

COMPARATORS FOR THE DEFINITION OF SURFACE QUALITY OF STEEL CASTINGS

(SHORTER SET IN ACCORDANCE
WITH ASTM A 802)

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RESEARCH AND TRADE ASSOCIATION





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WITH ASTM A 802)



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Preface

In 1981, the Steel Castings Research and Trade Association (SCRATA) published "Comparators for the Definition of Surface Quality of Steel Castings" which, together with its associated set of 48 visual-tactile comparators, was designed to facilitate agreement between steelfounders and their customers on the required surface quality of steel castings.

In 1985, the Manufacturers Standardization Society of the Valve and Fittings Industry (USA) included reference to the SCRATA comparators in its Standard Practice SP-55: Quality Standard for Steel Castings for Valves, Flanges and Fittings and other Piping Components, thereby enabling the comparators to be used in conjunction with SP-55.

As a result of continued interest in the USA, particularly on the part of the American Society for Testing and Materials (ASTM), SCRATA has now produced a shorter set of comparators, consisting of 31 replicas. This new set forms the basis for assessing the surface quality of steel castings according to ASTM A802: Steel Castings, Textures and Discontinuities, Evaluating and Specifying, by Visual Examination. The terms used to describe the various categories of defect have, therefore, been modified to bring them in line with the terminology employed in ASTM A802. In order to avoid confusion, the reference numbers for the individual replicas (e.g. A1, C2, etc.) used in the original set have been retained.

The original set of 48 replicas is still available for those requiring a more complete reference tool.

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Foreword

The object of this set of comparators is to facilitate co-operation between founder and casting purchaser in determining the surface condition (i.e. quality level) required. It should assist in avoiding misunderstandings arising from imprecise descriptions at the order stage and should also help in defining a surface that is amenable to a particular technique of non-destructive testing. The use of comparators is superior to methods based on photographs which can introduce uncertainties concerning interpretation, particularly with regard to the depth of surface irregularities.

The set of comparators is comprised of replicas of actual casting surfaces, after shot-blasting, demonstrating acceptable surfaces of varying roughness, of different degrees of dressing and other features normally encountered on steel castings. Master replicas will be held at SCRATA for an indefinite period of time.

Full size photographs of the replicas are given in an Appendix to assist in making a rapid review of the overall content of the set. It is emphasised that the replica/comparators and not the photographs will be used to form the basis of agreement.

1. Scope

Comparators measuring 150 x 100mm are reproductions of actual casting surfaces and are provided for establishing the categories and quality levels of the surface conditions that occur during the production of steel castings by conventional sand moulding techniques.

The surface roughness is intended to represent the natural surface arising from the casting process and does not measure the size of the abrasive used for blast cleaning.

The comparators do not apply to castings made by shell, investment and other precision moulding techniques.

2. Definition of Surface Quality

Comparators covering nine categories are provided, each with 2, 3 or 4 quality levels, decreasing from 1 to 4 (i.e. level 1 is the highest quality).

- A. *Surface Texture*.—The natural surface of the casting after shot blasting. (4 levels)
- B. *Non-Metallic Inclusions*.—Non-metallic material trapped on the casting surface. (4 levels)
- C. *Gas Porosity*.—Indications of gas at the casting surface. (4 levels)
- D. *Fusion Discontinuities*.—Surface irregularities giving a wrinkled appearance. (3 levels)
- E. *Expansion Discontinuities*.—Slightly raised surface irregularities. (2 levels)
- F. *Inserts*.—Indications of chaplets or internal chills. (2 levels)
- G. *Metal Removal Marks - Thermal Dressing*.—Surface remaining after using oxy-gas or air-carbon arc processes for metal removal. (4 levels)
- H. *Metal Removal Marks - Mechanical Dressing*.—Surface remaining after using a mechanical means of dressing a cast surface or a previously thermally dressed surface. (4 levels)
- J. *Metal Removal Marks - Welds*.—Indications of welds fully or partially removed by thermal or mechanical dressing. (4 levels)

3. Assessment of Surface Quality

- 3.1 The areas of the casting which are to have controlled surface quality must be clearly indicated on the drawing at the enquiry and order stages. The category and quality level shall be stated.



3.2 The manufacturing stage at which the surfaces are to be assessed should be stated. Normally, and if not otherwise stated on the order, surface quality comparisons shall be carried out on the finished casting.

3.3 For evaluating casting surfaces, the areas indicated on the drawing shall be compared, without optical aids, with the appropriate replica-comparators on the basis of the category and quality level.

3.4 Comparison of the comparators with the casting surface shall be made with the comparators held next to the casting under good conditions of lighting.

3.5 When two or more surface categories are present in any controlled area, each shall be assessed according to its own quality level.

3.6 The assessment shall be satisfactory if, in the required area, the surface condition of the casting corresponds to that of the stated reference comparators, or if it generally corresponds to a higher quality level.

3.7 It is recognised that difficulties may arise in assessing surfaces of castings covering a wide range of size and section thickness using the standard comparators measuring 150 x 100mm. It is emphasised, however, that it is *not* intended that areas of the casting shall be divided up into equivalent comparator areas and assessments made for each area.

4. Notes

4.1 Due to the method of production, an unavoidable slight glaze will be apparent on the surface of some comparators.

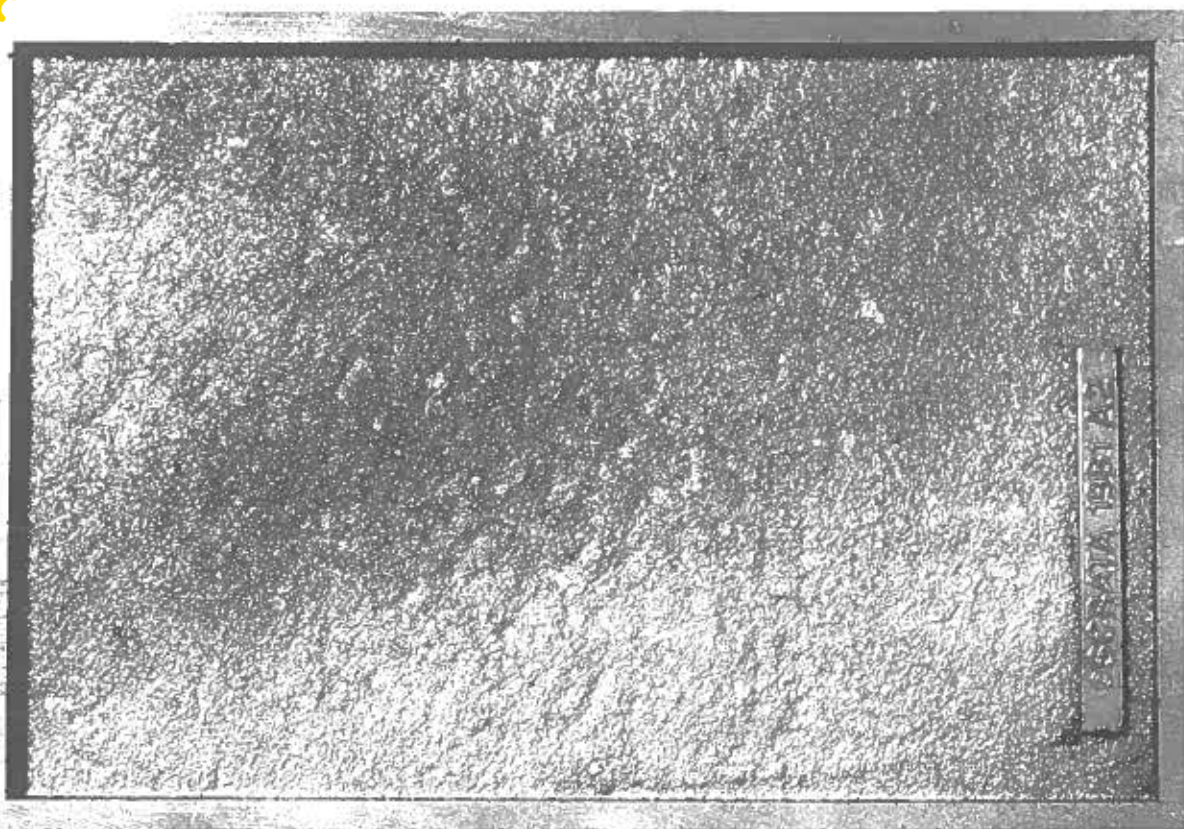
4.2 It is important that the comparators should always be stored in the box provided, since prolonged exposure to sunlight or ultra-violet light will lead to a fading in colour.

Appendix





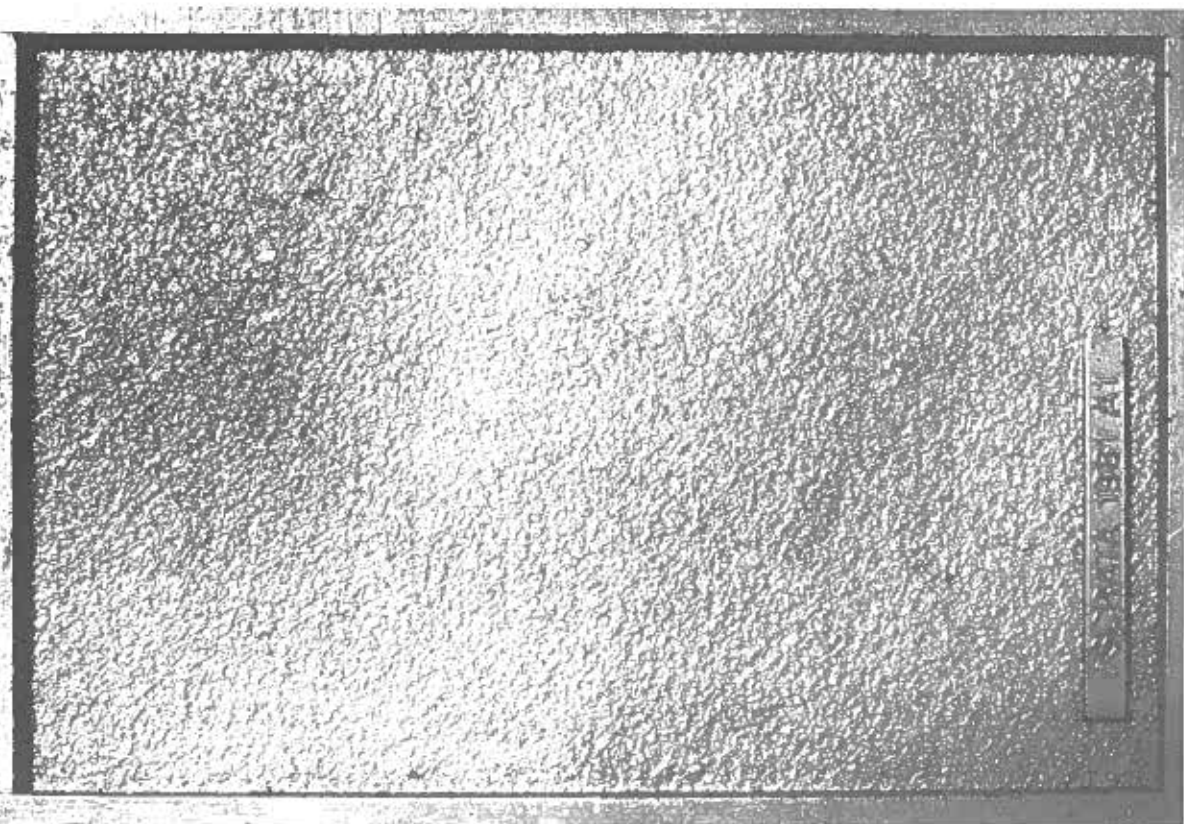
A. SURFACE TEXTURE



A2



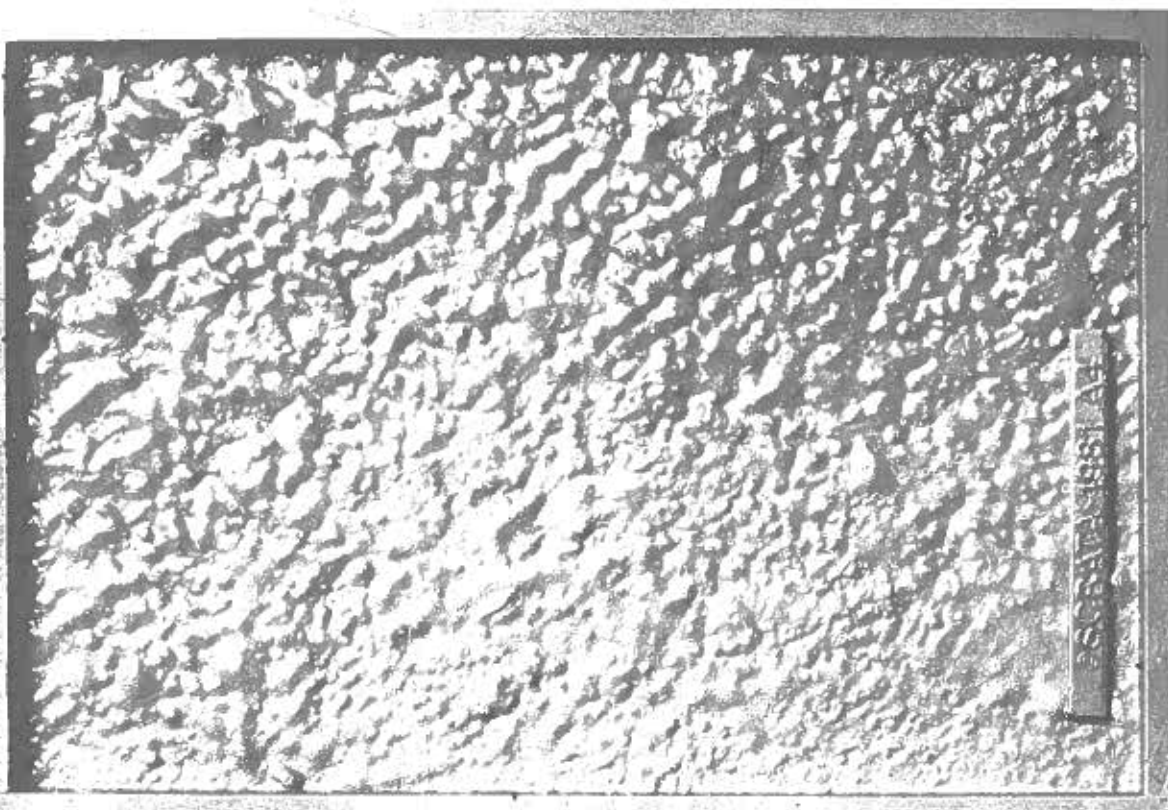
SURFACE TEXTURE



A1



A. SURFACE TEXTURE

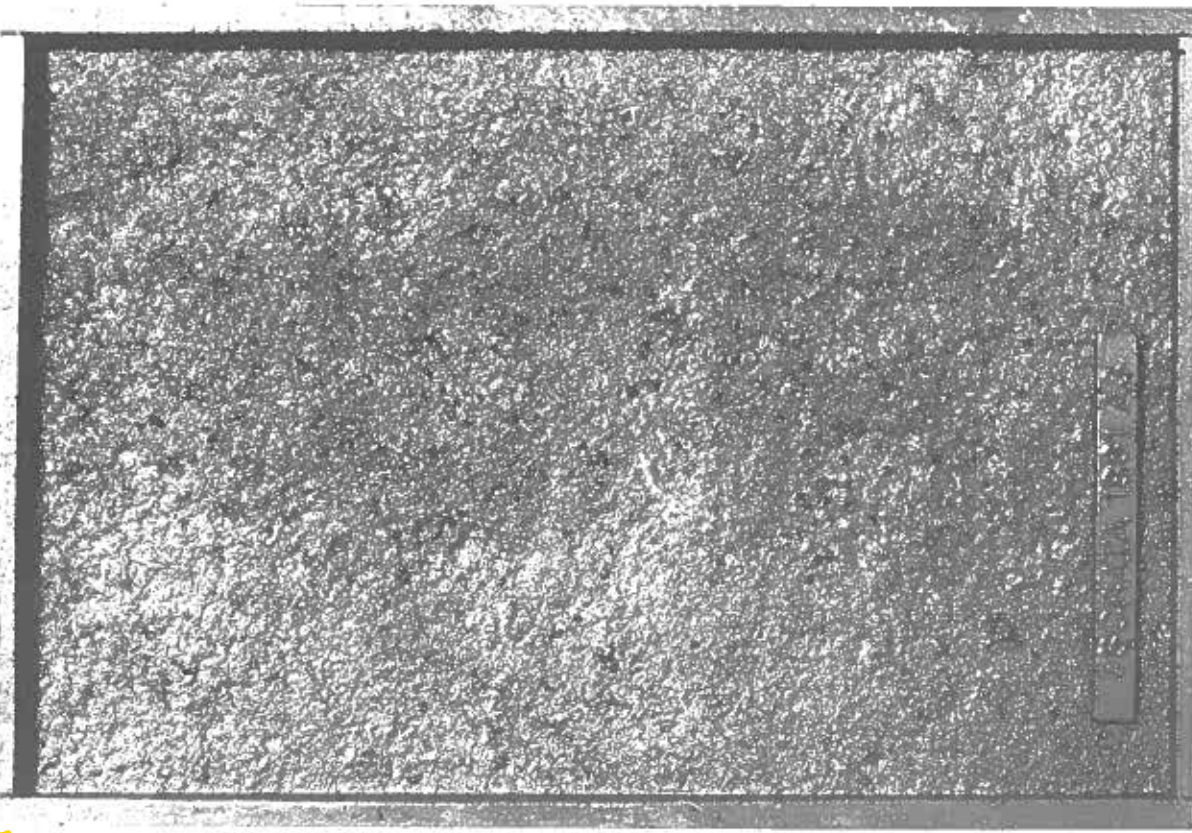


A4

11



SURFACE TEXTURE

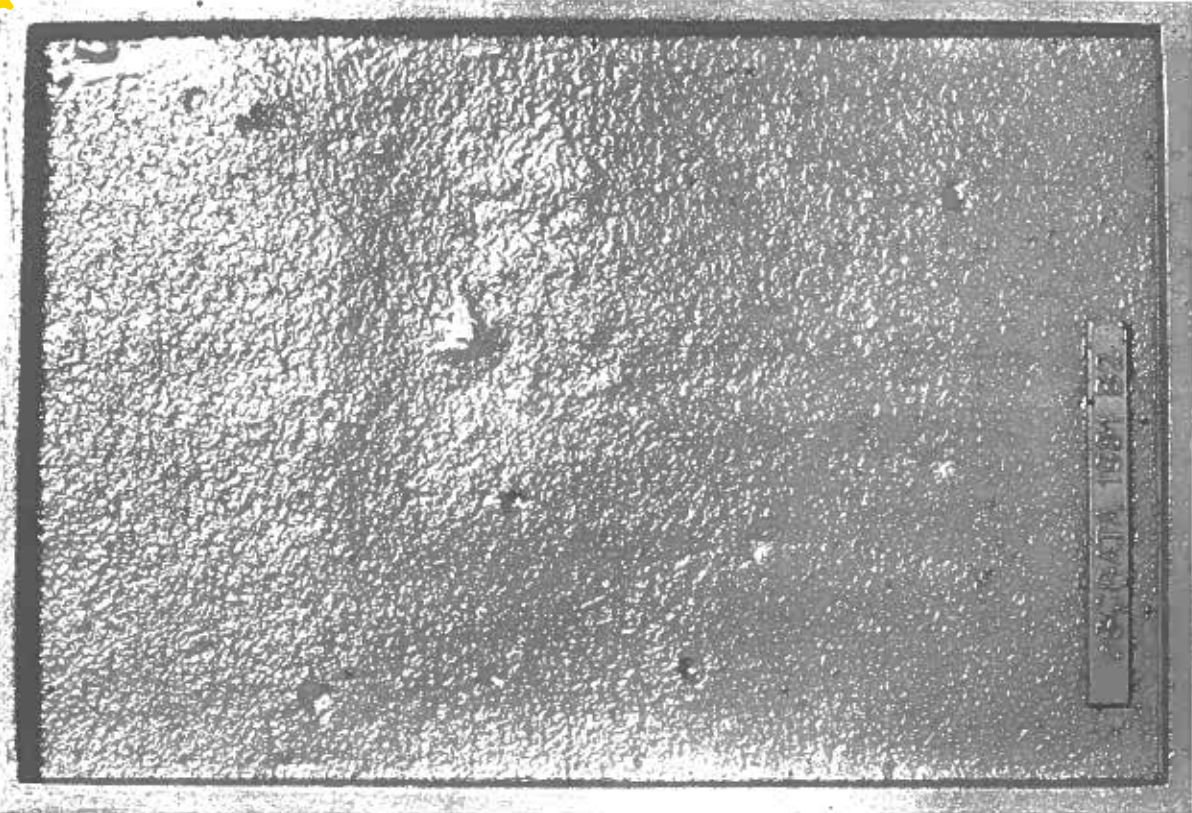


A3

10



B. NON-METALLIC INCLUSIONS

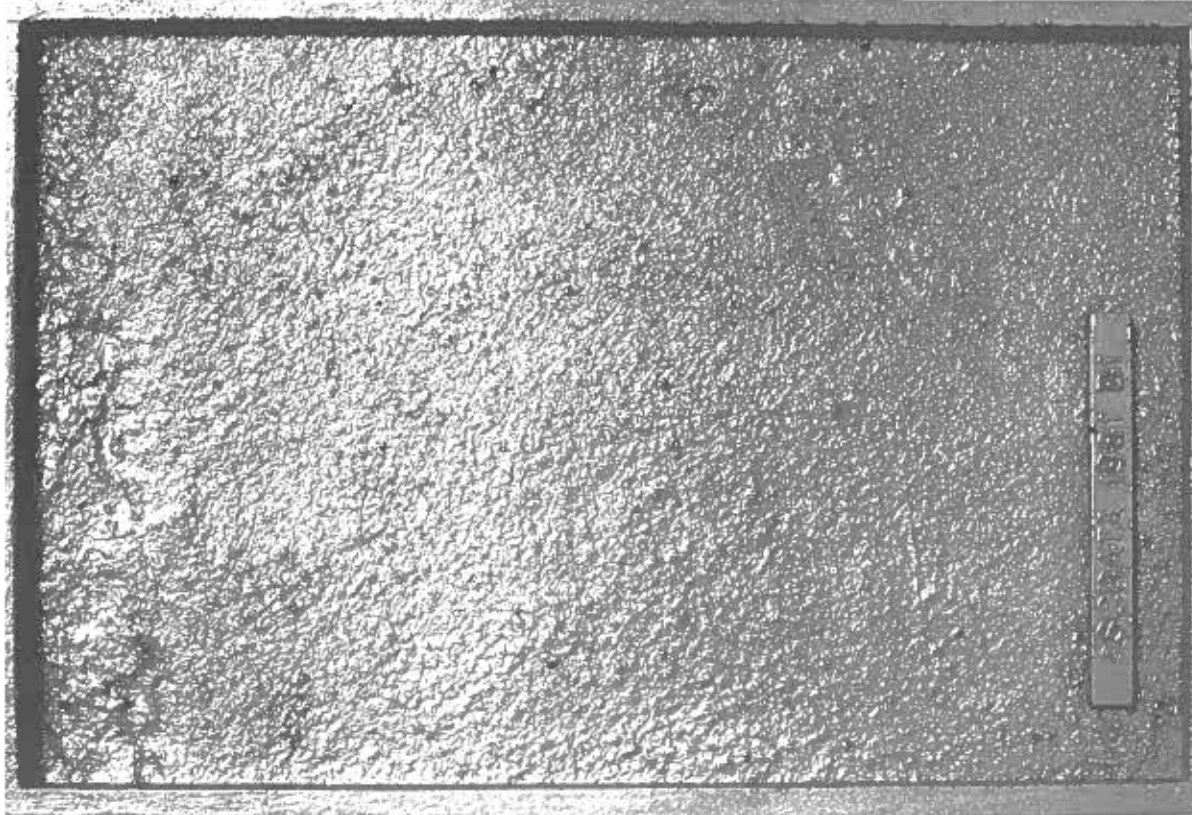


B2

13



B. NON-METALLIC INCLUSIONS

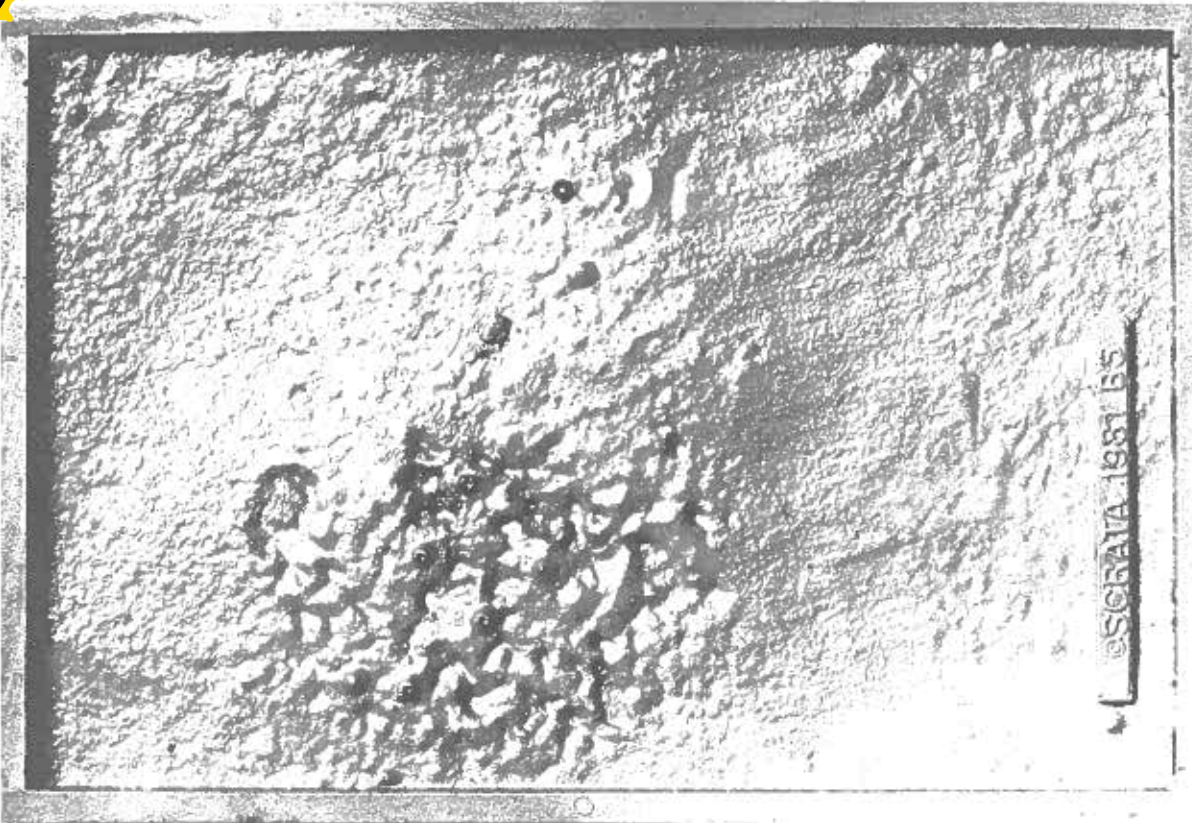


B1

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B. NON-METALLIC INCLUSIONS



B5



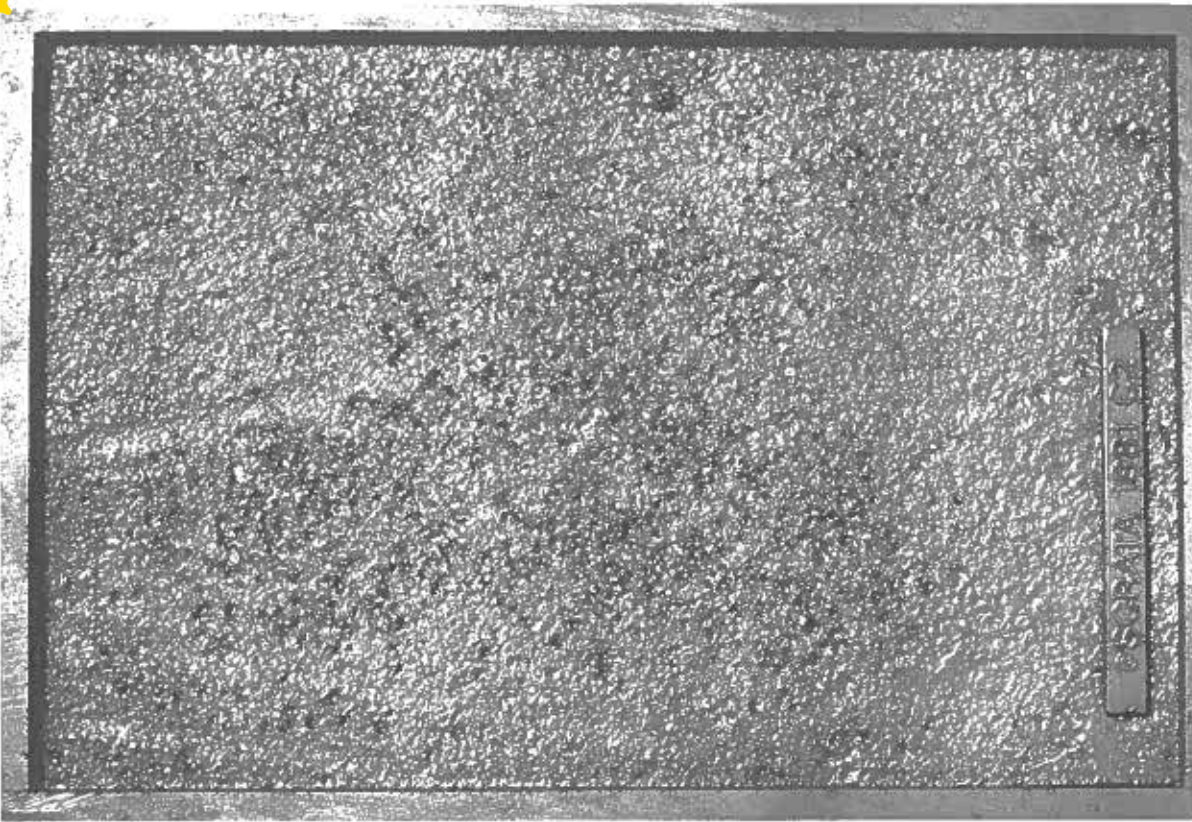
NON-METALLIC INCLUSIONS



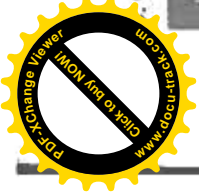
B4



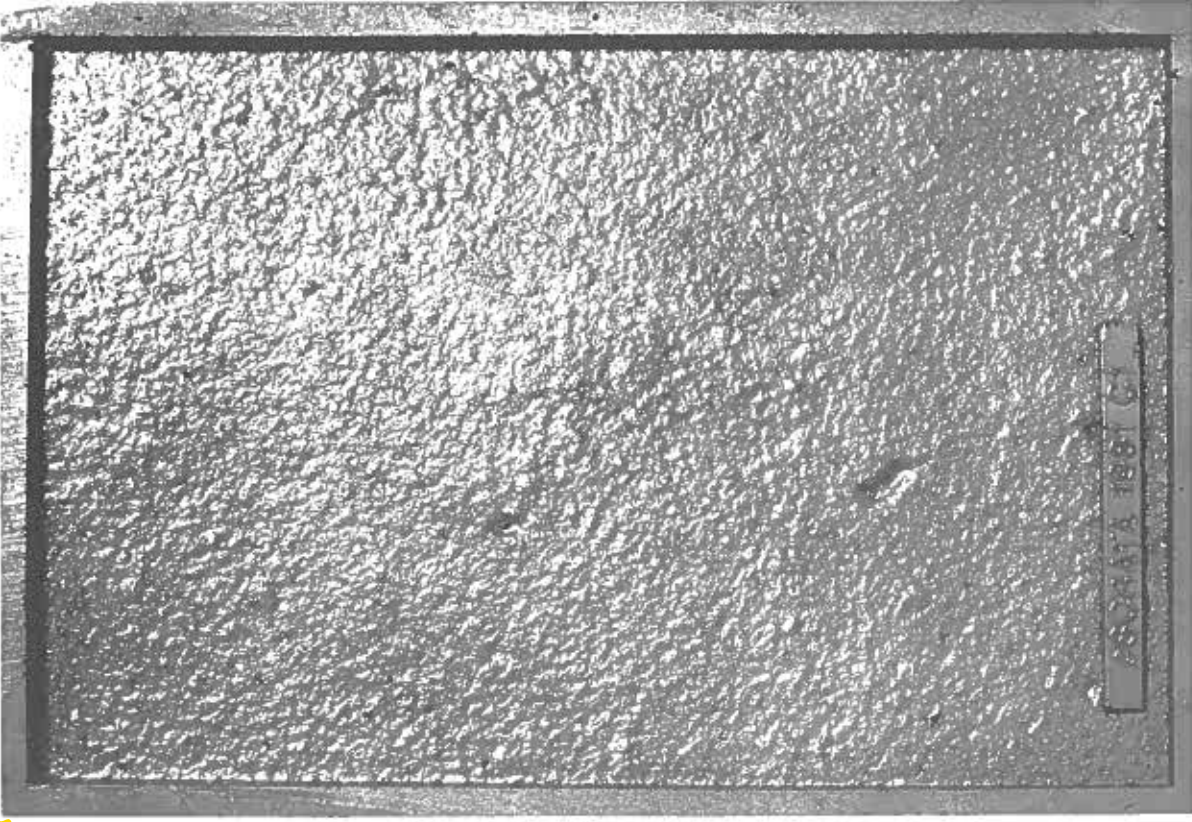
C. GAS POROSITY



C2



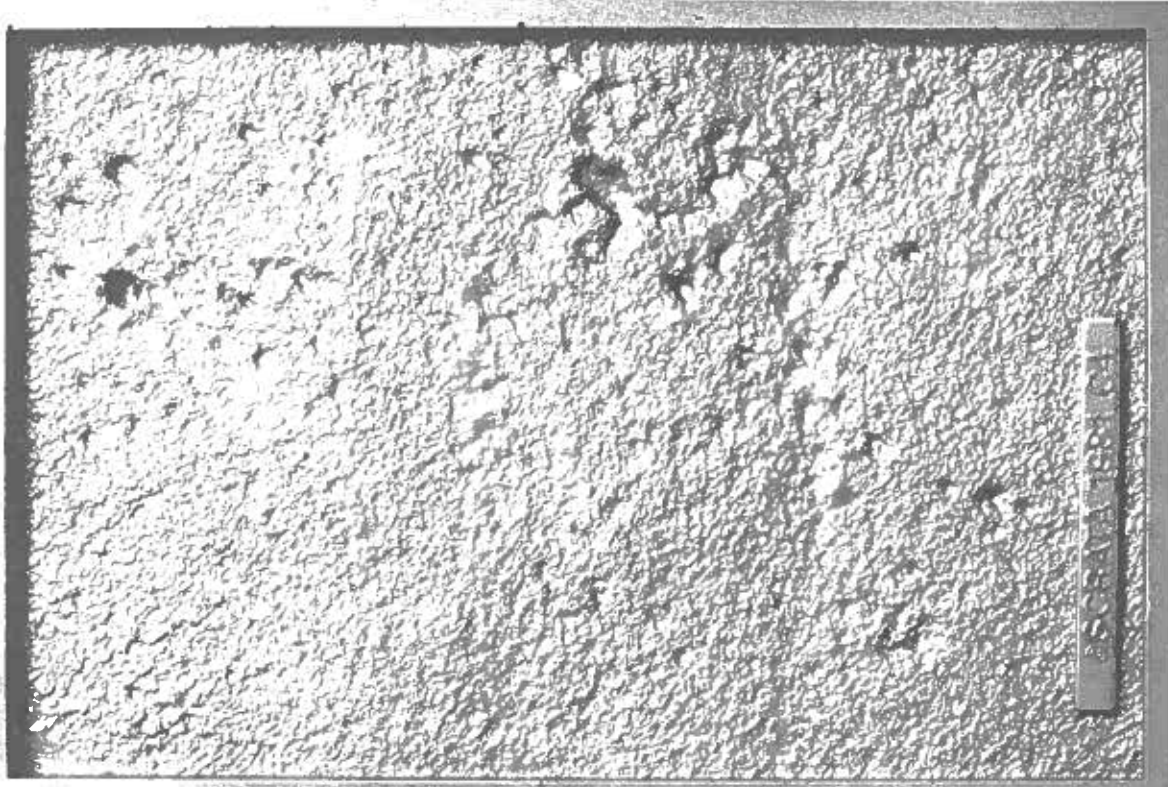
GAS POROSITY



C1



C. GAS POROSITY

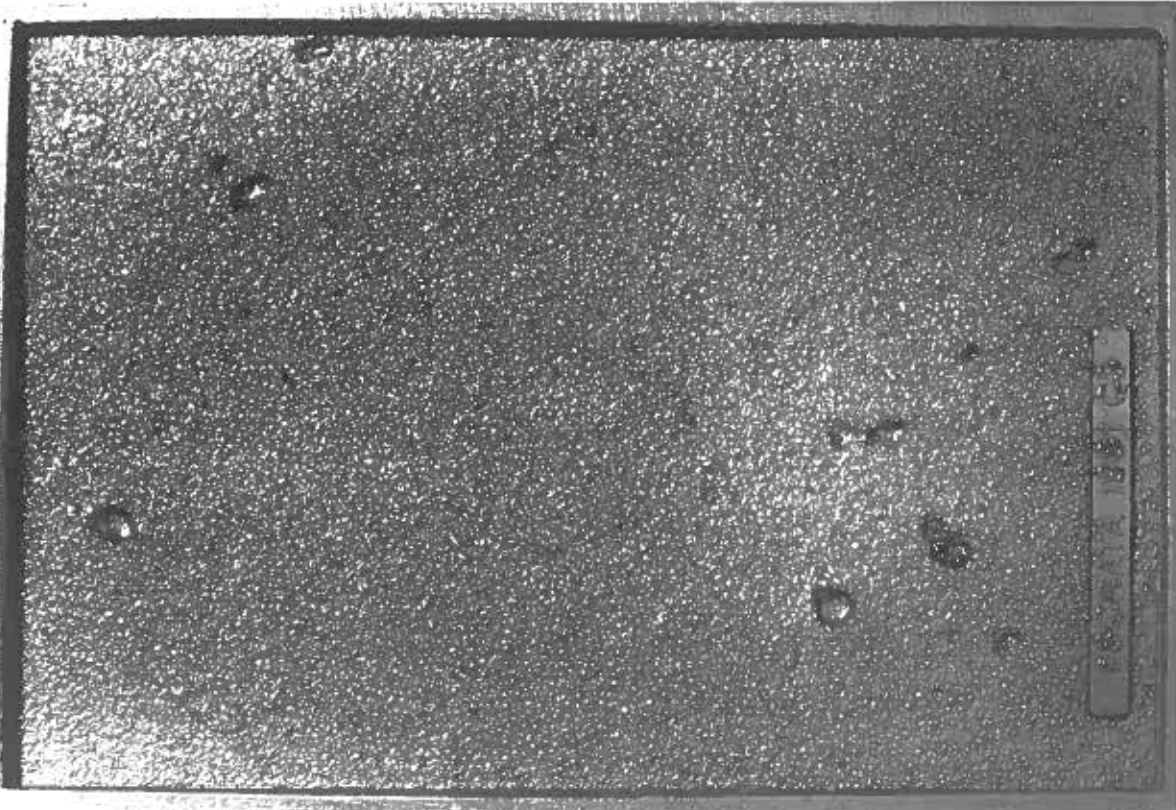


C4

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GAS POROSITY

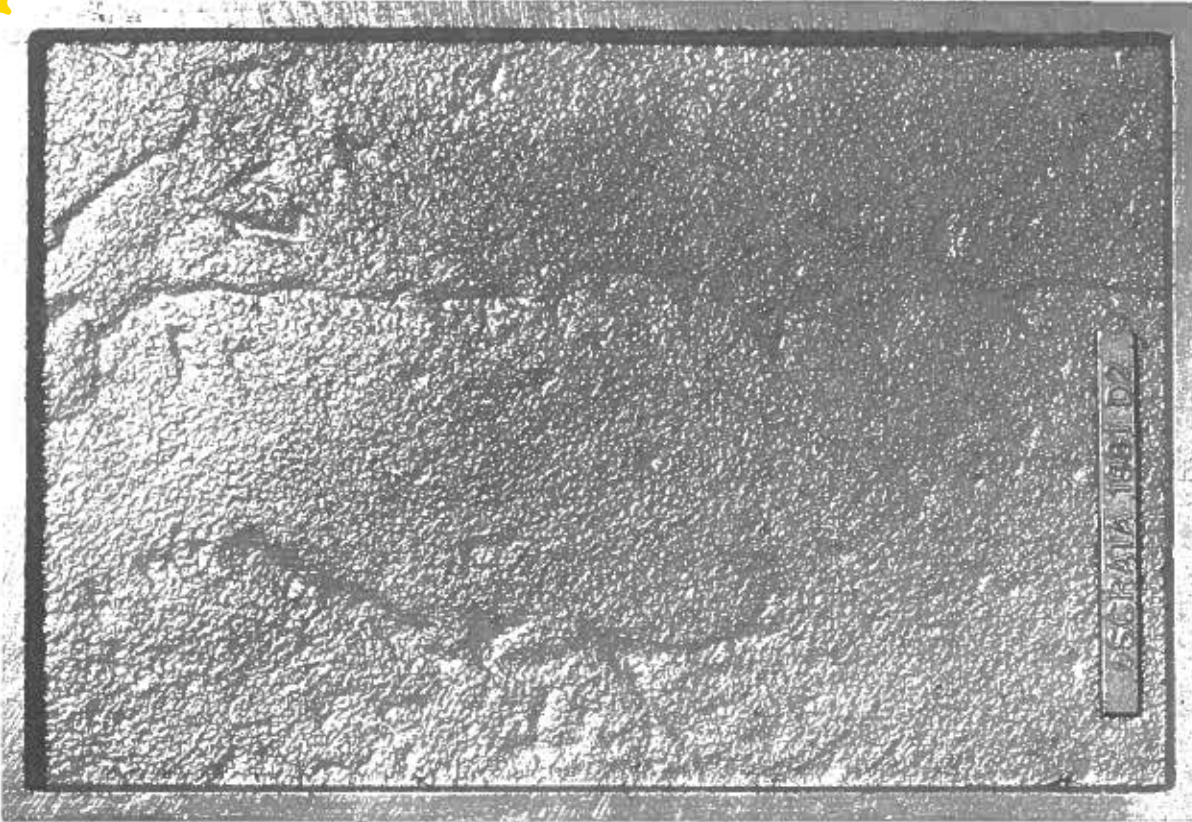


C3

18



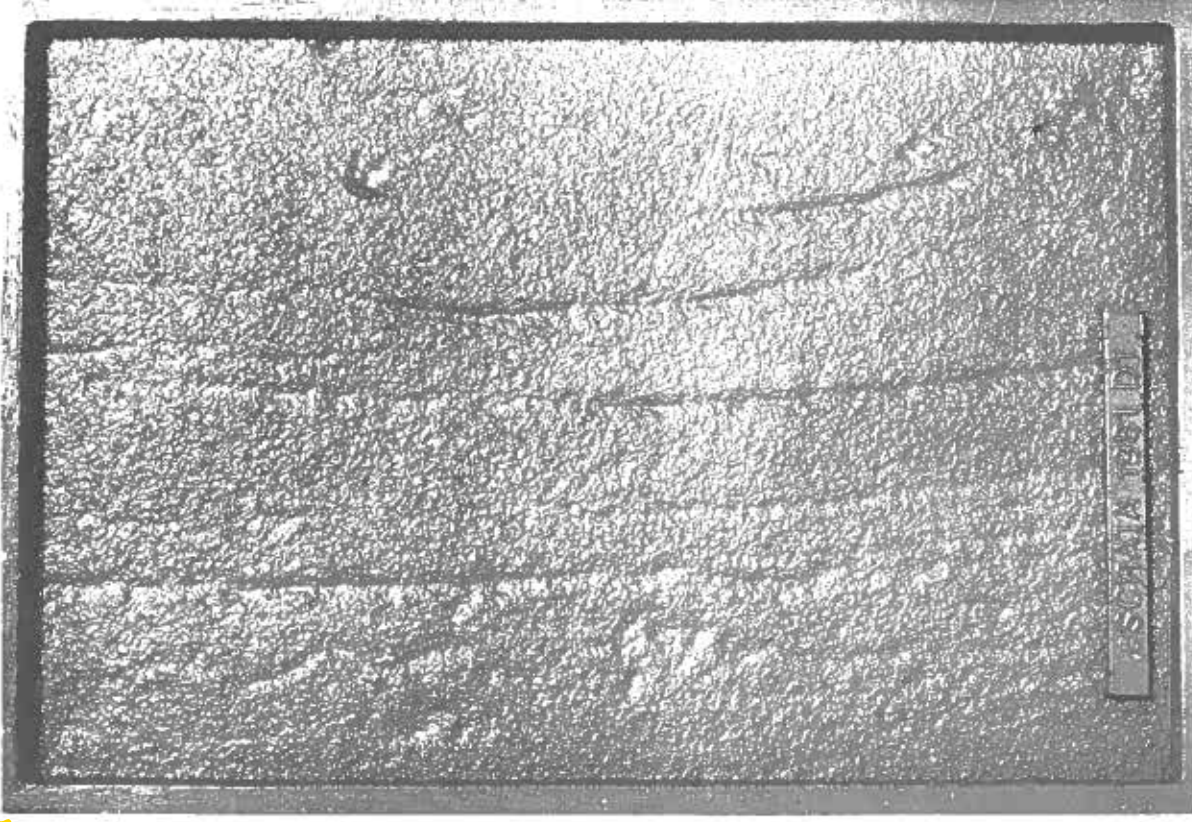
D. FUSION DISCONTINUITIES



D2



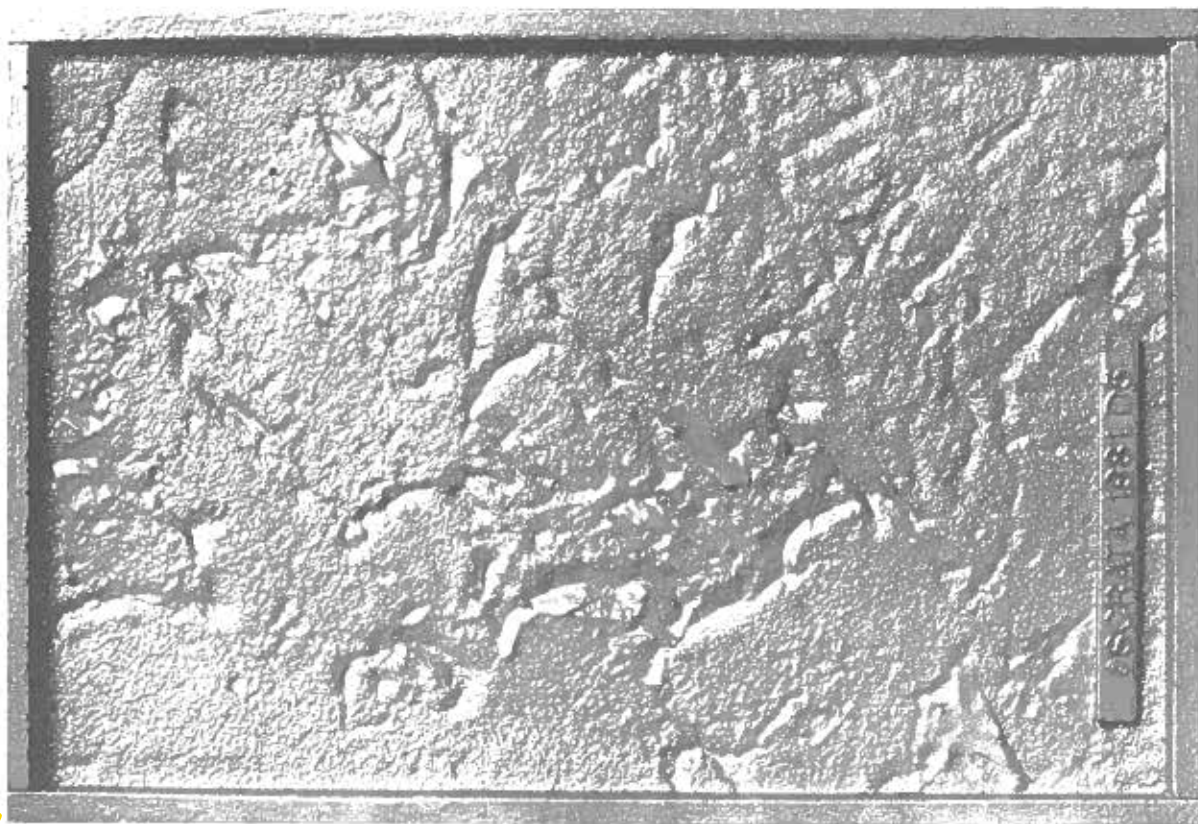
FUSION DISCONTINUITIES



D1



FUSION DISCONTINUITIES

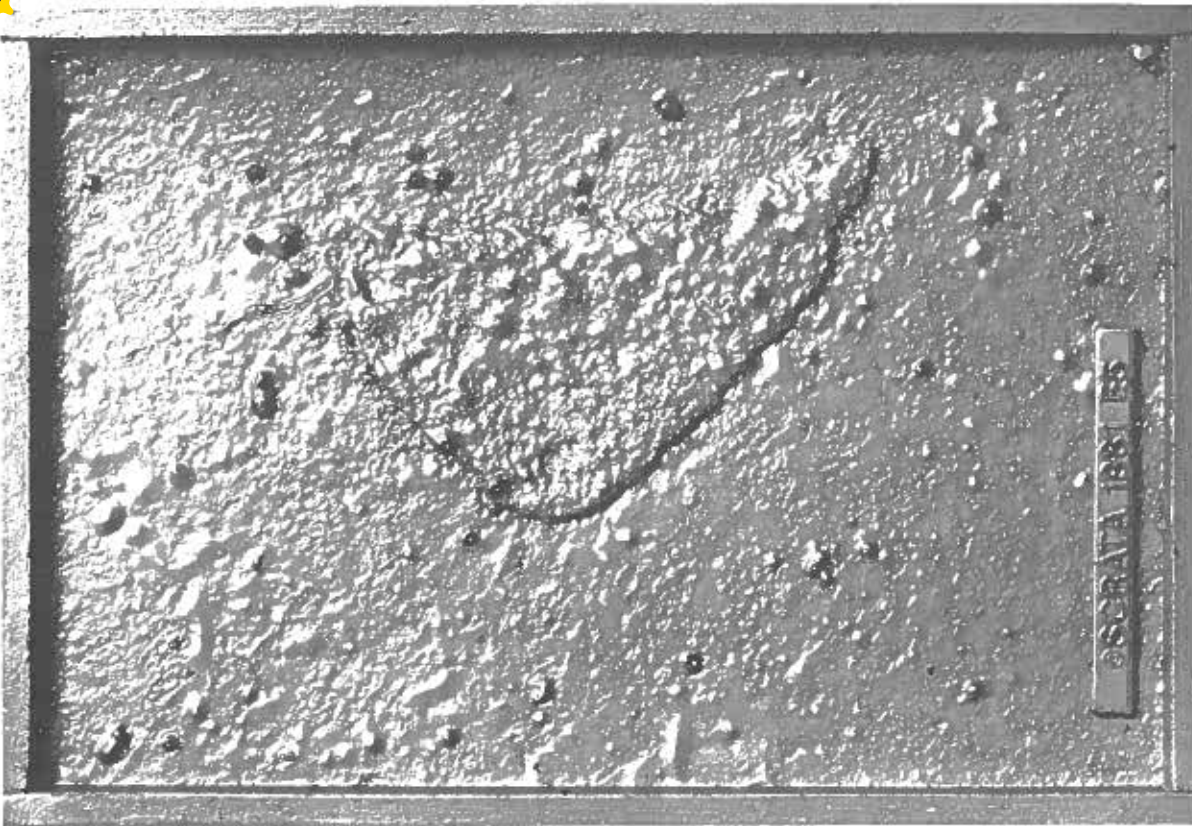


D5





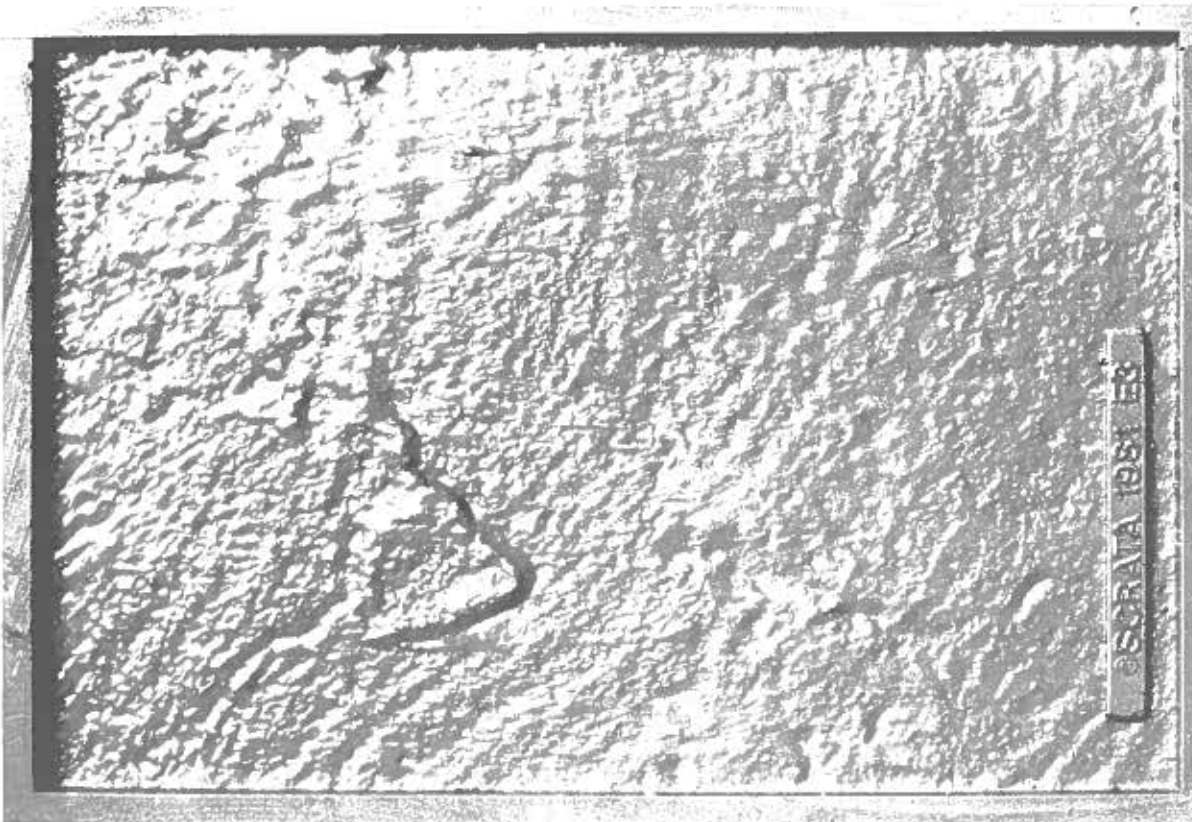
E. EXPANSION DISCONTINUITIES



E5



EXPANSION DISCONTINUITIES



E3



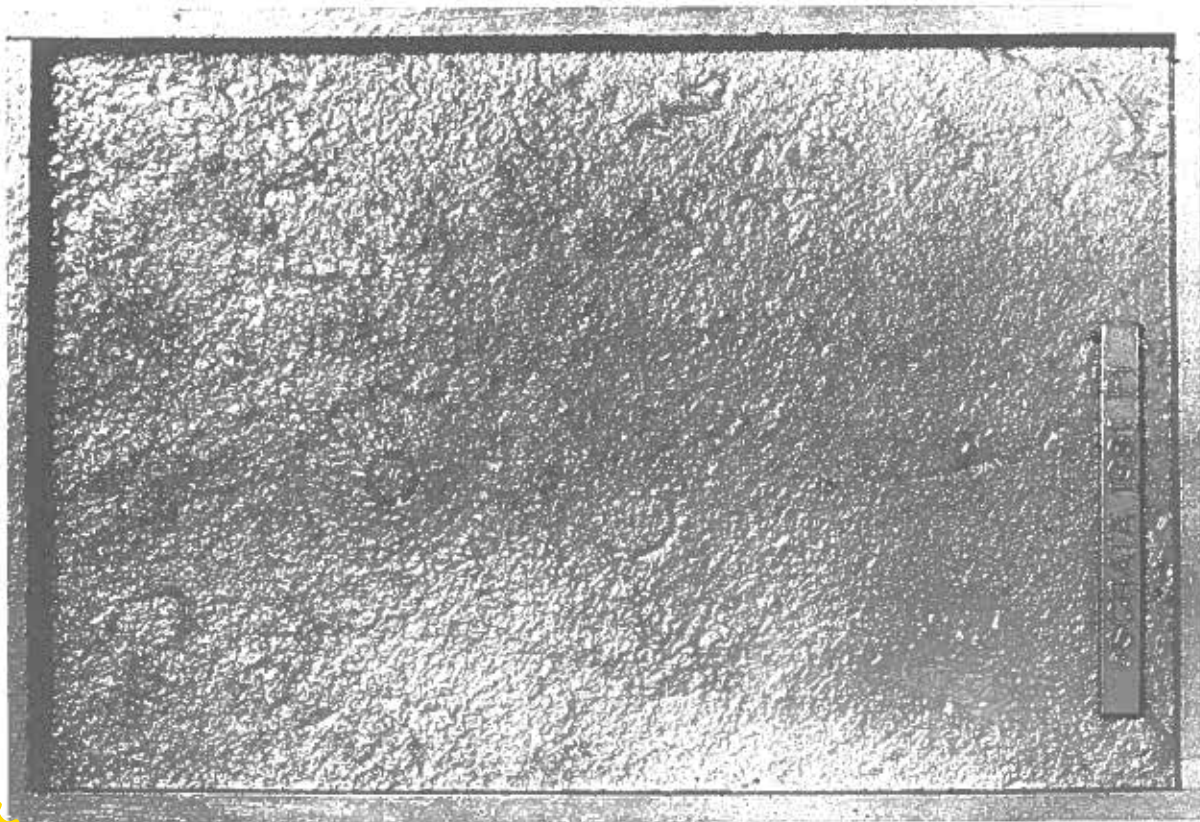
F. INSERTS



F3



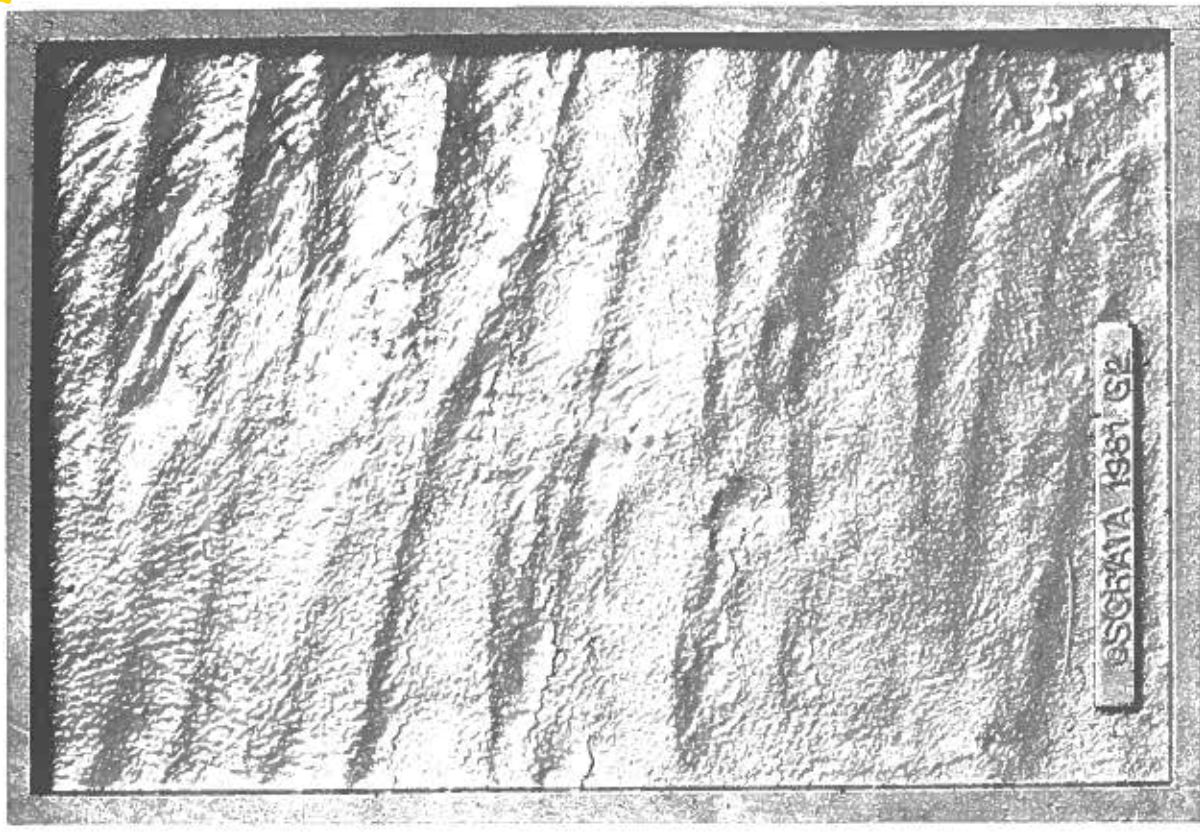
F. INSERTS



F1



G. METAL REMOVAL MARKS - THERMAL DRESSING

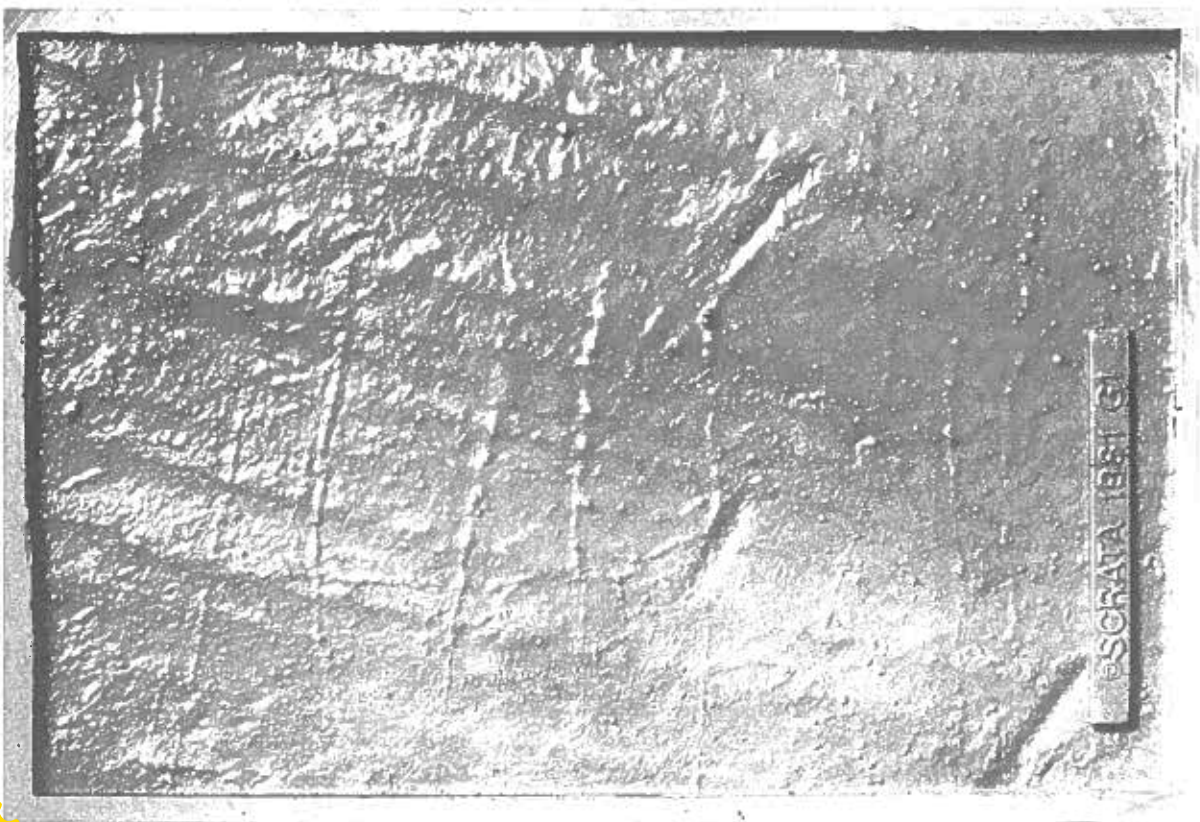


G2

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METAL REMOVAL MARKS - THERMAL DRESSING

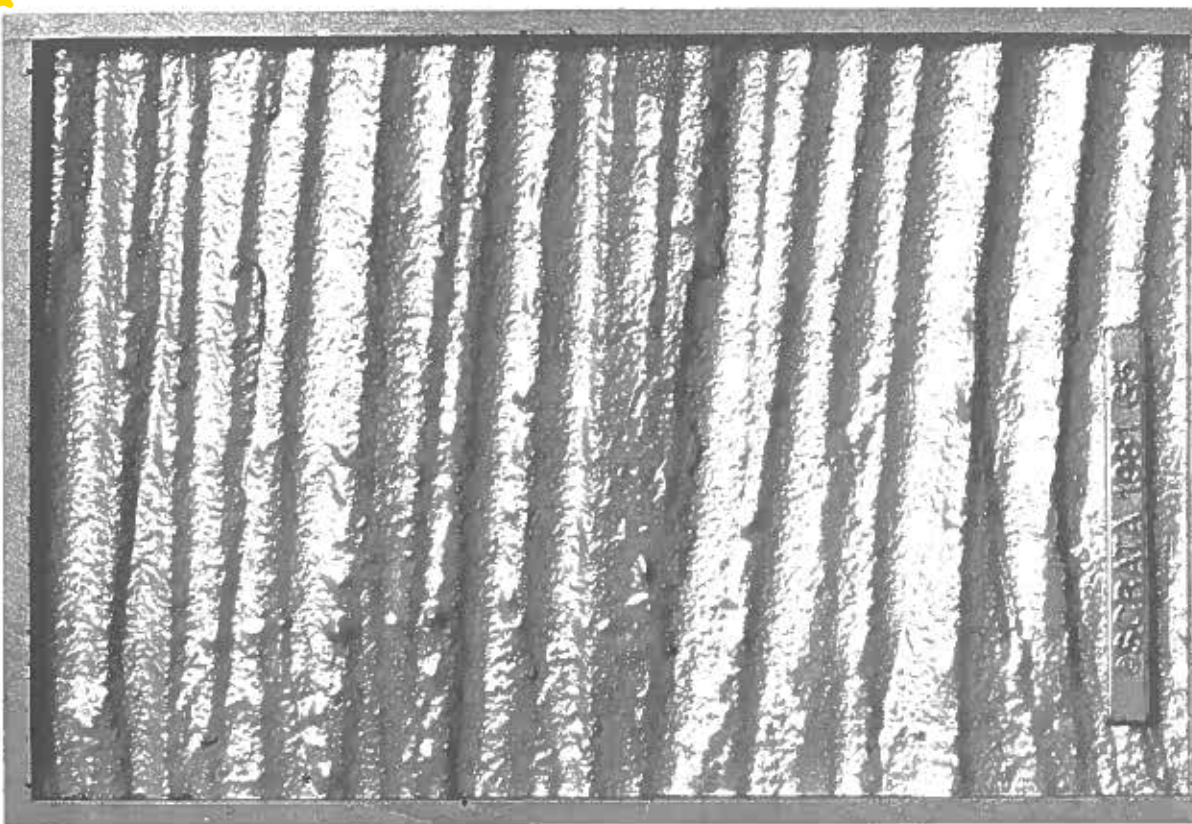


G1

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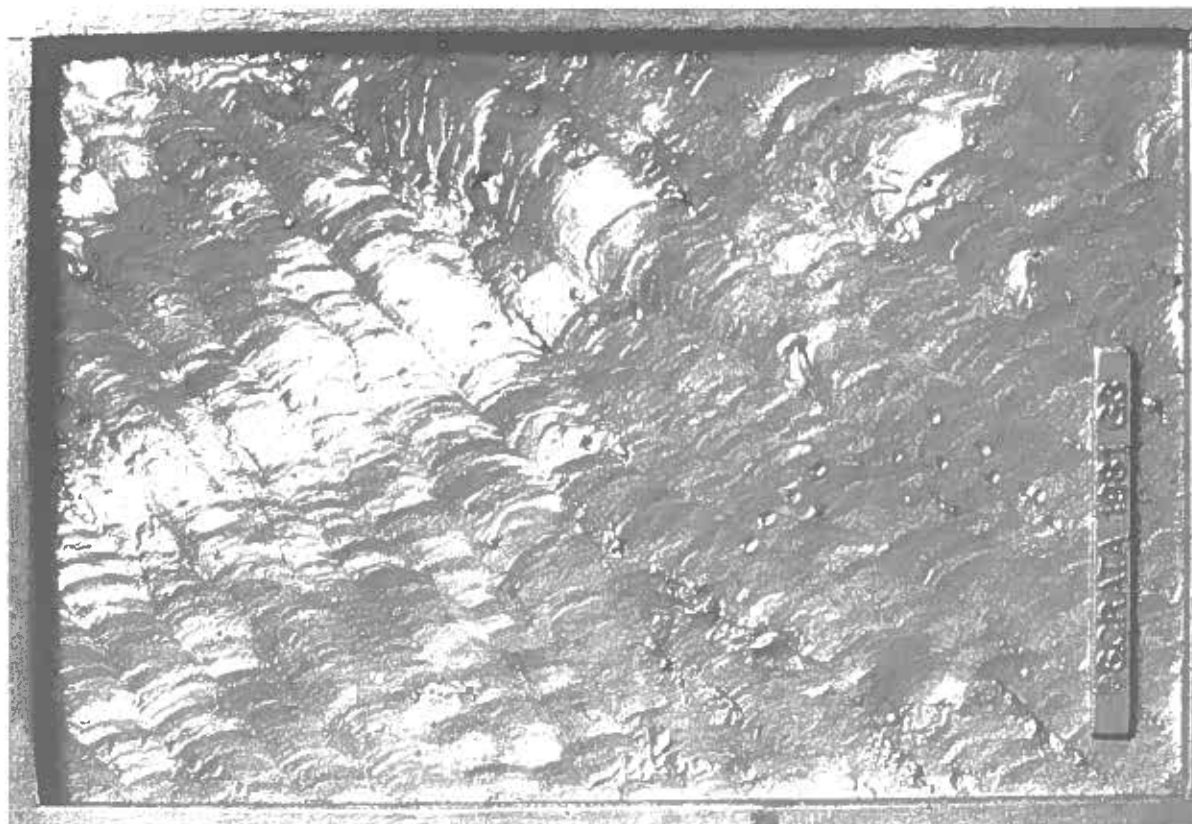
G. METAL REMOVAL MARKS - THERMAL DRESSING



G5



G. METAL REMOVAL MARKS - THERMAL DRESSING



G3



H. METAL REMOVAL MARKS - MECHANICAL DRESSING

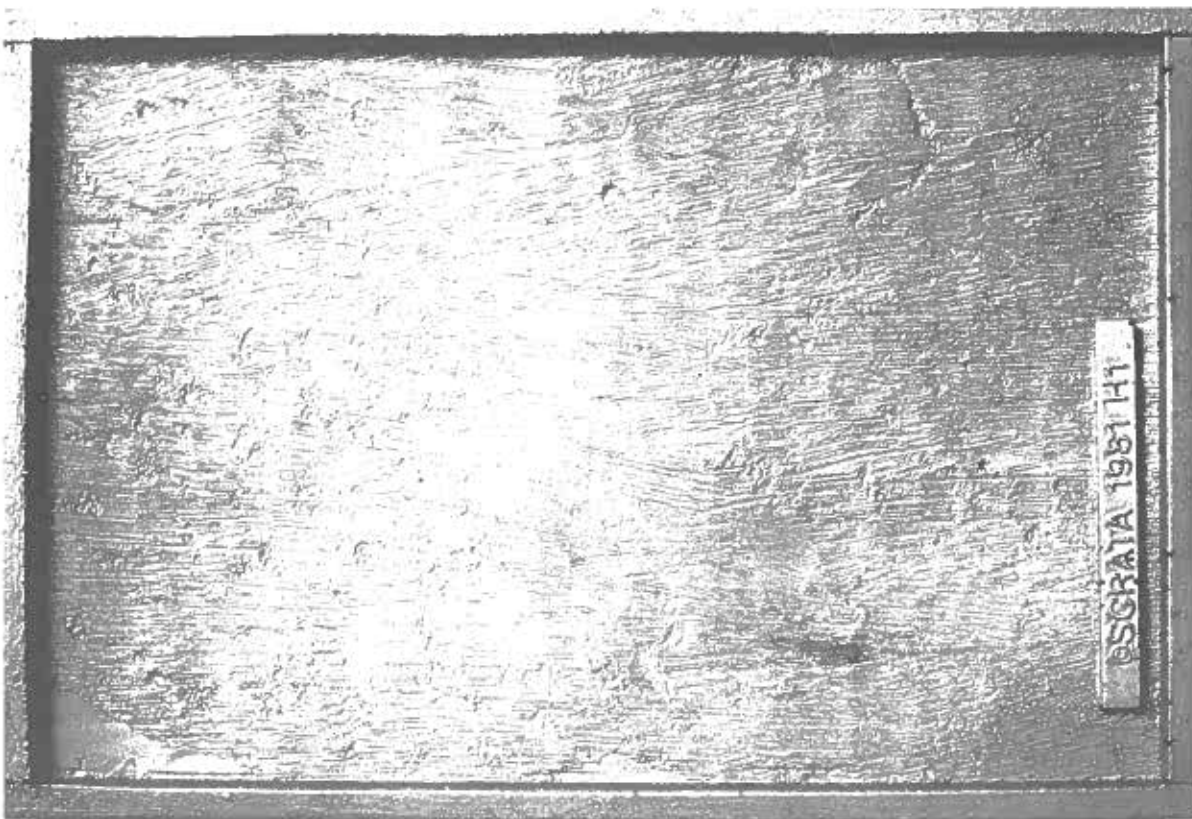


H3

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METAL REMOVAL MARKS - MECHANICAL DRESSING

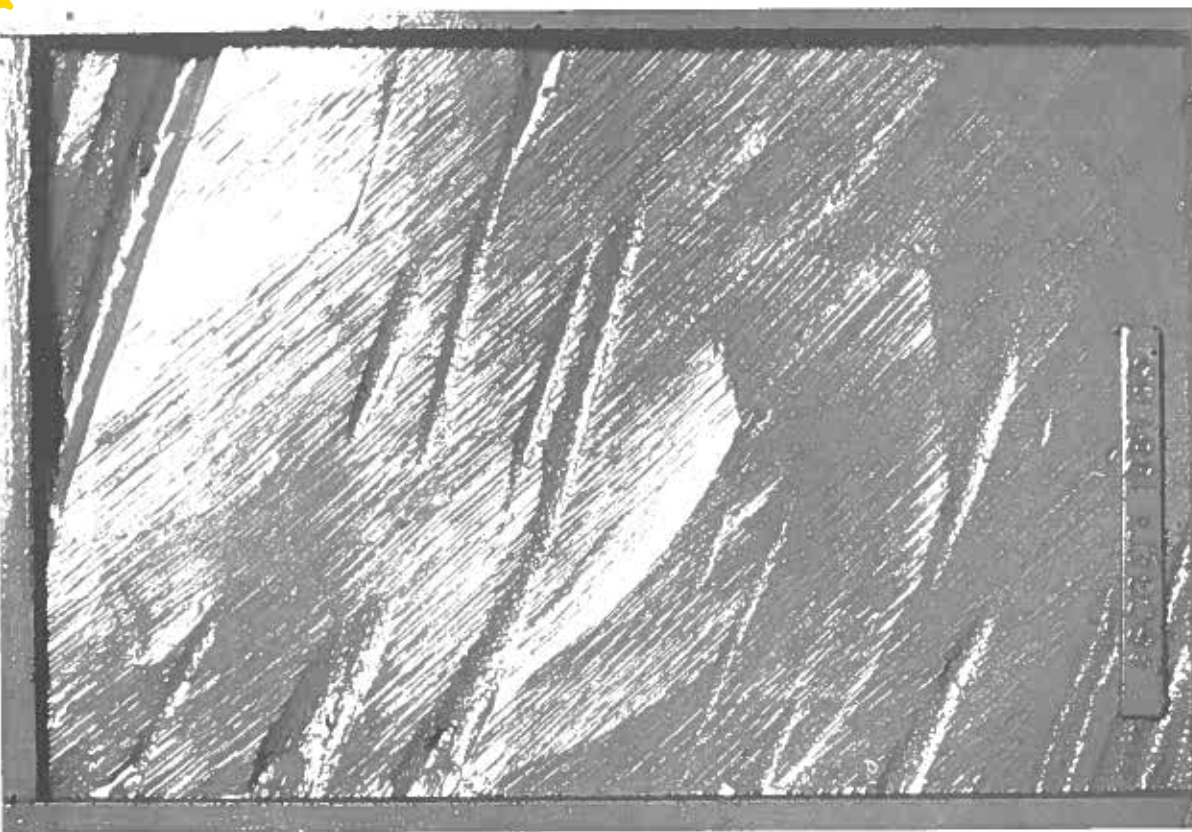


H1

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H. METAL REMOVAL MARKS - MECHANICAL DRESSING

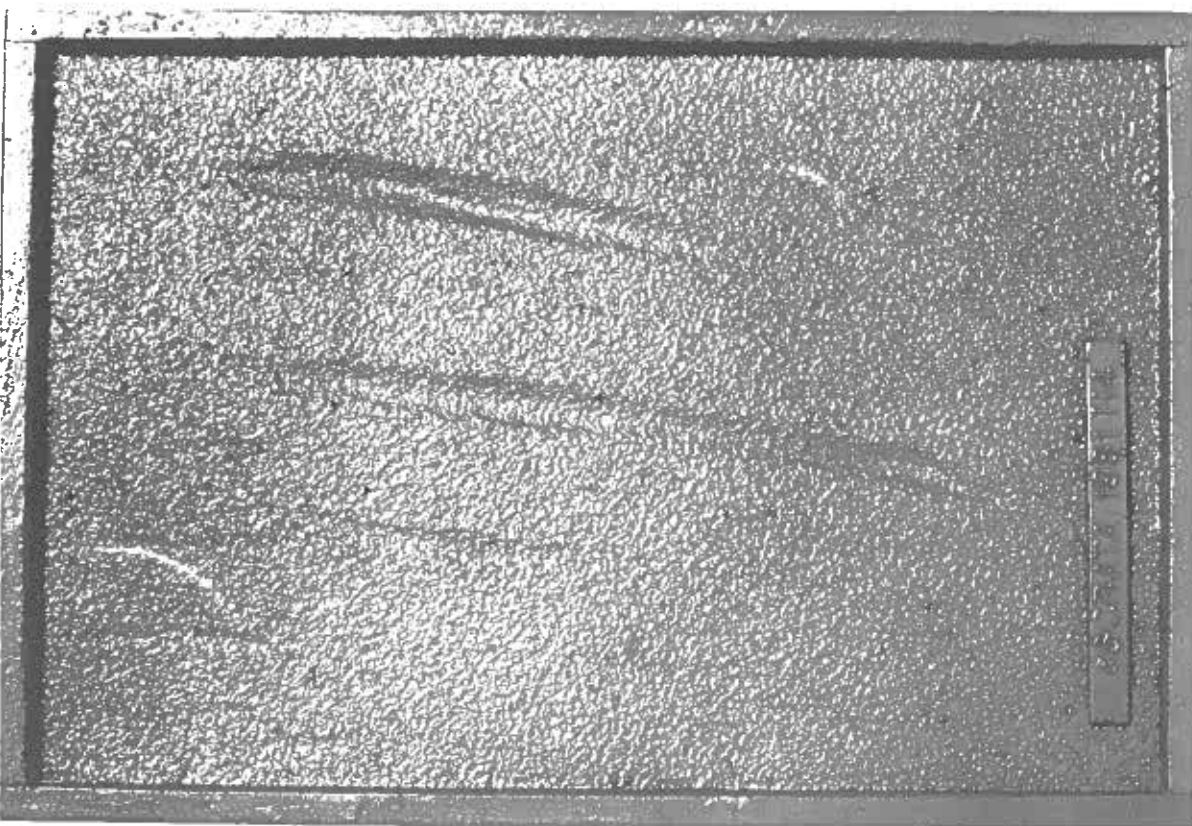


H5

35



METAL REMOVAL MARKS - MECHANICAL DRESSING

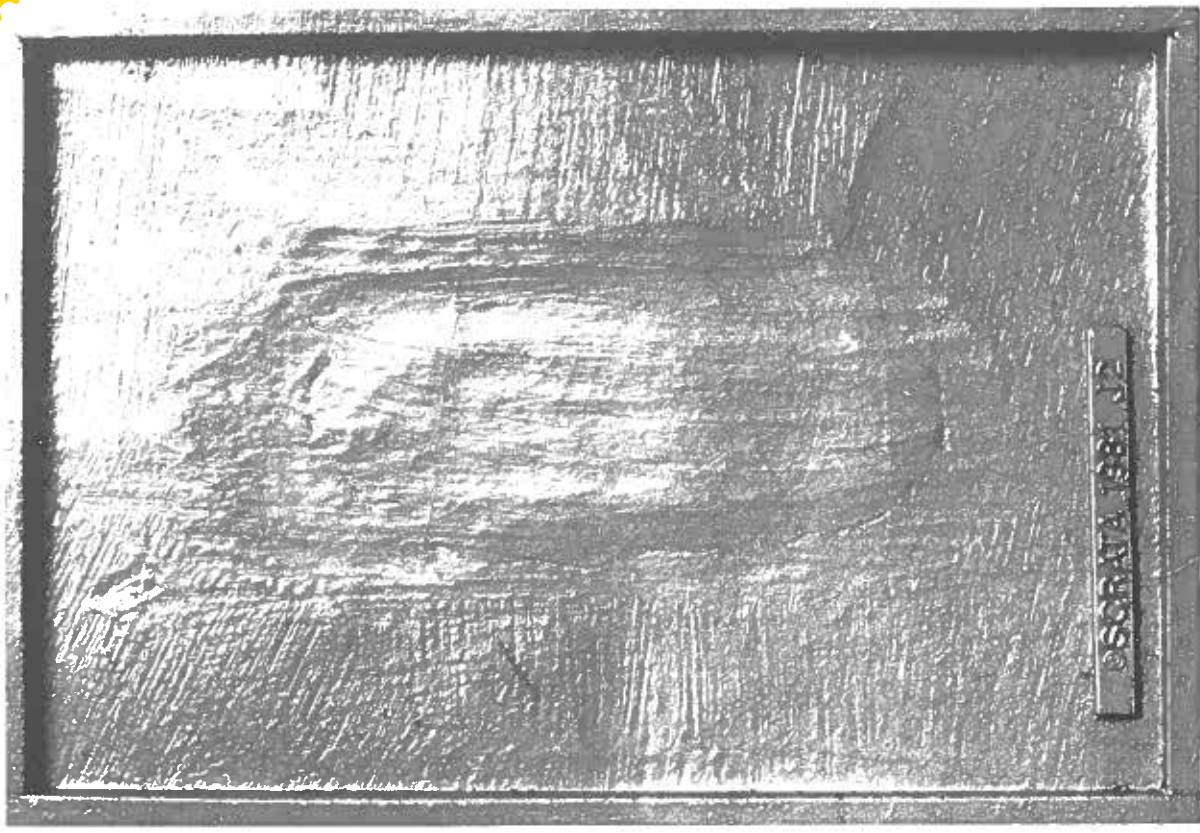


H4

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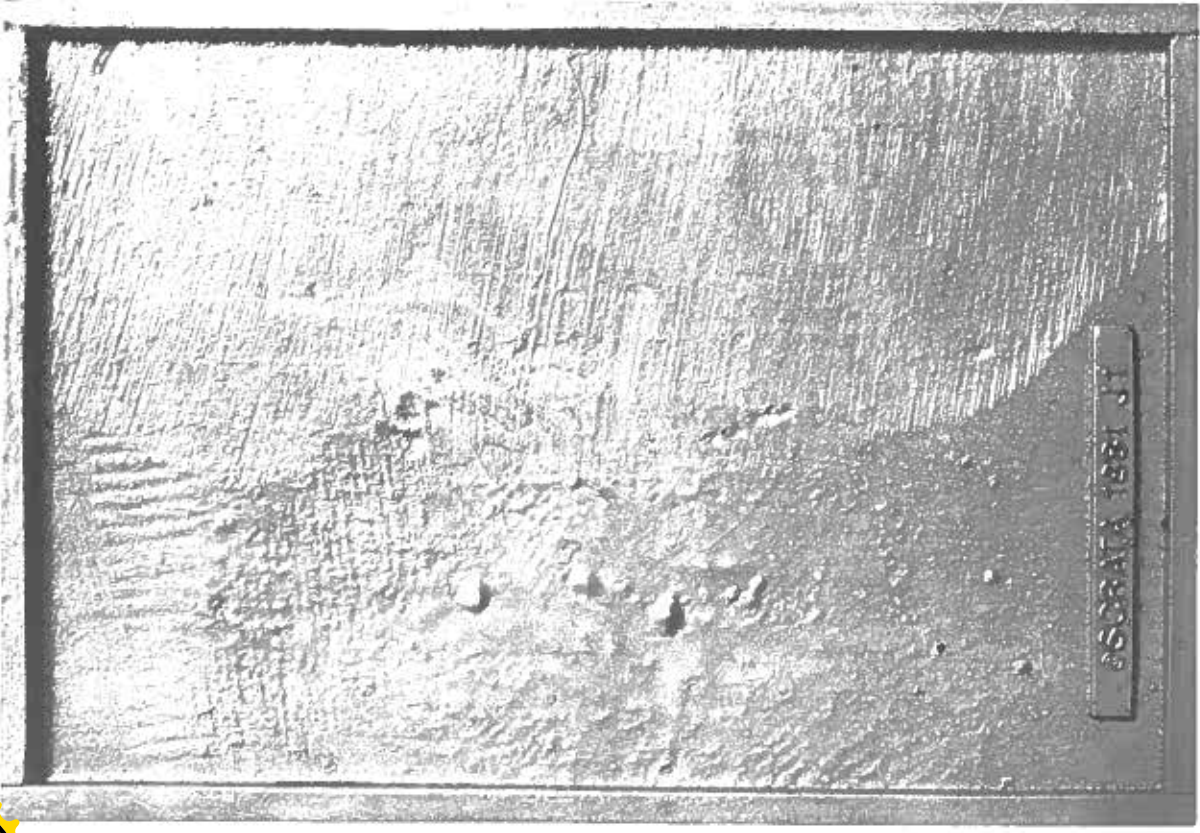
J. METAL REMOVAL MARKS - WELDS



J2



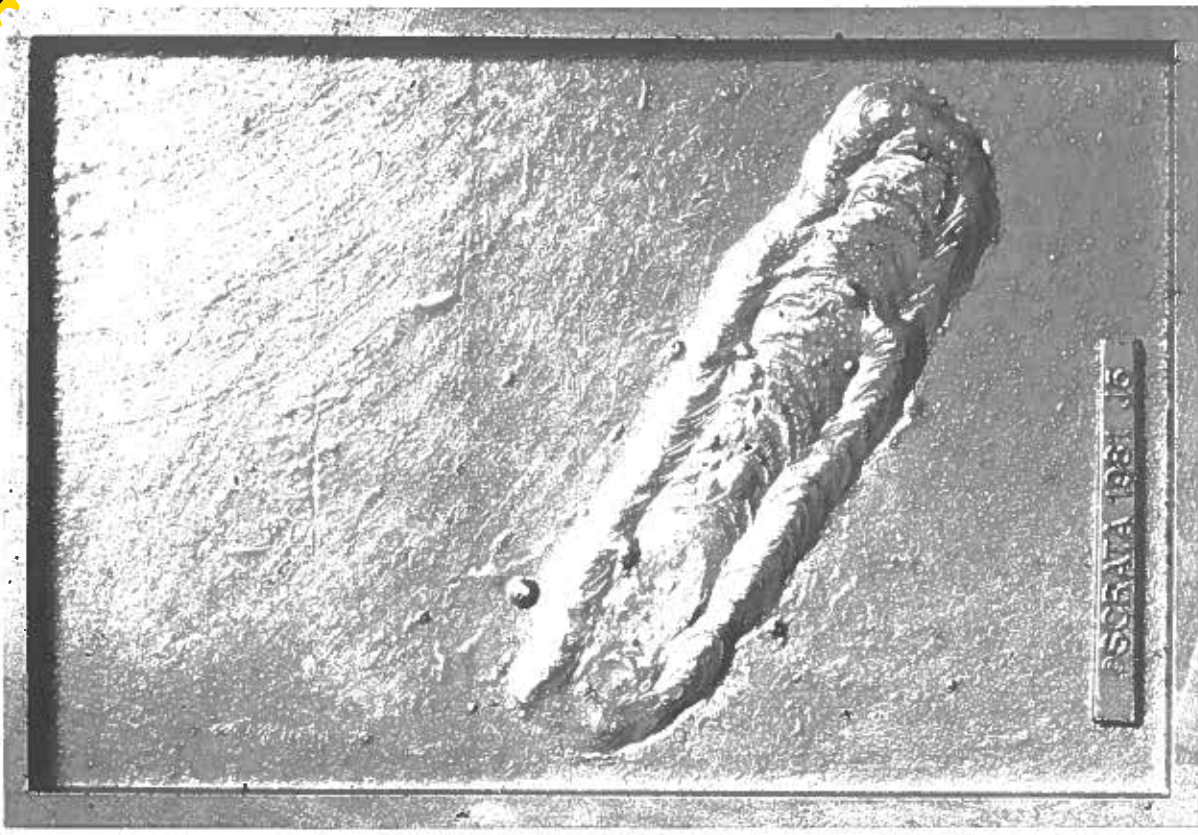
METAL REMOVAL MARKS - WELDS



J1



J. METAL REMOVAL MARKS - WELDS

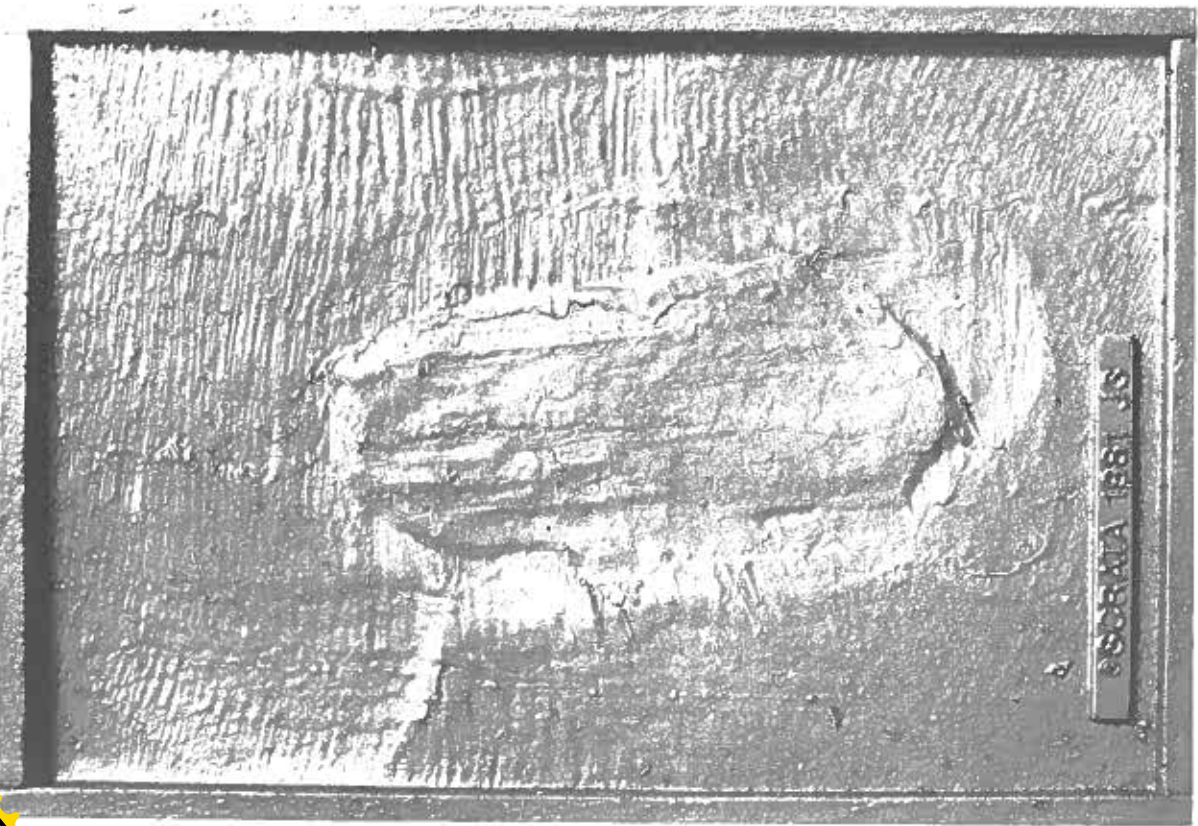


J5

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METAL REMOVAL MARKS - WELDS



J3

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