cl. 1

CLADDING NONE

TYPES OF FLAW

Shrink-Fit, Flat-Bottomed Hole
17 mm Through Thickness Size
0 Degree Tilt
Smooth Surface

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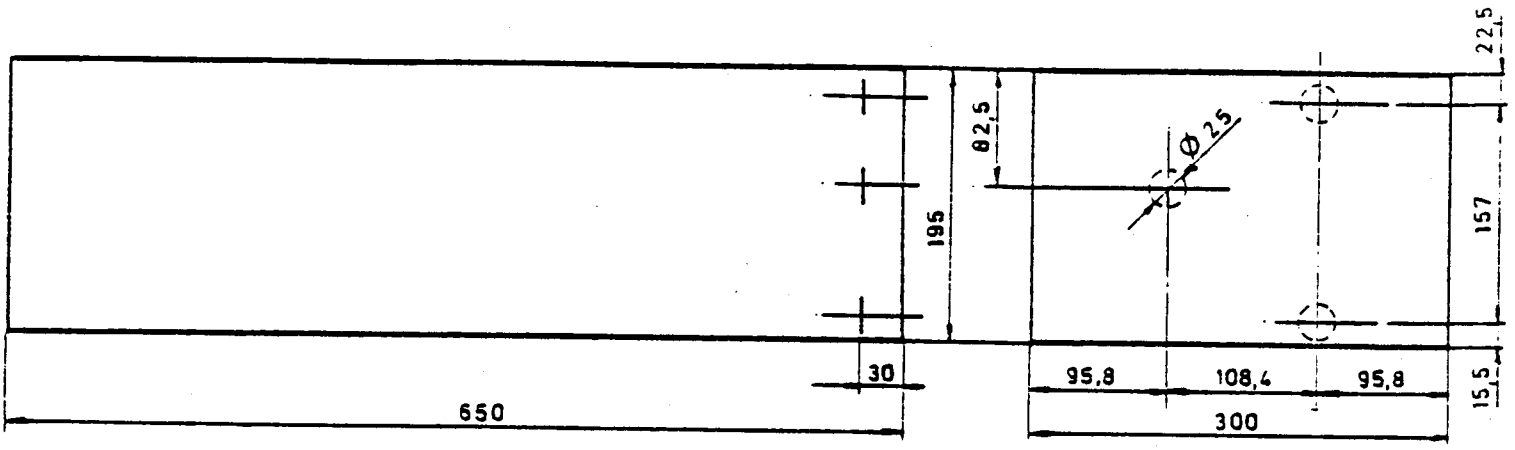
SPECIMEN IDENTITY PISC EDC-40-8

DRAWING 84-1275-0A

WEIGHT ≃ 275 Kg



ALL DIMENSIONS IN MM

MATERIAL ASME SA 533 B cl. 1

CLADDING NONE

TYPES OF FLAW SHRINK- FIT, FLAT-BOTTOMED HOLES
25 mm THROUGH-THICKNESS SIZE
0 DEGREES TILT
SMOOTH SURFACE

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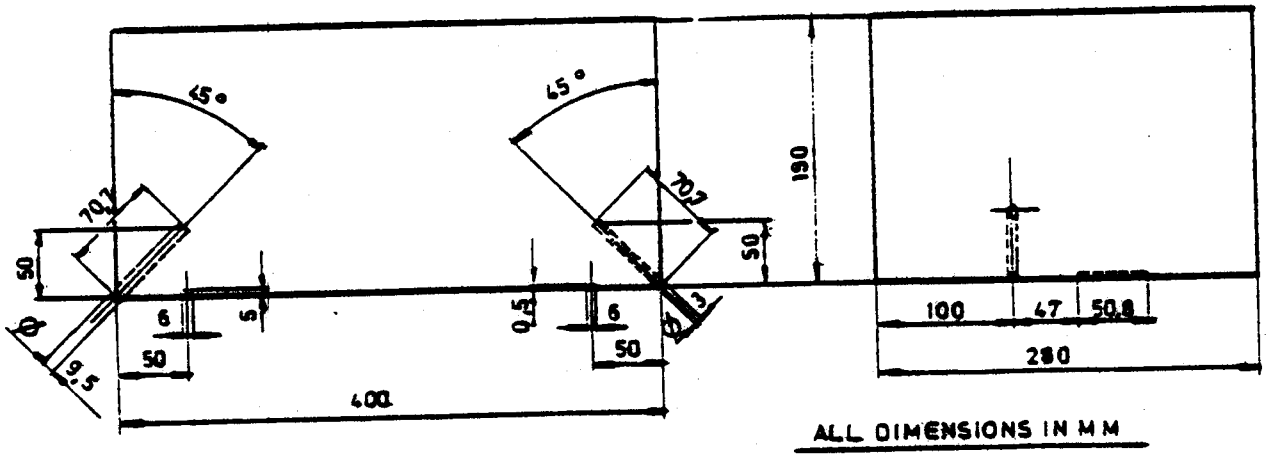
SPECIMEN IDENTITY

PISC EEC-45

DRAWING 84-1275-08

WEIGHT ~ 170 Kg



MATERIAL ASME SA 533 B Cl. 1

CLADDING NONE

TYPES OF FLAW

- 45 Degrees Machined Flat-Bottomed Holes
Diameter : 9,5 mm and 3 mm
Smooth Surface
- Machined Slots
Dimensions : 6 mm x 50,8 mm
Extremities with Radius 6 mm)
Depth : 5 mm and 0,5 mm
Smooth Surface

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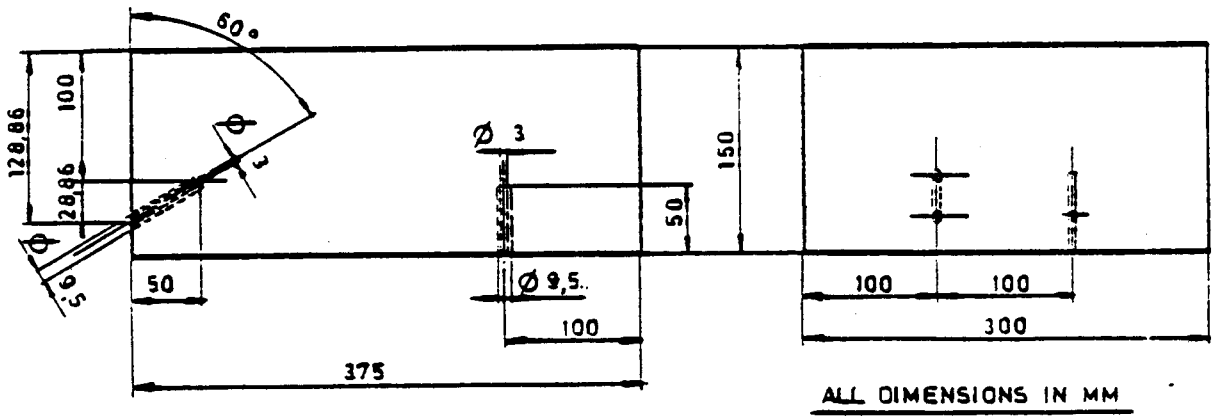
SPECIMEN IDENTITY PISC EEC-60

DRAWING 81-1192-EEC-60 **WEIGHT** ~ 132 Kg



MATERIAL ASME SA 533 B Cl. 1

CLADDING NONE

TYPES OF FLAW

- 60 Degrees Machined Flat-Bottomed Hole
Diameter : 9,5 mm and 3 mm
Smooth Surface
- 0 Degrees Machined Flat-Bottomed Holes
Diameter : 9,5 mm and 3 mm
Smooth Surface

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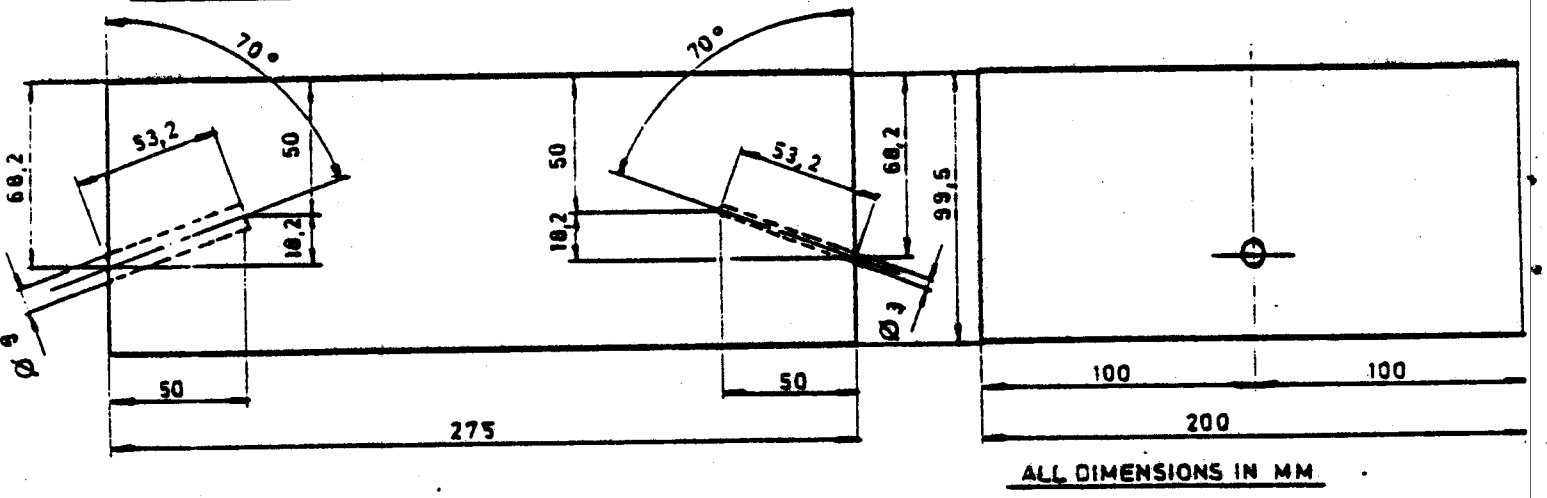
SPECIMEN IDENTITY PISC EDC-70

DRAWING 81-1192-EEC-70 **WEIGHT** ~43 Kg



MATERIAL ASME SA 533 B Cl. 1

CLADDING NONE

TYPES OF FLAW.

- 70 Degrees Machined Flat Bottomed Holes
Diameter : 9 mm and 3 mm
Smooth Surface

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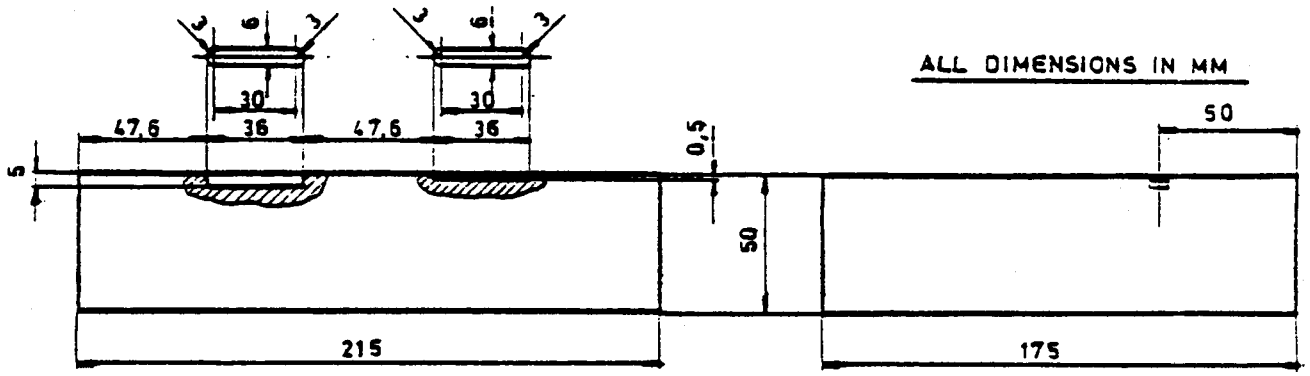
SPECIMEN IDENTITY PISC EEC-S

DRAWING 81-1192-EEC-S **WEIGHT** ~ 15 Kg



MATERIAL ASME SA 533 B Cl. 1

CLADDING NONE

TYPES OF FLAW

- Machined Slots

Dimensions : 6 mm x 36 mm

Depth :5 mm and 0,5 mm

Smooth Surface

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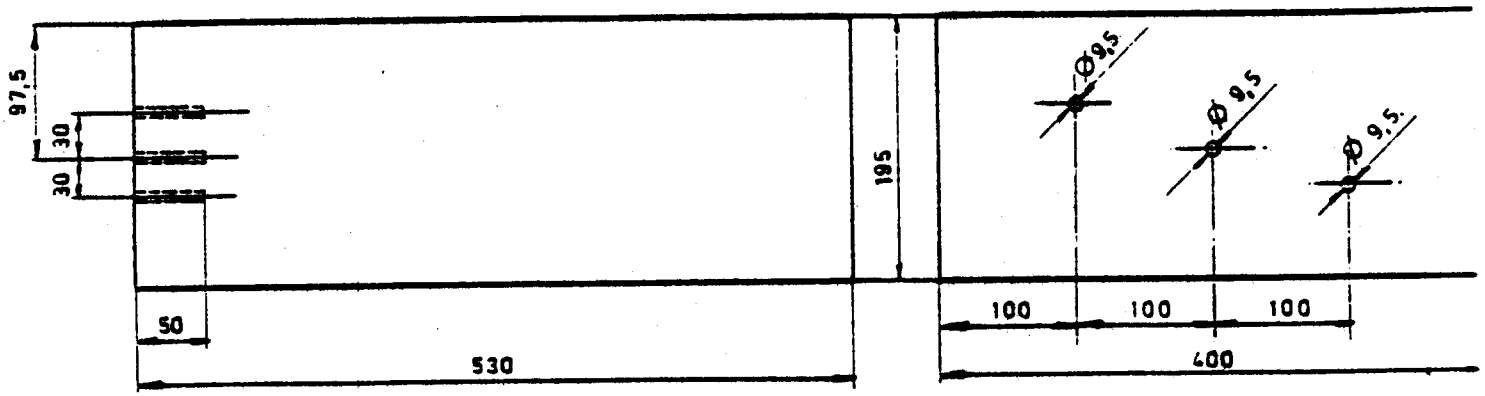
SPECIMEN IDENTITY PISC EEC-T

DRAWING 81-1192-EEC-T **WEIGHT** ~ 325 Kg



ALL DIMENSIONS IN MM

MATERIAL ASME SA 533 B Cl. 1

CLADDING NONE

TYPES OF FLAW
- 90 Degrees Machined Flat-Bottomed Holes
Diameter : 9,5 mm
Smooth Surface

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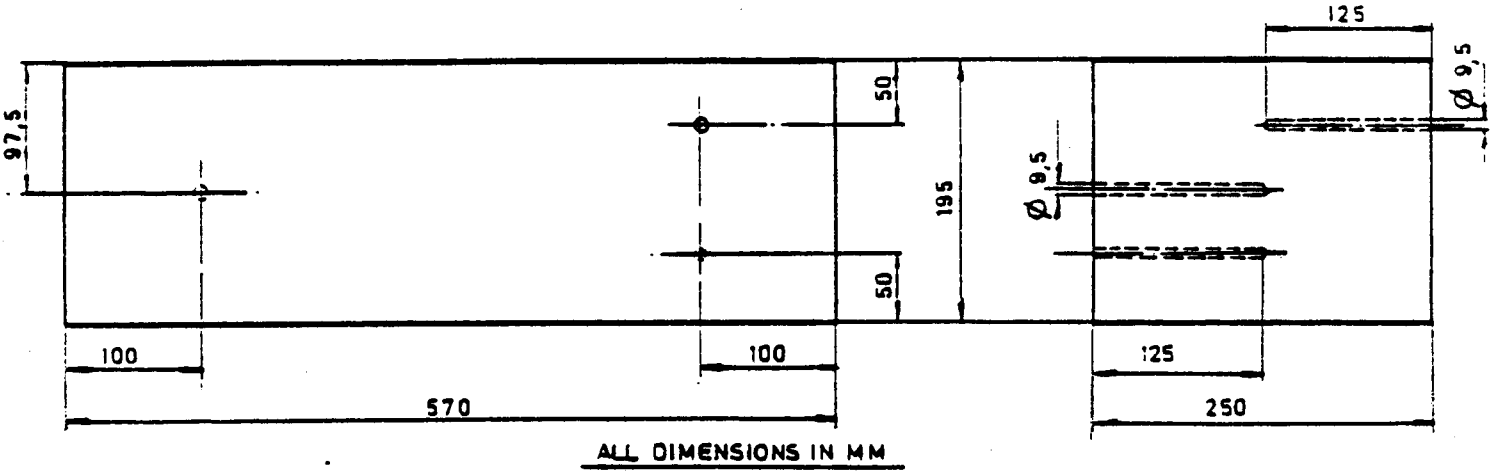
SPECIMEN IDENTITY PISC EDC-C1-d

DRAWING 81-1192-EDC-C1-d **WEIGHT** ~ 218 Kg



MATERIAL ASME SA 533 B Cl. 1

CLADDING NONE

TYPES OF FLAW

- Machined Side-Drilled Holes
Diameter : 9,5 mm Length 125 mm
Smooth Surface

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