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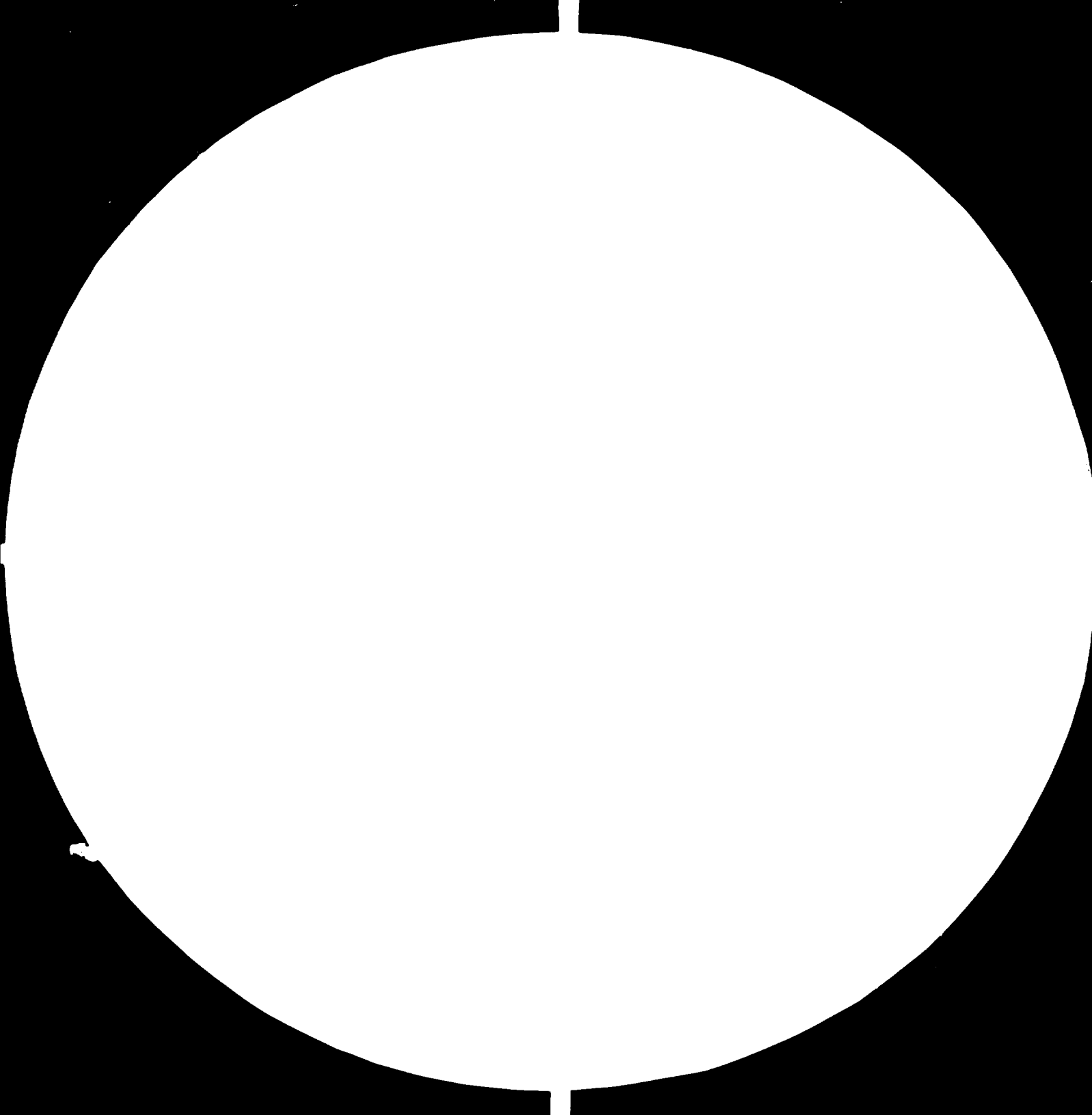
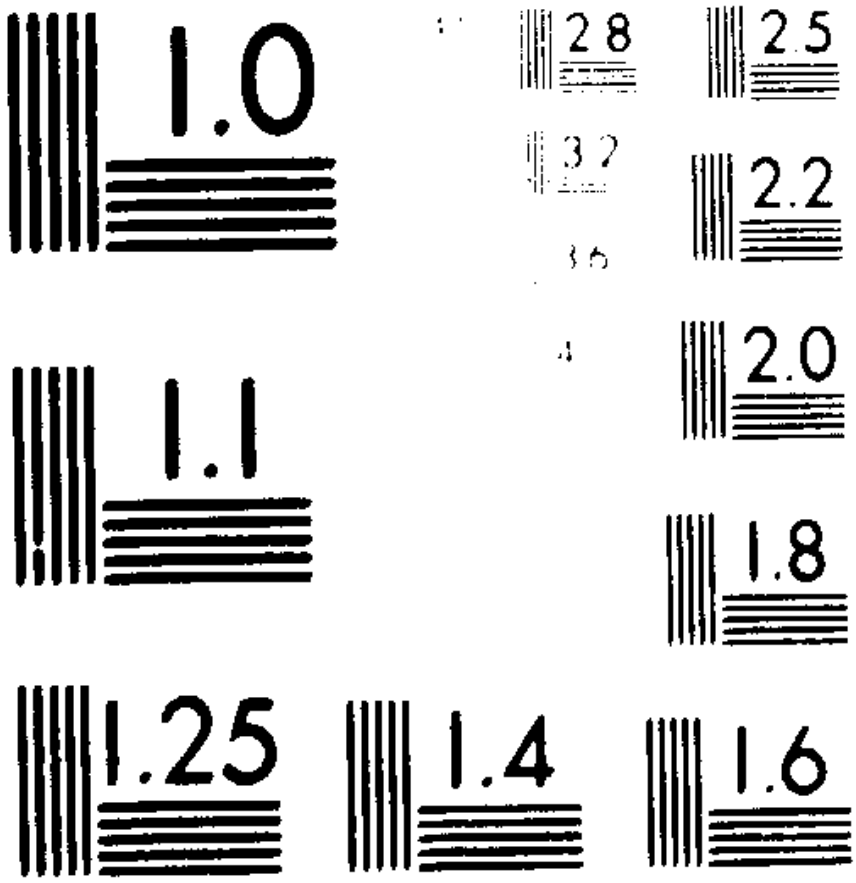
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

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09678

DP/ID/SER.A/241
12 May 1980
English

SMALL SCALE GLASS MANUFACTURE IN MALAWI

SI/MLW/78/801

MALAWI

R1 Technical report: Design of a range of glass containers

Prepared for the Government of Malawi by the
United Nations Industrial Development Organization,
executing agency for the United Nations
Development Programme

Based on the work of John Cochrane, glass design/marketing expert

United Nations Industrial Development Organization
Vienna

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Summary

1.0 This study is an extension to that undertaken by the late Dr. S.M. Cox in May, 1979 and which, together, are the limits of current UNIDO funding.

2.0 The primary objective of this mission is to advise on the design of a minimum range of articles which will satisfy the market without copying already imported articles. This range is now designed, most items having been fully detailed and made ready for final development or mould making. However, additional manufacturing/marketing opportunities have been identified and are reported.

3.0 The market for this proposed minimum range has been assessed in terms of the glassware currently available on the Malawi market, which it is intended the new range should substitute.

3.1 It is recommended, however, that a market and marketing analysis in depth be undertaken to determine the likely penetration of the new range, as an essential element in the preparation of a final overall viability statement.

4.0 It is established that glassmaking sands, which constitute the main bulk of the glassmaking batch, exist in Malawi. (see specimen glasses and British Glass Industry Research Associated report dated 13 July 1979, retained by Mr. Msiska).

4.1 Analysis of the quality and assessment of the quantity of these sands, in the Mchinji district, is proceeding via the Geological Survey Department, Zomba (UNDP/UNIDO project MLW/78/003).

5.0 In general, each of the main market sectors for glass products in Malawi - domestic, commercial, industrial, scientific, and possibly ethical - offer relatively low production volume opportunities. Hence, the scope to exploit these opportunities profitably will arise from an appropriate and versatile manufacturing technology, adaptable to speedy batch and product change, and ignoring conventional bottle production, although bottles are currently the largest single glass import. (Note that some products are described as bottles in this report. These, it is intended, would be made by the semi-auto jar machine).

5.1 Hence, the satisfaction of three further elements in the viability requirements are demanded:

5.1.1 The availability of suitable sand deposits to ensure, say, 20 years production at full capacity - the major plant and equipment being amortised over 15 years. (See report on meeting with Chief Geologist Ref M. 021/5-159, datei 18 January 1980).

5.1.2 Acceptance of a manufacturing technology appropriate to the Malawi market. The Cox report envisages just such a technology.

5.1.3 The contribution, by an agency such as UNDP/UNIDO, of the transfer of the necessary technology, production and management expertise.

6.0 The scope for glass manufacture might be greater than is implicit in winning the market from currently imported ware. Feasibility/design studies are recommended into glass products for the construction industry where, for example, if a glass wall tile should be successfully produced there could be a minimum market for 1,000,000 per annum 100 mm x 100 mm pieces. Again, a recent meeting with the Chief Executive of Southern Bottlers, where some principles of multi-trip bottles were discussed, resulted in a further meeting and an enquiry for the development of a 1 litre squash bottle, where the order quantity could be 500,000 pieces. The same company could be interested in the chemically-resistant virtues of glass as a floor tile. Glass roof tiles are another, though more difficult to realise, possibility, and an interest has been expressed by the Chief Architect, Ministry of Works and Supplies, in hollow glass blocks.

6.1 These are indications of where under the right management, adopting positive attitudes, the market for glass products could be expanded into untapped areas and, given some successes, make worthwhile contributions to profitability.

6.2 It is recommended that an early opportunity be taken to initiate the above studies, as the results might influence plant/equipment proposals, and viability figures.

7.0 Consideration should be given to two further studies:

7.1 In the event of it being proved impracticable to establish hand-crafted, or small-scale factory, production of ceramic items in the country, the viability and design, leading to hand-pressed production, of glass cups, saucers and plates should be studied. This could be particularly pertinent should the building industry products study result in a recommendation for the introduction of glass toughening techniques.

7.2 Glass paper weights of merit are sought by collectors throughout the world and, given appropriate marketing resources, could be profitable line. An interesting possibility, is the encapsulation in glass of a miniature reproduction of a cave painting from the Linthipe/Changoni Area.

7.2.1 Quality of presentation, and the inclusion of a well written piece or the antiquity, are basic to commercial success in this field.

8.0 Additionally, the design of the range of decorative ware has been developed to embody an 'African' character, with a definite marketing theme, in order to give this ware an appeal in export, as well as domestic markets. It is strongly recommended that all Malawi glass destined for abroad should reflect high standards of design and finish in order to distinguish it on foreigh retailers shelves, and compete with other glassware of merit.

9.0 Separate meetings held with Messrs. Indebank, Press (Holdings) and Malawi Development Corporation (two meetings) during which a production processes profile related to potential product ranges were presented, together with a possible company development plan, and all within the compass of the Cox technology, resulted in expressions of support. Messrs. Indebank's reaction, expressed by Mr. Goddard following a meeting with Mr. Anthony was that, subject to the normal checks and safe-guards, they would be enthusiastic participants and investors, possibly to their policy maximum of 35% equity and the advance of the full loan money.

10.0 On the subject of time scale, it is urged that all matters affecting this project be kept in constant progressive movement, with the realistic objective, of melting and shaping glass in less than two years from today.

Group 1 - General Purpose jars Semi-auto P + B production

1.0 The ware in this range, being totally metric, has no direct equivalent on the current market, and therefore anticipates minimum market needs when Government metrication policy is fully implemented.

1.1 The design objectives were as follow:

1.1.1 To establish a simple, modern 'family' style which is transposable to a wide range of proportions.

1.1.2 To avoid the often troublesome undercut shoulder, deep punt, and to generally create the prospect of inexperienced operatives being able to quickly strike a reasonable level of production efficiency. Elimination of the shoulder also allows the user to more easily clear the contents of a jar.

1.1.3 To rationalize the finish (see footnote) so that customers would have the benefit of potential bulk purchase of a single size of closure. There are, of course, implied mould manufacturing benefits also.

2.0 The closure is commercially available in Europe, but its manufacture could be of interest to a local concern, involving, as it does, a single tool set.

3.0 Squat jars are intended for honey, preserves, dry foodstuffs, and the like; tall jars for such as fruit juices, where it is required to pour from the jar. The 15 cl jar is envisaged for beeswax products, toiletries, etc.

3.1 This proposed minimum jar range is stepped evenly for capacities, but the net weight of contents would obviously vary with the nature of contents. For example, the 35 cl jar will take 500 g of honey, and is the approximate metric equivalent of the imperial 1 lb (454 g).

4.0 The marketing drawings have been prepared to allow for a market analysis and an assessment of mould making priorities to be made.

Footnotes:

i) The expression 'finish' is in universal use in the glass industry to describe that part of the ware which, by traditional methods was made last, but which in modern machine production is made first. In the cases of jars, this is the 'bayonet' or screw fixing, and takes place during the 'press' operation (manual) of the semi-automatic 'press and blow' process.

ii) In addition to pressing out the finish during this first stage, the 'parison' is formed. This ensures even glass distribution in the second, or 'blow' stage of the process.

iii) A specimen closure is retained by Mr. Msiska.

iv) With the exception of smaller quantities of amber jars, the main need of the food packaging industry is for jars made from white glass, so that the colour of the contents is not distorted.

v) It is also proposed that these jars, with closures, be offered for sale through normal retail outlets as preserve and storage jars.

Group 2 - Domestic/commercial ware Pressed production: Semi-auto P + B

1.0 Conceived as a minimum range of decorative ware, most pieces being adaptable to more than one use, the main design objectives were as follow:

1.1 To embody export potential, in addition to home market appeal, in a range of visually related ware.

1.2 To accept as a virtue the existence of sand deposits with an excess of FE_2O_3, where the resulting colour could be taken as an essential part of the character of the ware.

1.3 To take into account the requirements of the commercial market, e.g. badging, when determining forms.

1.4 To take into account the production planners' need to balance the pull on the glass melting tank, by keying anticipated larger volume ware, e.g. tumblers, to semi-auto production.

1.5 To inject something of an 'African' character and a freshness of approach to the ware.

2.0 The theme it is proposed to adopt for Malawi is the 'Dragonpalm' leaf cluster for open forms, such as bowls, and the Dragonpalm bark for cylindrical forms, such as tumblers. The proposed treatment for each piece, it is suggested, would result in a range of ware of character, appropriate to a company taking pride in standards, and to manufacture in white, green or pale amber glass.

2.1 The proposed items, used imaginatively, embody potential for the build-up of a positive product identity, particularly in overseas markets. This can be of great value when items of ware are made up into suites, or sets, in printed packs, and possibly supported by point-of-sale or other promotional material.

3.0 In addition to being sold as single pieces, or in bulk to commercial outlets, some examples of how these pieces can be made up into sets, or suites, are as follow:

3.0.1 The medium bowl and six small dishes would form an economically priced fruit set.

3.0.2 Add a turned hardwood tray to 3.1 and it becomes an Hors d'oeuvre set.

3.0.3 The tall and squat tumblers can be packaged in a wide number of variations, with and without the decanters.

3.0.4 Decanters can be made into sets of different coloured glasses, or badged 'whisky', 'Brandy', 'Port', 'Sherry', 'Gin', 'Claret', 'Burgundy' and so on.

3.0.5 The large bowl with six or eight small dishes and a pair of carved hardwood servers would make an interesting salad set.

3.0.6 Six tankards with one bar jug would make an acceptable gift set.

4.0 The finished working drawings indicate the scope for badging, when sold through commercial outlets. Badging would become an adjunct to ACL activity, possibly by means of decalcomania transfers.

5.0 Mould pattern preparation for this ware would be by means of hand-carved leaf clusters, appropriately scaled, and transcription of the actual tree bark. The tree bark must be selected with great care, to avoid excessive undercuts or high points, to ensure dimensional accuracy allowing for casting shrinkage, and to allow for the right mix of horizontal and vertical banding for transcription to the ware.

5.1 All the ware must be fire-polish finished, and consideration should be given to fine-grinding the bases of bowls and tankards.

Group 3 - Blown ware

1.0 Three production lines are anticipated. The third line is intended for occasional pressed or semi-auto production and for the build up of mould blown production. This latter would allow the introduction of containers beyond the capacity of the jar machine, where stoppered finishes are acceptable; for the production of thin-walled vessels; for what will probably prove to be the best production/mould cost balance where particularly low production volume is undertaken, and for the economic production of proving samples prior to investment in semi-auto mould sets.

2.0 An advantage of the method over semi-auto production is that when ware of circular cross-section is produced it can be 'spun' blown, thereby obviating any seam lines and imparting a high quality surface finish. Ware of other than circular cross-section would be 'still' blown.

3.0 It might prove necessary to send, say, two operative abroad to acquire a foundation for the skills involved.

Group 4 - Products for the Construction Industry Pressed Production

1.0 It is proposed to compete with the importation of 2 mm thick glass for glazing in low cost housing by the production of pressed panels of nominal 4 mm thickness.

2.0 At a meeting with the Chief Architect, Ministry of Works and Supplies, it was agreed that these panels should be 225 mm x 225 mm for accommodation in glazing bars spaced at 250 mm centres.

2.1 It was further agreed that in view of the likelihood of some 'ring marking' in the production of these panels, a shallow allover pattern on one face would be acceptable.

2.2 It is recommended that the selection of this pattern be delayed until the mould maker is selected and his machining facilities checked out, as a 'mechanical' type of pattern would be most appropriate.

2.3 It was suggested that these panels would be acceptable for glazing bathroom/lavatory windows in better grade housing.

2.4 The panels would also be suitable for louvre frames.

3.0 The possible production of other glass products for buildings was discussed, as follows: -

3.1 Wall tiles are not made in Malawi, due to the relatively small market. A preliminary assessment suggests that this could be for some 10,000 square metres of tiles per year, equal to 1,000,000 single tiles 100 mm x 100 mm per year. A typical cost was suggested as 50t per tile.

3.1.1 It is recommended that a study be undertaken into the feasibility and viability of manufacturing wall tiles in glass, and into methods of installing the tiles.

3.2 A similar situation, as 3.1, applies to roof tiles. Here, however, it is anticipated that it will prove more difficult to reconcile the performance/installation requirements of the tile with the production requirements of the glassmaker.

3.2.1 It is recommended that a study be undertaken into the feasibility and viability of manufacturing roof tiles in glass, and into methods of installing the tiles.

3.3 The Chief Architect expressed an interest in the use of hollow glass bricks as a feature in some buildings.

3.3.1 It is recommended that the viability of producing hollow glass bricks be studied and reported.

Group 5 - Customed products
Pressed, Semi-auto, Blown production

1.0 This section describes ware commissioned by customers, full or part mould costs being levied against the customer, depending on the level of exclusivity agreed, and the production volumes involved.

2.0 An example is the proposed 1 litre capacity multi-trip milk bottle, where mould, or part mould sets, would be engraved with specific customer logo and address information. Such bottles could be made on the jar machine.

3.0 An enquiry has been lodged by the Chief Executive, Southern Bottlers, Blantyre, for the evaluation of a 1 litre capacity multi-trip squash bottle, where an order quantity of 500,000 has been suggested. Southern Bottlers are preparing a detailed design brief.

3.1 It is recommended that this design study be undertaken.

4.0 A further enquiry for glass floor tiles for use by Southern Bottlers has also been verbally communicated.

4.1 It is recommended that this opportunity also be studied in conjunction with the recommended building products study.

Group 6 - Scientific and Laboratory ware

Lamp work production

1.0 It is proposed that an arrangement be reached between the proposed new company and the importer of laboratory and scientific glassware whereby the country's requirements for flasks, beakers and test tubes be purchased direct from the new company.

1.1 The procedure for the company would be to import supplies of borosilicate tubing and, from this, fashion the above ware by means of lampworking techniques.

1.1.1 The two-fold benefit to the company would be the difference in the cost between the tubing and the imported cost of finished ware, as contribution, and the introduction of further skills, which can be developed.

1.1.2 The necessary skills to the level envisaged could be imparted by a UNIDO expert on a relatively short mission.

1.1.3 The lampworking expert could be briefed to identify further opportunities for the company, within the immediate level of skills, and formulate a forward programme for the further development of these skills.

Semi-auto production: Blow production

1.0 Various standards have been studied in an effort to identify further market opportunities within this group. These are as follow:

SABS 747 - 1965: Standard specification for glass bottles for blood transfusion and intravenous solutions.

SABS 409 - 1973: Glass winchester bottles.

BS 1679 - 1965: Containers for pharmaceutical dispensing.

BS 1679 Part 6: 1967 : Glass medicine bottles.

BS 1679 : Part 7 : 1968 : Ribbed oval glass bottles.

2.0 From this study, the conclusion is that the company, in particular laboratory and quality control, would not be ready for such production until some background in general glass manufacture had been gained. Also, the Malawi market at this point in time seems to be below viability.

3.0 It is recommended that these aspects of possible manufacture be re-appraised, say, within two years of company start up, and on a broader base than the domestic market.

ACL Work

1.0 ACL is the commonly used abbreviation for Applied Colour Labeling, and is a process which allows direct printing to glassware. The same process can often be used for the preparation of water-slide transfers on decalcomania paper, which volatilises on firing, for hand application.

2.0 See Cox report page 16, para 4, and supplementary notes.

3.0 The importation of undecorated bottles by Southern Bottlers has been confirmed by the Chief Executive as a possibility.

3.1 Before negotiations could be advanced it would be necessary to assure that company on the areas of concern recorded in their letter

dated 17 January 1980, and to reply to the technical matters raised by the Coca Cola Company in a memorandum dated 18 September 1979.

3.2 It is recommended the above actions be taken when this study advances to project status.

4.0 The existence of an ACL facility could be important to tile production, if realised, and to commercial badging. However, detailed study might result in a conclusion that such a facility would be better sited at Blantyre in order to save the extra handling and transportation costs involved in a Lilongwe siting.

4.1 A further element in the equation, likely to arise in the tiles study, is the possible requirement of a colour spraying facility, such production being fired in the decorating lehr.

4.2 Analysis of lehr capacity, and a possible need for two such lehrs, must await detailed study.

5.0 A UNIDO expert would be needed to teach the skills involved in these activities.

Identification of Project Experts

1.0 In the event of this study advancing to a project, it is strongly recommended that it be placed under UNDP/UNIDO management for a period of not less than two years.

1.1 The project manager would have a responsibility for the setting up and initial development of the company's activities, and the management and co-ordination of the work of the other experts, as follow:

2.0 Lampworking expert, see page 11, on a short-term assignment.

2.1 ACL expert, see page 12, on a short-term assignment.

2.2 Glass technologist, on a medium-term assignment.

2.3 Depending on the contractual arrangements with the suppliers of the main equipment, training of the production/plant maintenance personnel would either be undertaken by them, or might require UNDP/UNIDO assistance.

2.4 Specialised engineering assistance would probably be needed by the project manager, because of the weight of activity in this area.

2.5 Short-term assistance would also be needed into market/marketing research, and viability assessments.

2.6 The various design studies detailed in this report.

3.0 It is recommended that 2.0 and 2.1 above be given a level of priority, as these could be activated in advance of glassmaking, and a cash flow started.

Annex I *

List of design drawings

Calculation sheets 1, 1/1, 2
Calculator programme
Graph 1 - Relates capacity to internal diam/level of fill
Graph 2 - Relates vol. of material/wall thickness/internal diam
Drawing 1/1 - Standard jar, 35 cl (Finished working dwg)
Drawing 1/2 - Standard jar, 35 cl (Marketing dwg)
Drawing 1/3 - Standard jar, 70 cl (Finished working dwg)
Drawing 1/4 - Standard jar, 70 cl (Marketing dwg)
Drawing 1/5 - Tall jar, 1 litre (Finished working dwg)
Drawing 1/6 - Tall jar, 1 litre (Marketing dwg)
Drawing 1/7 - Tall jar, 70 cl (Finished working drawing)
Drawing 1/8 - Tall jar, 70 cl (Marketing dwg)
Drawing 1/9 - Detail of standard finish
Drawing 1/10 - Specification of self-sealing closure
Drawing 1/11 - Standard jar, 15 cl (Finished working dwg)
Drawing 1/12 - Standard jar, 15 cl (Marketing dwg)
Drawing 2/1 - Fruit bowl, 200 mm diam.
Drawing 2/2 - Fruit/nuts/crisps/cereals dish, 125 mm diam
Drawing 2/3 - Tankard, 50 cl, pressed with handle
Drawing 2/4 - Bar jug
Drawing 2/4 - Ice-lip jug
Drawing 2/5 - Decanters, 25 cl and 75 cl
Drawing 2/6 - Tumblers, 34 cl and 50 cl
Drawing 2/7 - Salad/fruit/punch bowl, 300 mm diam
Drawing 3/1 - Proposed multi-trio light weight milk bottle 1 litre

Preliminary drawing - Small ashtray
Preliminary drawing - Large ashtray

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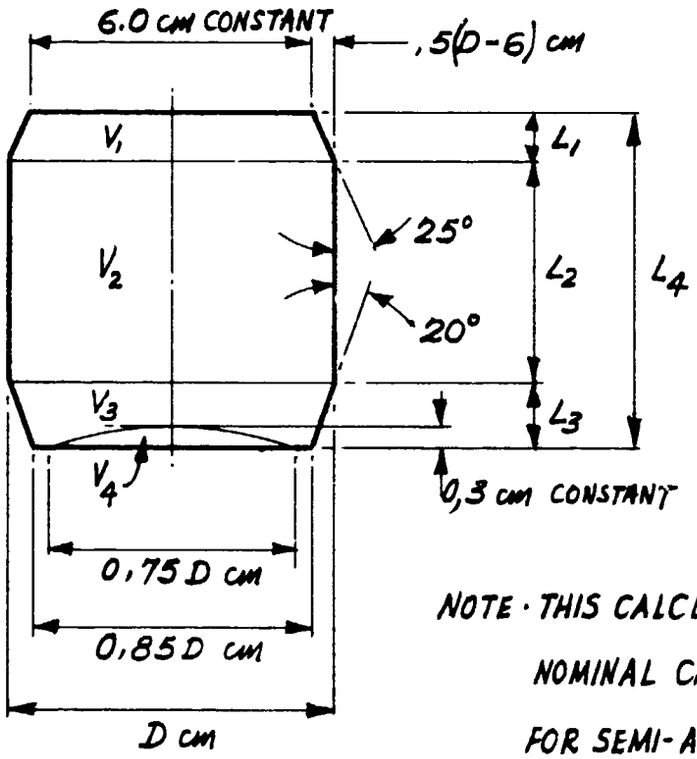
Addendum

CALCULATION SHEET 1 : GENERAL PURPOSE JARS

CALCULATION TO ESTABLISH RELATIONSHIPS BETWEEN CAPACITY + INTERNAL DIMS.



NOTE · THIS CALCULATION WILL PROVIDE NOMINAL CAPACITY. ALLOW 8% TOLERANCE FOR SEMI-AUTO MANUFACTURE, AND 2.3% FOR FULLY AUTO

CAPACITY (INTERNAL VOLUME) $= V_1 + V_2 + V_3 - V_4$ cm^3

V_1 (TRUNCATED CONE) $= ,2618\, L_1 [D^2 + (D \times 6) + 36]$ WHERE $L_1 = \frac{,5(D-6)}{\tan 25°}$

V_2 (CYLINDER) $= ,7854\, D^2 L_2$

V_3 (TRUNCATED CONE) $= ,2618\, L_3 [D^2 + (D \times ,85D) + (,85D)^2]$

WHERE $L_3 = \frac{,075D}{\tan 20°}$

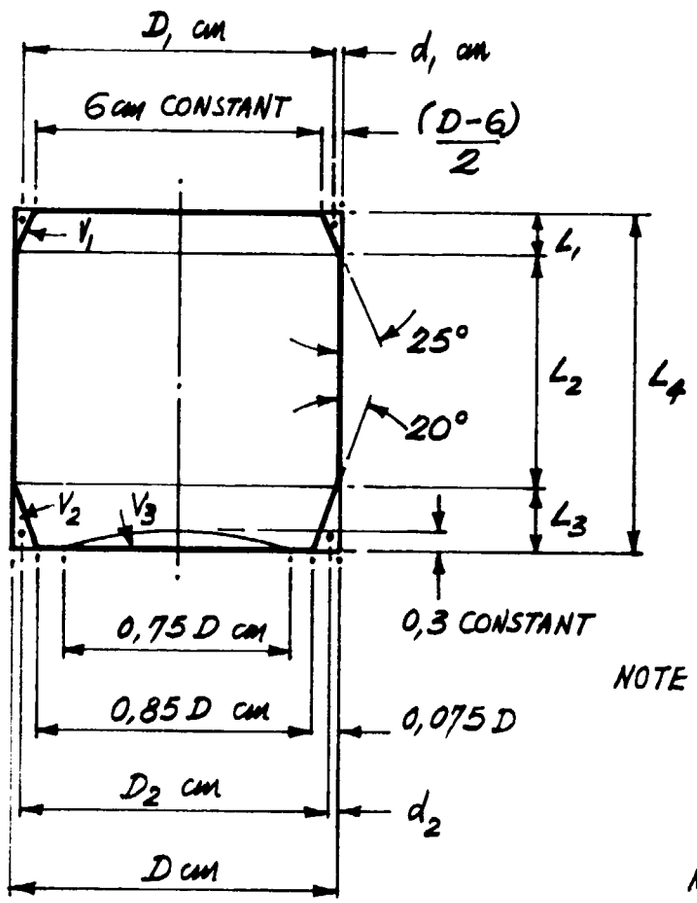
V_4 (SPHERICAL SEGMENT) $= 3\pi \left[\frac{(,75D)^2}{8} + \frac{,3}{6} \right]$

CALCULATION IN CM ; RESULTS IN cm^3

NOTE: RESULTS FOR 35 cl AND 70 cl SUMMARISED IN GRAPH 1.

CALCULATION SHEET 1/1 : GENERAL PURPOSE JARS

ALTERNATIVE CALCULATION : CAPACITY / INTERNAL DIMS. RELATIONSHIPS



NOTE · THIS CALCULATION WILL PROVIDE NOMINAL CAPACITY. ALLOW 8% TOLERANCE FOR SEMI-AUTO MANUFACTURE; 2.3% FULLY AUTO

CAPACITY = VOL. COMPLETE CYLINDER $- V_1 - V_2 - V_3$ cm^3

WHERE

$V_{cyl} = .7854\, D^2 L_4$

$V_1 = \pi D_1 \left[\frac{L_1 \times \frac{(D-6)}{2}}{2} \right]$ and $D_1 = D - 2d_1$; $d_1 = \frac{x\left[(.5D-6)+x\right]}{2\left(L_1 + \frac{D-6}{2} + x\right)}$

$x = \frac{.5(D-6)}{\sin 25°}$

$V_2 = \pi D_2 \left(\frac{L_3 \times .075D}{2} \right)$

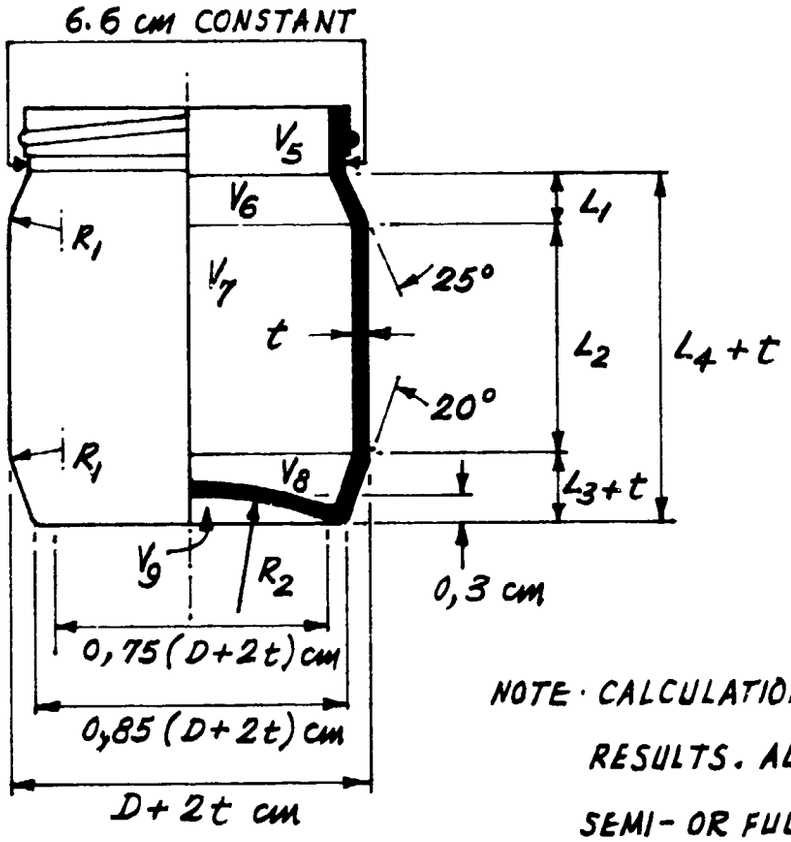
WHERE $D_2 = D - 2d_2$; $d_2 = \frac{y(.075D+y)}{2(L_3 + .075D + y)}$; $y = \frac{.075D}{\sin 20°}$; $L_3 = \frac{.075D}{\tan 20°}$

$V_3 = .3\pi \left(.75\frac{D^2}{8} + .\frac{3}{6} \right)$

CALCULATION IN cm ; RESULTS IN cm^3

CALCULATION SHEET 2 : GENERAL PURPOSE JARS

QUANTITIES OF GLASS REQUIRED TO MAKE FINISHED JARS



NOTE · CALCULATION TO GIVE NOMINAL RESULTS. ALLOW TOLERANCE FOR SEMI- OR FULLY AUTO MANUFACTURE, AS APPROPRIATE

Vol. of Glass = $V_5 + V_6 + V_7 + V_8 - V_9$ - capacity : where

$V_6 = 0.2618\, L_1 \left[(D+2t)^2 + (D+2t \times 6.6) + 6.6^2 \right]$

$V_7 = 0.7854\, (D+2t)^2\, L_2$

$V_8 = 0.2618\, (L_3+t) \left[(D+2t)^2 + ((D+2t \times (.85 \times D+2t)) + .85(D+2t) \right]$

$V_9 = 0.3\pi \left[\frac{(.75 \times D+2t)^2}{8} + \frac{.3}{6} \right]$

$R_1 = 0.2\,(D+2t)$ - TO BE ROUNDED OFF

$R_2 = \frac{(.75D+2t)^2 + 0,36}{2,4}$ - TO BE ROUNDED OFF

CALCULATION IN CM ; RESULTS IN CM^3

NOTE : RESULTS FOR 35 cL AND 70 cL SUMMARISED IN GRAPH 2

TITLE / TITEL / TITRE: DESIGN OF GENERAL PURPOSE JARS — PAGE / SEITE / PAGE: 1 OF / VON / DE: 3

PROGRAMMER / PROGRAMMIERER / GRAMMEUR: JOHN COCHRANE — DATE / DATUM / DATE: 11, 12, 79

TI PROGRAMMABLE
PROGRAM RECORD
PROGRAMM-BERICHT
FICHE PROGRAMME

Partitioning (Op 17) / Speicher-Bereichsverteilung / Partition (Op 17) | Library Module / Software-Modul / Module enfichable | Printer / Drucker / Imprimante | Cards / Karten / Cartes

PROGRAM DESCRIPTION • PROGRAMM BESCHREIBUNG • DESCRIPTION DU PROGRAMME

CALCULATION TO DETERMINE :

1) CAPACITY / INTERNAL DIAMETER / LEVEL OF FILL-RELATIONSHIPS

2) RELATIVE VOLUMES OF GLASS REQUIRED TO MAKE FINISHED JARS

3) R_1 AND R_2

USER INSTRUCTIONS • BENUTZER INSTRUKTIONEN • MODE D'EMPLOI

STEP / SCHRITT / SEQUENCE	PROCEDURE / PROZEDUR / PROCEDURE	ENTER / EINGABE / INTRODUIRE	PRESS / BEFEHL / APPUYER SUR	DISPLAY / ANZEIGE / AFFICHAGE
	CAPACITY (INTERNAL VOLUME) cm^3	STO 01		
	INTERNAL DIAMETER, cm (D)	STO 02		
	WALL THICKNESS, cm (t)	STO 03		
	VOLUME OF MATERIAL IN NECK = CONSTANT = 9 cm^3	STO 04		
	—			
	INPUT D FROM 6.8 TO 10.0 IN .2 INCREMENTS FOR 350 cm^3 AND 700 cm^3 CAPACITY, AND t FROM .25 TO .4			

USER DEFINED KEYS / PROGRAMM-ADRESSTASTEN / TOUCHES UTILISATEUR	DATA REGISTERS / DATENSPEICHER / REGISTRES-MEMOIRE (INV ■)		LABELS (Op 08) / LABELS (Op 08) / LABELS (Op 08)
A	0	0	INV, Ins, CE, CLR, x≥t, x²
B	1	1	√x, 1/x, STO, RCL, SUM, y^x
C	2	2	EE, (,), ÷, GTO, x̄
D	3	3	SBR, −, RST, +, R/S, ·
E	4	4	+/−, =, CLP, INV, Σ+, ■
A'	5	5	■, ■, ■, ■, ■, ■
B'	6	6	■, ■, ■, ■, ■, ■
C'	7	7	■, ■, ■, ■, ■, ■
D'	8	8	■, ■, ■, ■, ■, ■
	9	9	■, ■

FLAGS / FLAGS / DRAPEAUX	0	1	2	3	4	5	6	7	8	9

DESIGN OF

TITLE / TITEL / TITRE: GENERAL PURPOSE JARS

PAGE / SEITE / PAGE: 2 OF / VON / DE 3

PROGRAMMER / PROGRAMMIERER / PROGRAMMEUR:

DATE / DATUM / DATE:

TI PROGRAMMABLE
CODING FORM
KODEFORM
FEUILLE DE PROGRAMMATION

LOC ADR ADR	CODE KODE CODE	KEY TASTE TOUCHE	COMMENTS BEMERKUNGEN COMMENTAIRES
0			
1		REC 02	
2		−	
3		6	
4		=	
5		×	
6		.5	
7		÷	
8		.4663	
9		=	
0		STO 05	L_1
1		REC 02	
2		X^2	
3		=	
4		+	
5		36	
6		=	
7		STO 06	
8		REC 02	
9		×	
0		6	
1		=	
2		+	
3		REC 06	
4		=	
5		×	
6		REC 05	
7		×	
8		.2618	
9		=	
0		STO 07	V_1
1		REC 02	
2		×	
3		.075	
4		÷	
5		.364	
6		=	
7		STO 08	L_3
8		REC 02	
9		×	
0		.85	
1		×	
2		REC 02	
3		=	
4		STO 09	
5		REC 02	
6		X^2	
7		=	
8		STO 10	
9		REC 02	
0		×	
1		.85	
2		=	
3		X^2	
4		=	

LOC ADR ADR	CODE KODE CODE	KEY TASTE TOUCHE	COMMENTS BEMERKUNGEN COMMENTAIRES
5		+	
6		REC 09	
7		+	
8		REC 10	
9		=	
0		×	
1		REC 08	
2		×	
3		.2618	
4		=	
5		STO 11	V_3
6		REC 02	
7		×	
8		.75	
9		=	
0		X^2	
1		÷	
2		8	
3		=	
4		+	
5		.05	
6		=	
7		×	
8		.9425	
9		=	
0		STO 12	V_4
1		REC 01	
2		+	
3		REC 12	
4		−	
5		REC 07	
6		−	
7		REC 11	
8		=	
9		STO 13	V_2
0		REC 13	
1		÷	
2		.7854	
3		÷	
4		REC 02	
5		+	
6		REC 02	
7		=	
8		STO 14	L_2
9		REC 05	
0		+	
1		REC 14	
2		+	GRAPH 1
3		REC 08	
4		=	
5		STO 15	L_4
6		REC 02	
7		+	
8		REC 03	GRAPH 2
9		+	

LOC ADR ADR	CODE KODE CODE	KEY TASTE TOUCHE	COMMENTS BEMERKUNGEN COMMENTAIRES
0		REC 03	
1		=	
2		STO 16	$D+2t$
3		REC 16	
4		X^2	
5		=	
6		STO 17	$(D+2t)^2$
7		REC 16	
8		×	
9		6.6	
0		=	
1		+	
2		REC 17	
3		+	
4		43.56	
5		=	
6		×	
7		REC 05	
8		×	
9		.2618	
0		=	
1		STO 18	V_6
2		REC 17	
3		×	
4		REC 14	
5		×	
6		.7854	
7		=	
8		STO 19	V_7
9		REC 16	
0		×	
1		.85	
2		×	
3		REC 16	
4		=	
5		+	
6		REC 17	
7		=	
8		STO 20	
9		REC 16	
0		×	
1		.85	
2		=	
3		+	
4		REC 20	
5		=	
6		STO 21	
7			
8			

MERGED CODES
KOMBINATIONS-KODES
TOUCHES COMBINEES

62		72 [STO]		83 [GTO]	
63		73 [RCL]		84	
64		74 [SUM]		92 [INV] [SE]	

TEXAS INSTRUMENTS

TITLE / TITEL / TITRE: DESIGN OF GENERAL PURPOSE JARS

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FEUILLE DE PROGRAMMATION

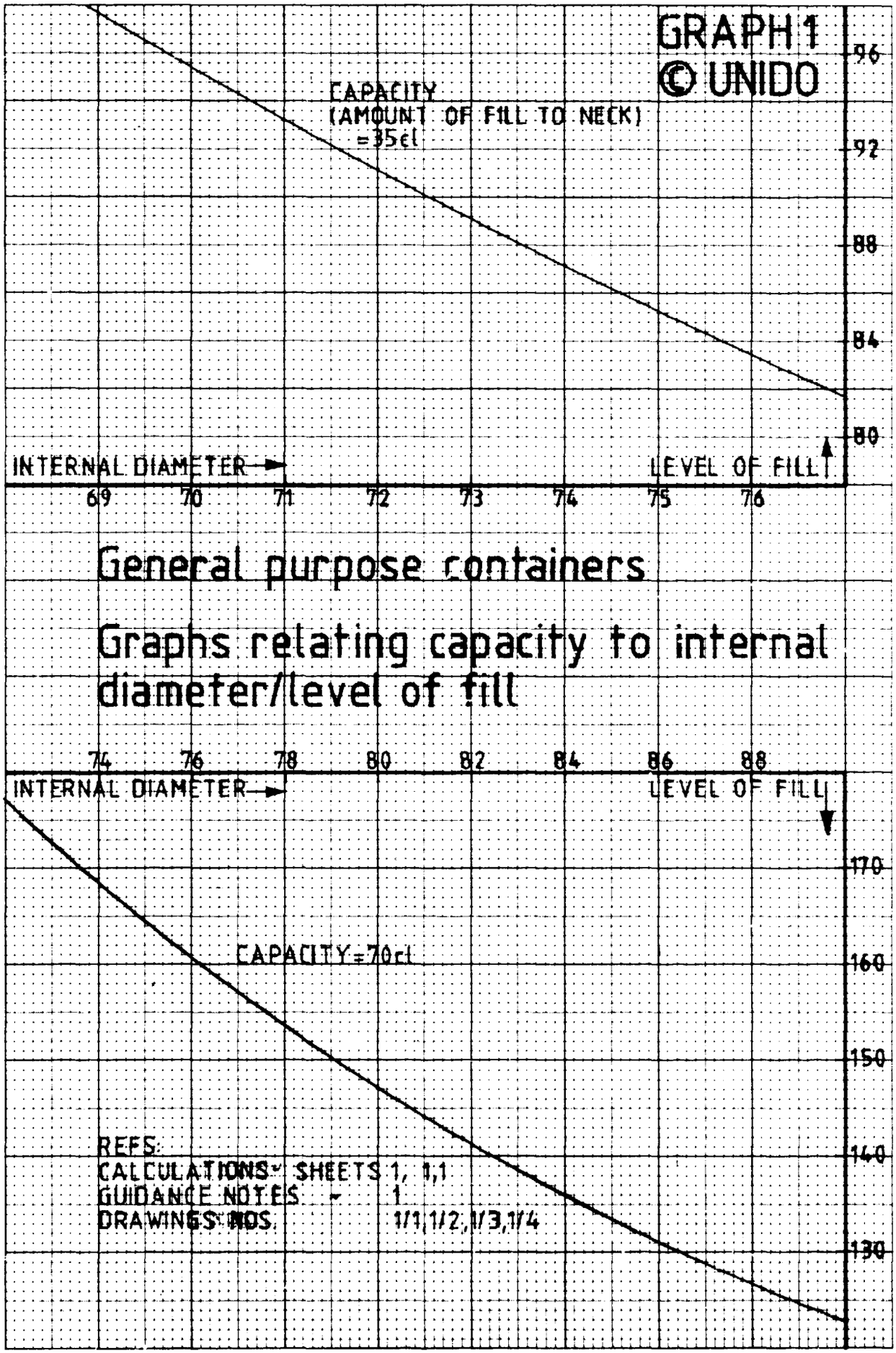
LOC ADR ADR	CODE KODE CODE	KEY TASTE TOUCHE	COMMENTS BEMERKUNGEN COMMENTAIRES
0			
1		REC 08	
2		+	
3		REC 03	
4		=	
5		X	
6		REC 21	
7		X	
8		.2618	
9		=	
0		STO 22	— V_8
1		REC 16	
2		X	
3		.75	
4		=	
5		X^2	
6		=	
7		÷	
8		8	
9		=	
0		+	
1		.05	
2		=	
3		X	
4		.9425	
5		=	
6		STO 23	— V_9
7		REC 04	
8		+	
9		REC 18	
0		+	
1		REC 19	
2		+	
3		REC 22	
4		+	
5		REC 23	
6		−	
7		REC 01	
8		=	
9		STO 24	VOL OF
0		REC 16	MATERIAL
1		X	
2		.2	
3		=	
4		STO 25	— R_1
5		REC 16	
6		X	
7		.75	
8		=	
9		X^2	
0		=	
1		+	
2		.36	
3		=	
4		÷	

LOC ADR ADR	CODE KODE CODE	KEY TASTE TOUCHE	COMMENTS BEMERKUNGEN COMMENTAIRES
5		2.4	
6		=	
7		STO 26	— R_2

MERGED CODES
KOMBINATIONS-KODES
TOUCHES COMBINEES

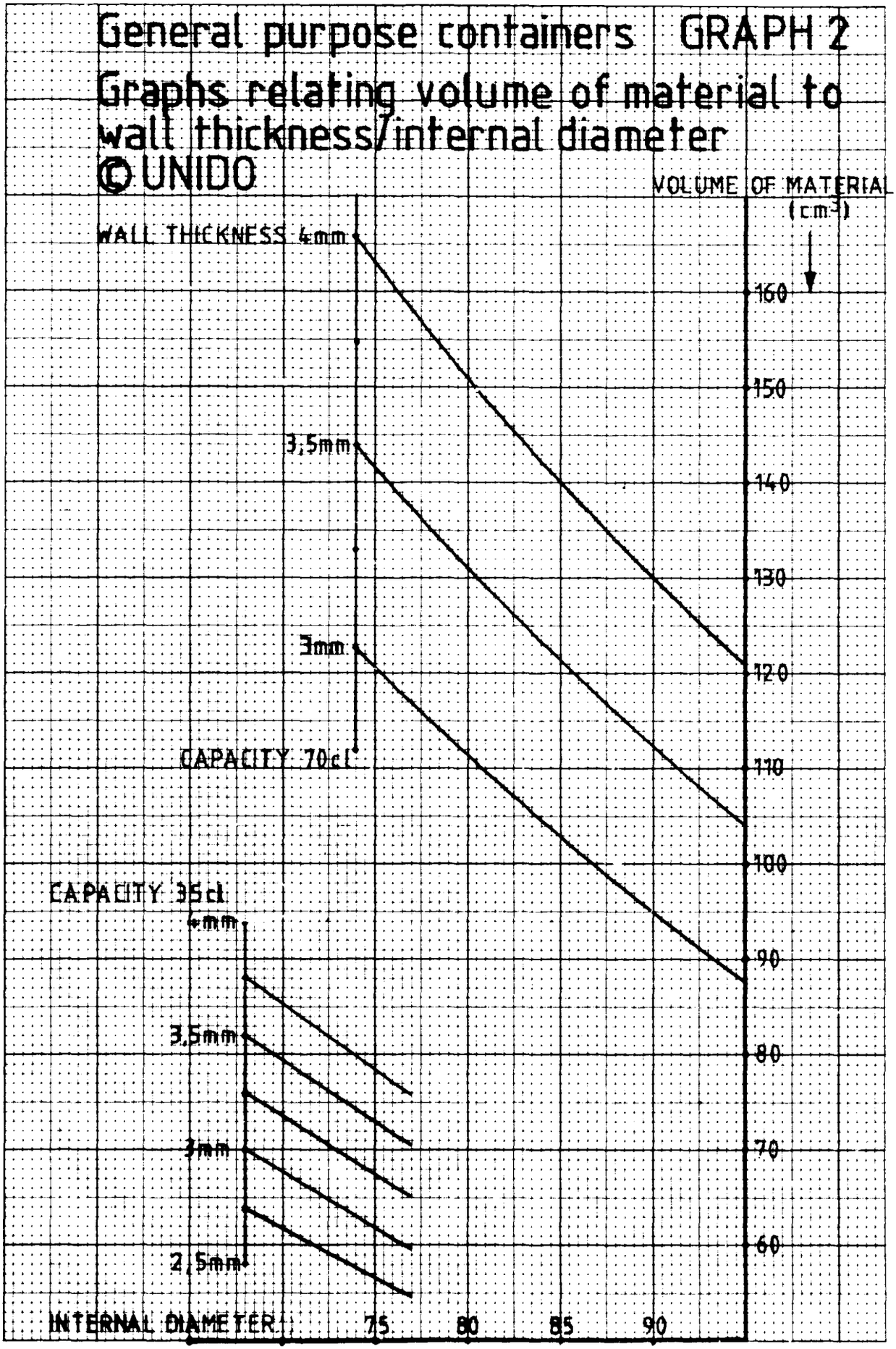
62 ▪ ▪ 72 STO ▪ 83 GTO ▪
63 ▪ ▪ 73 RCL ▪ 84 ▪ ▪
64 ▪ ▪ 74 SUM ▪ 92 INV SBR

TEXAS INSTRUMENTS

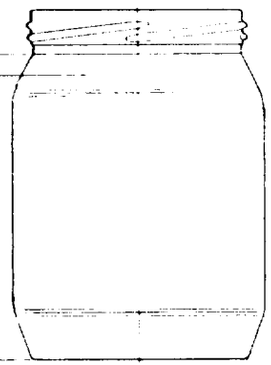

GRAPH 1
© UNIDO
CAPACITY
(AMOUNT OF FILL TO NECK)
=35cl
INTERNAL DIAMETER
LEVEL OF FILL
69
70
71
72
73
74
75
76
96
92
88
84
80
General purpose containers
Graphs relating capacity to internal diameter/level of fill
74
76
78
80
82
84
86
88
INTERNAL DIAMETER
LEVEL OF FILL
CAPACITY=70cl
170
160
150
140
130
REFS:
CALCULATIONS - SHEETS 1, 1,1
GUIDANCE NOTES - 1
DRAWINGS NOS. 1/1,1/2,1/3,1/4

General purpose containers GRAPH 2

Graphs relating volume of material to wall thickness/internal diameter

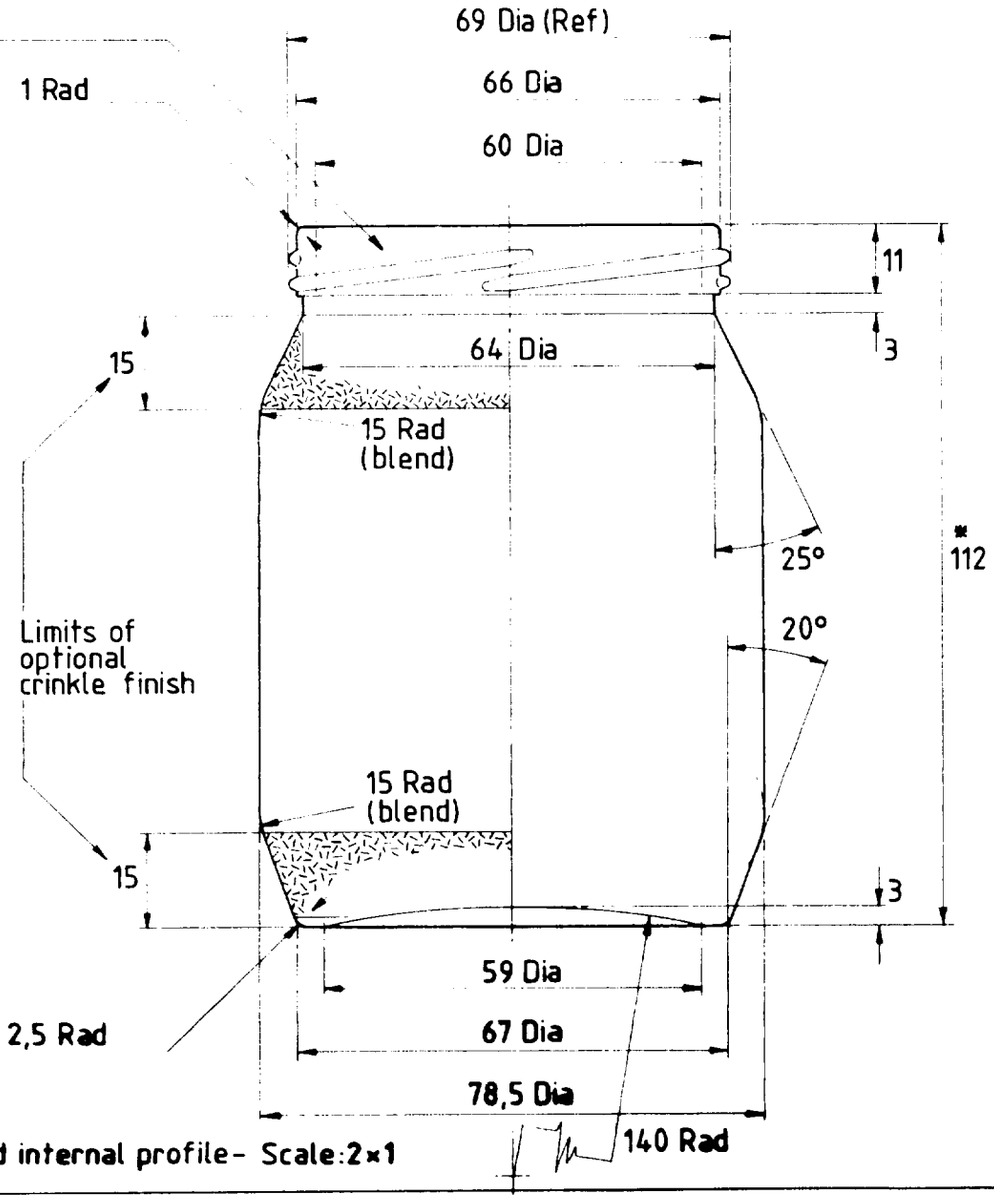


Finish as per Dwg 1/9



Scale: 1:1

Capacity = 350 cm^3 = 35cl



Mould internal profile - Scale: 2×1

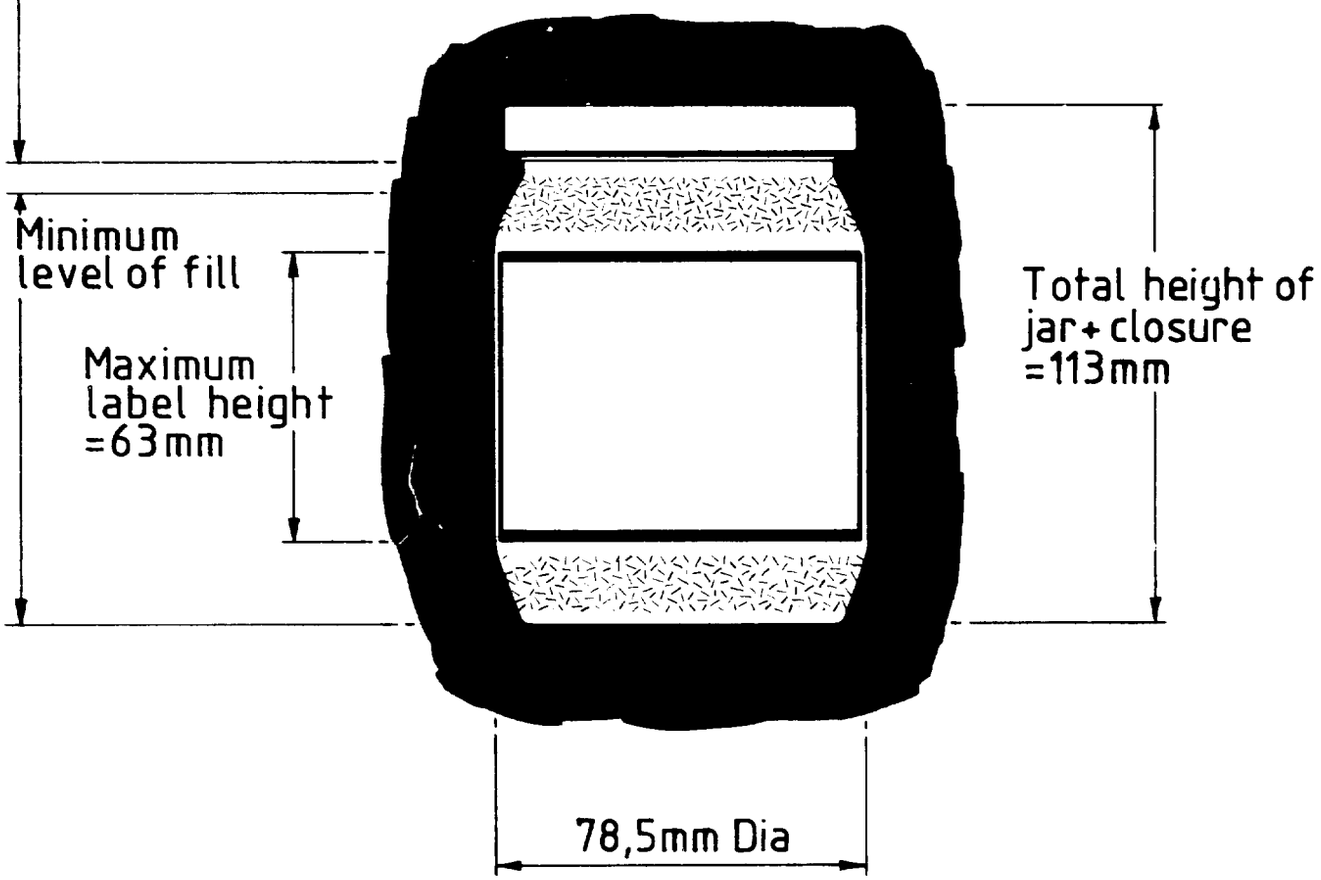
Notes:

1. All dimensions are millimetric
2. Dimensions are for semi-auto set-up
   For fully auto reduce *112 to 108 and glass tolerance band from 7 to 2

Standard JAR
35cl capacity

John Gabriel
17 Dec 1979

Drawing no 1/1



Notes:

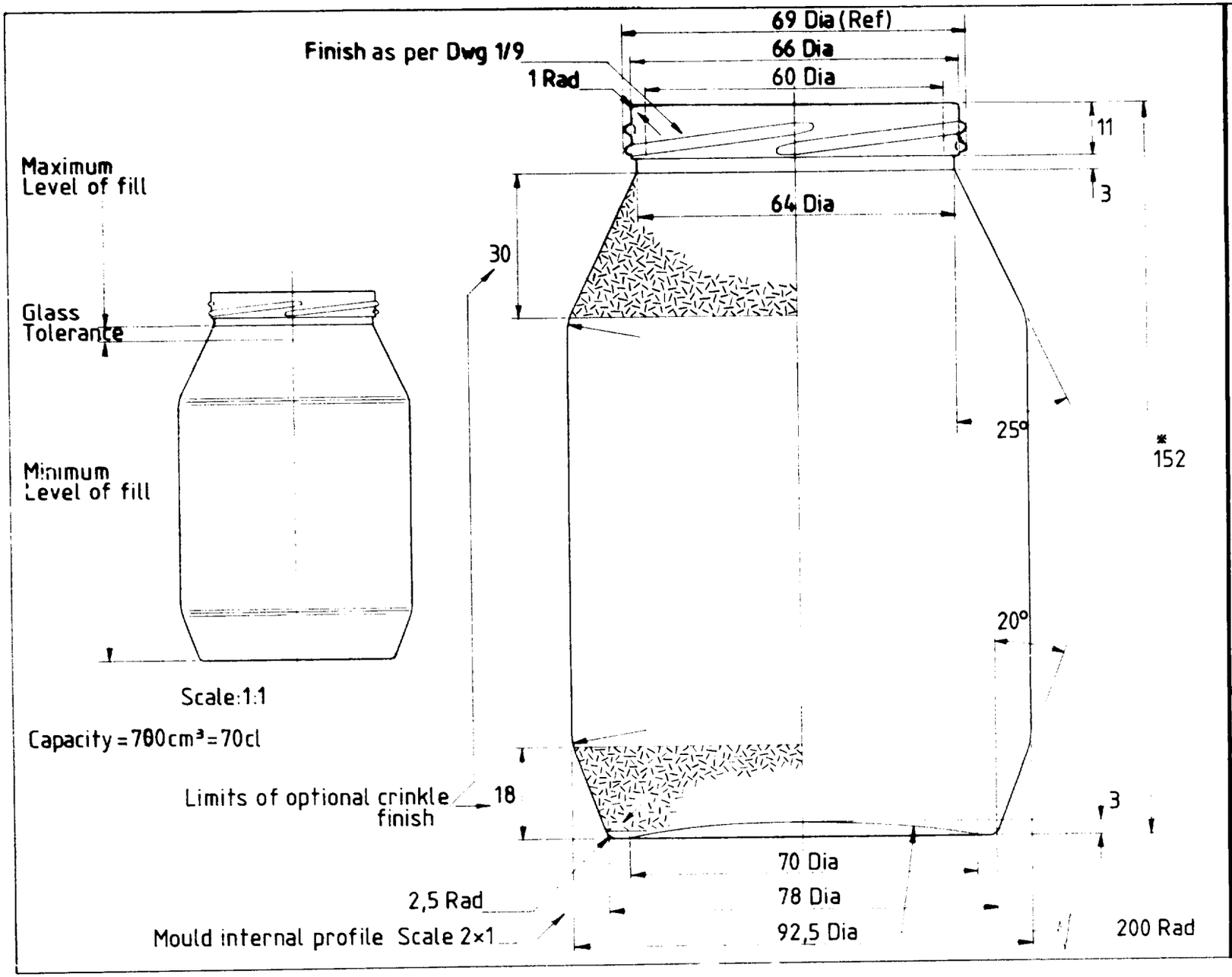
1 The quick-action self-sealing closure is interchangeable within the full range of standard and tall jars

2 See Dwg no 1/9 for closure specification

Outine of standard JAR 35cl capacity

21 Dec 1979

Drawing no 1/2



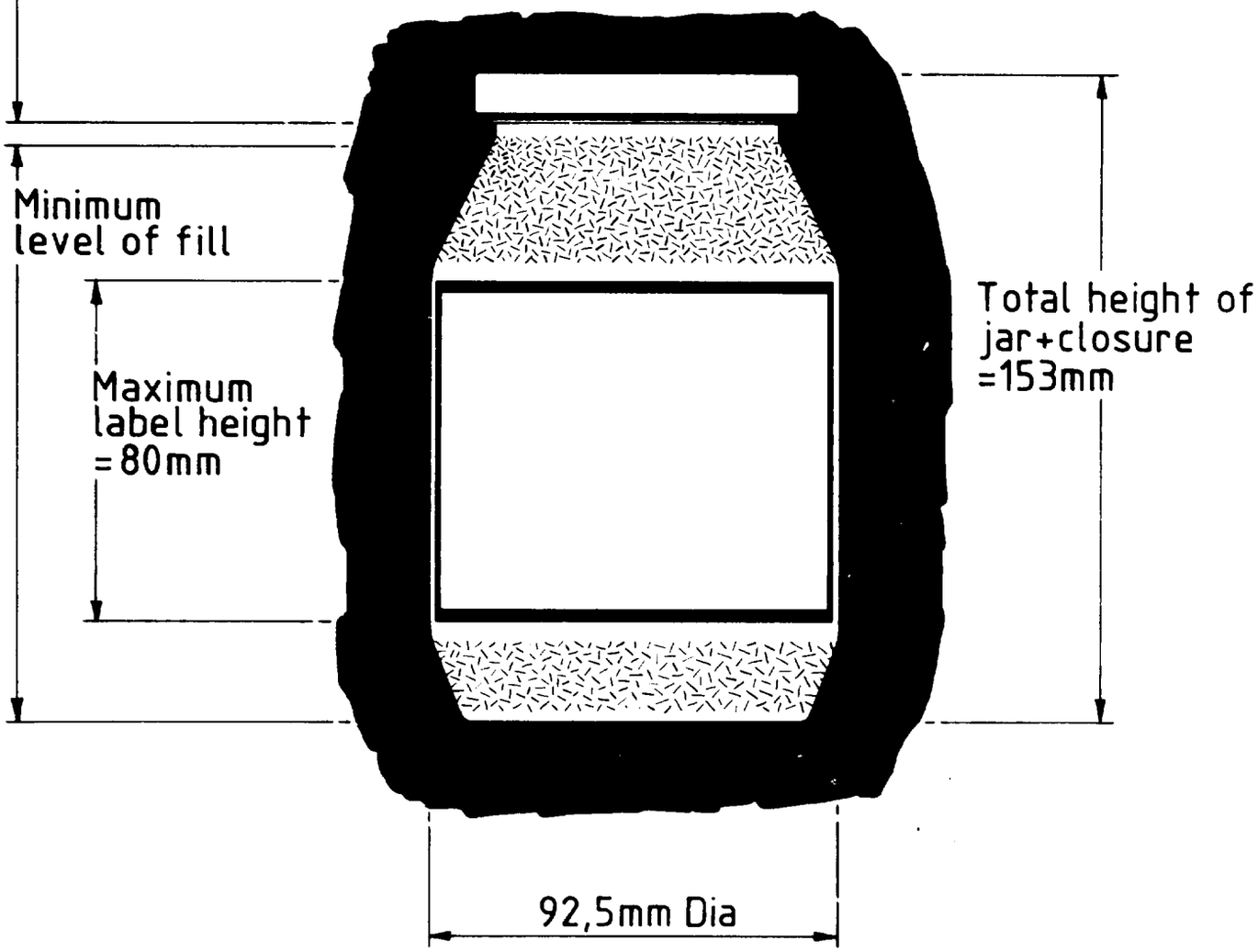
Notes:

1. All dimensions are millimetric
2. Dimensions are for semi-auto set-up. For fully auto reduce *152 to 148 and glass tolerance band from 6 to 1,7

Standard JAR
70cl capacity

18 Dec 1979

Drawing no 1/3



Notes:

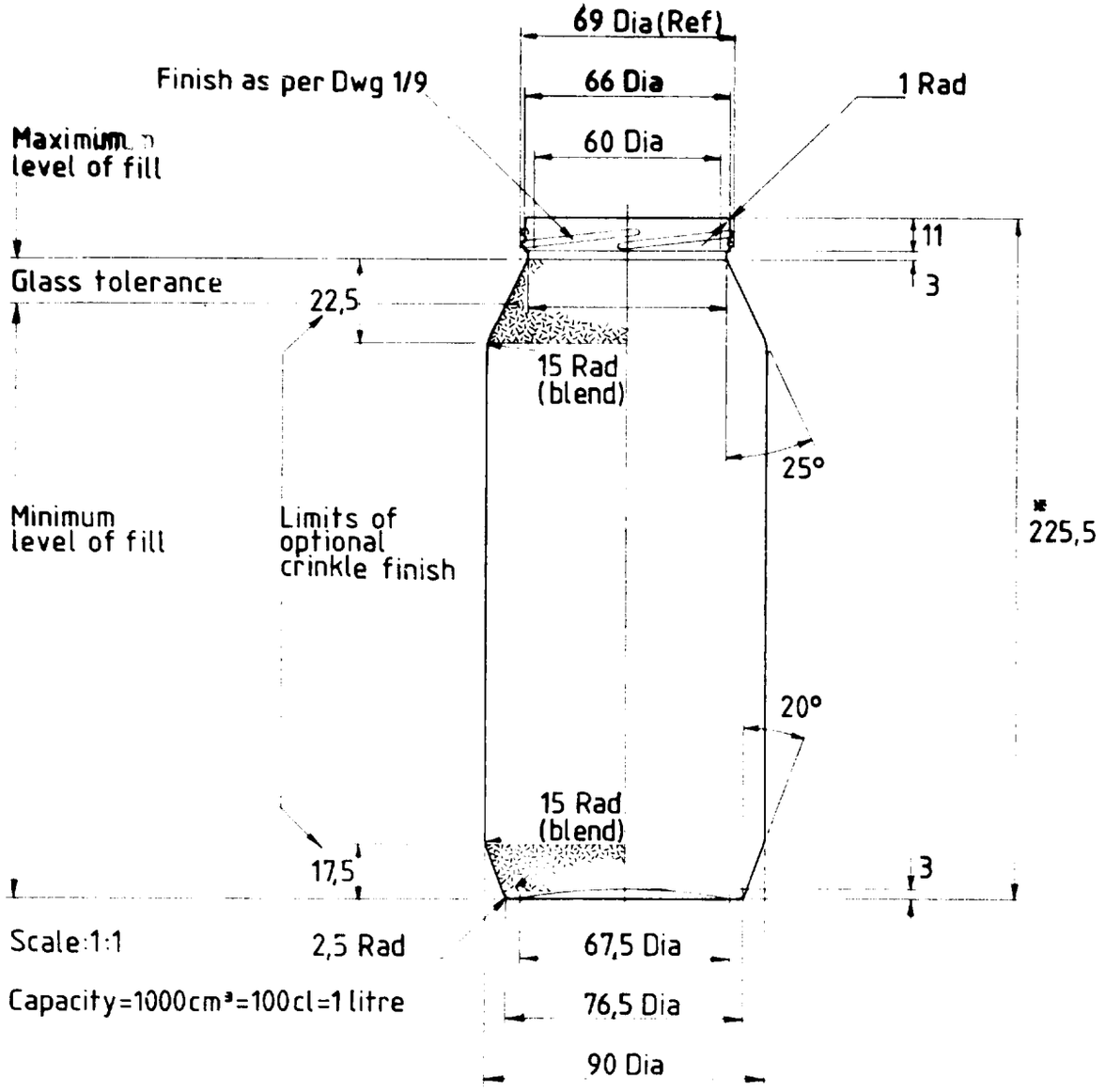
1 The quick-action self-sealing closure is interchangeable within the full range of standard and tall jars

2 See Dwg no 1/9 for closure specification

Outline of standard JAR 70cl capacity

21 Dec 1979

Drawing no 1/4



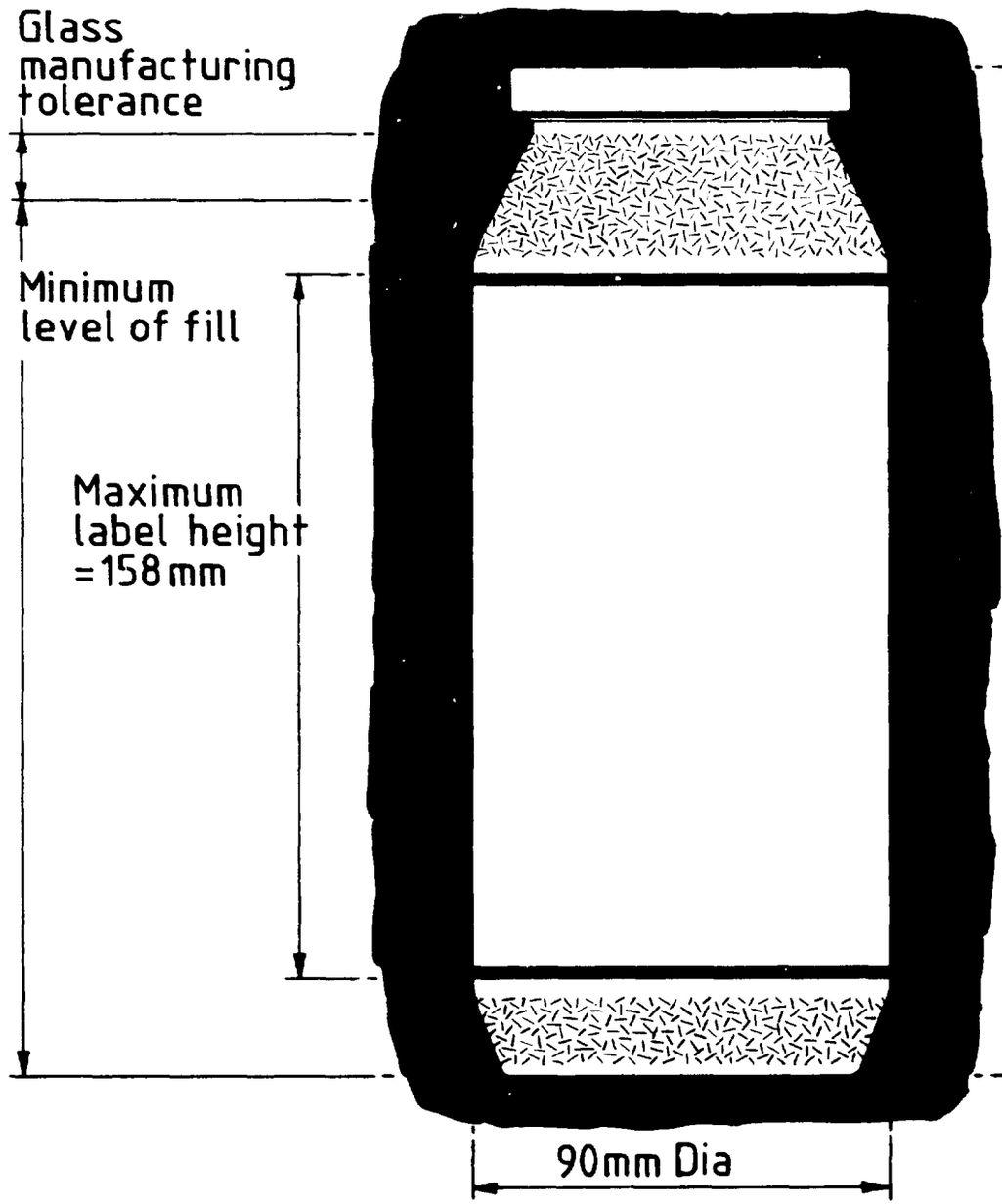
Notes:

1. All dimensions are millimetric
2. Dimensions are for semi-auto set-up. For fully auto reduce *225,5 to 215 and glass tolerance band from 15 to 4,5

Tall JAR
1 litre capacity

18 Dec 1979

Drawing no 1/5



Notes:

1 The quick-action self-sealing closure is interchangeable within the full range of standard and tall jars

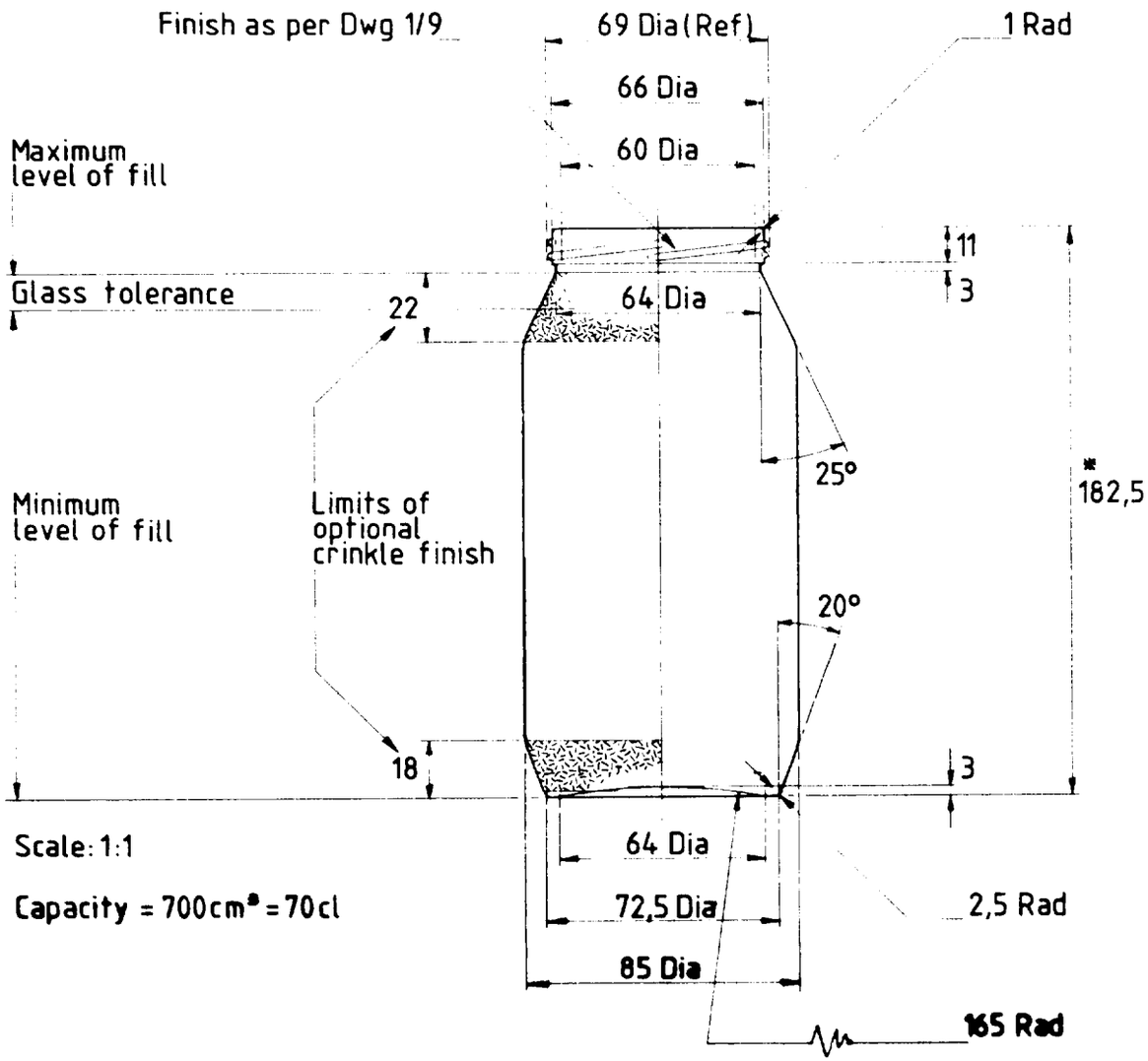
2 See Dwg no 1/9 for closure specification

3 Suitable with ACL as multi-trip jar

Outline of
tall JAR
1 litre capacity

24 Dec 1979

Drawing no 1/6



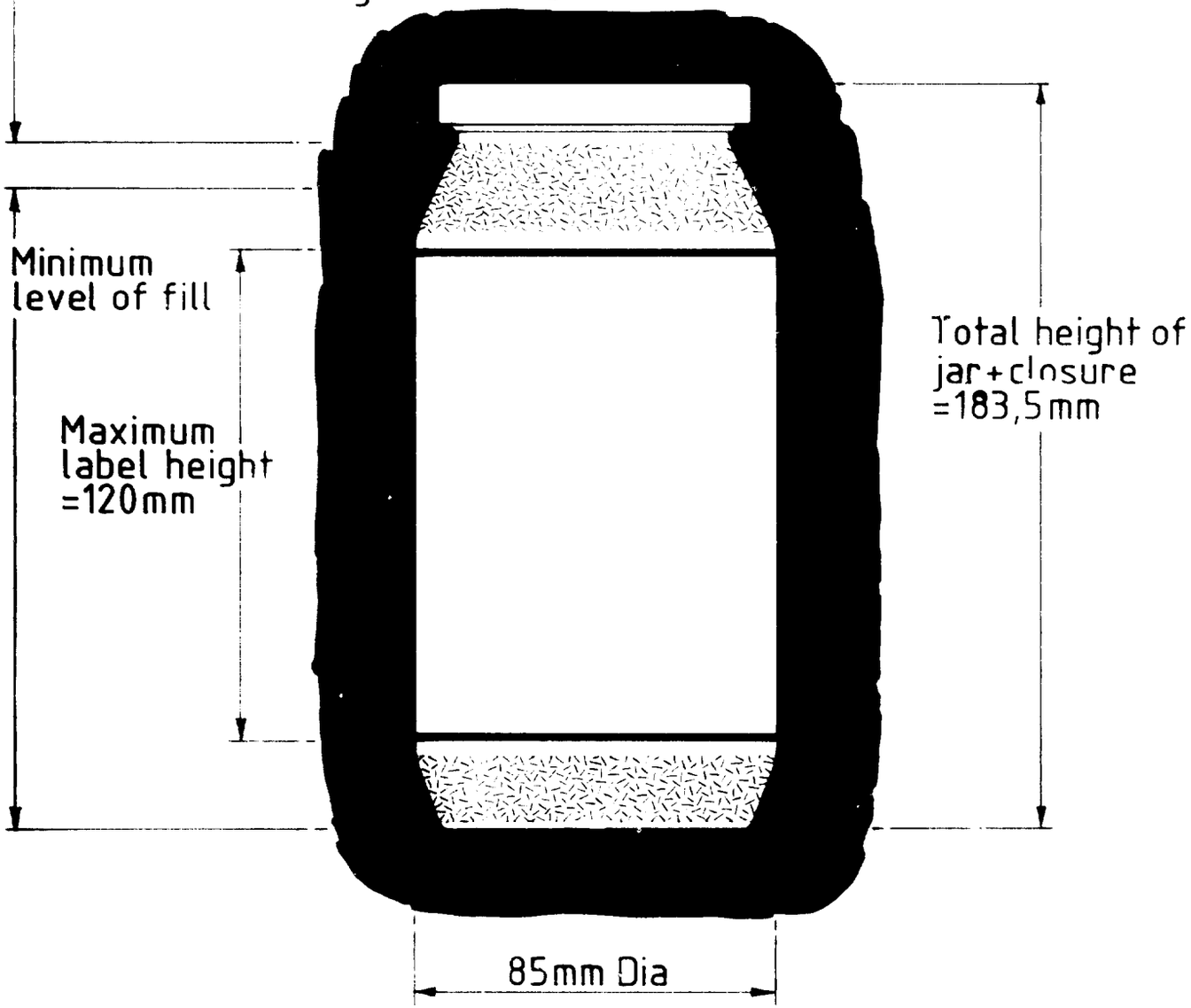
Notes:

1. All dimensions are millimetric
2. Dimensions are for semi-auto set-up. For fully auto reduce *182,5 to 174,5 and glass tolerance band from 11,5 to 3,3

Tall JAR
70cl capacity

19 Dec 1979

Drawing no 1/7



Notes:

1 The quick-action self-sealing closure is interchangeable within the full range of standard and tall jars

2 See Dwg no 1/9 for closure specification

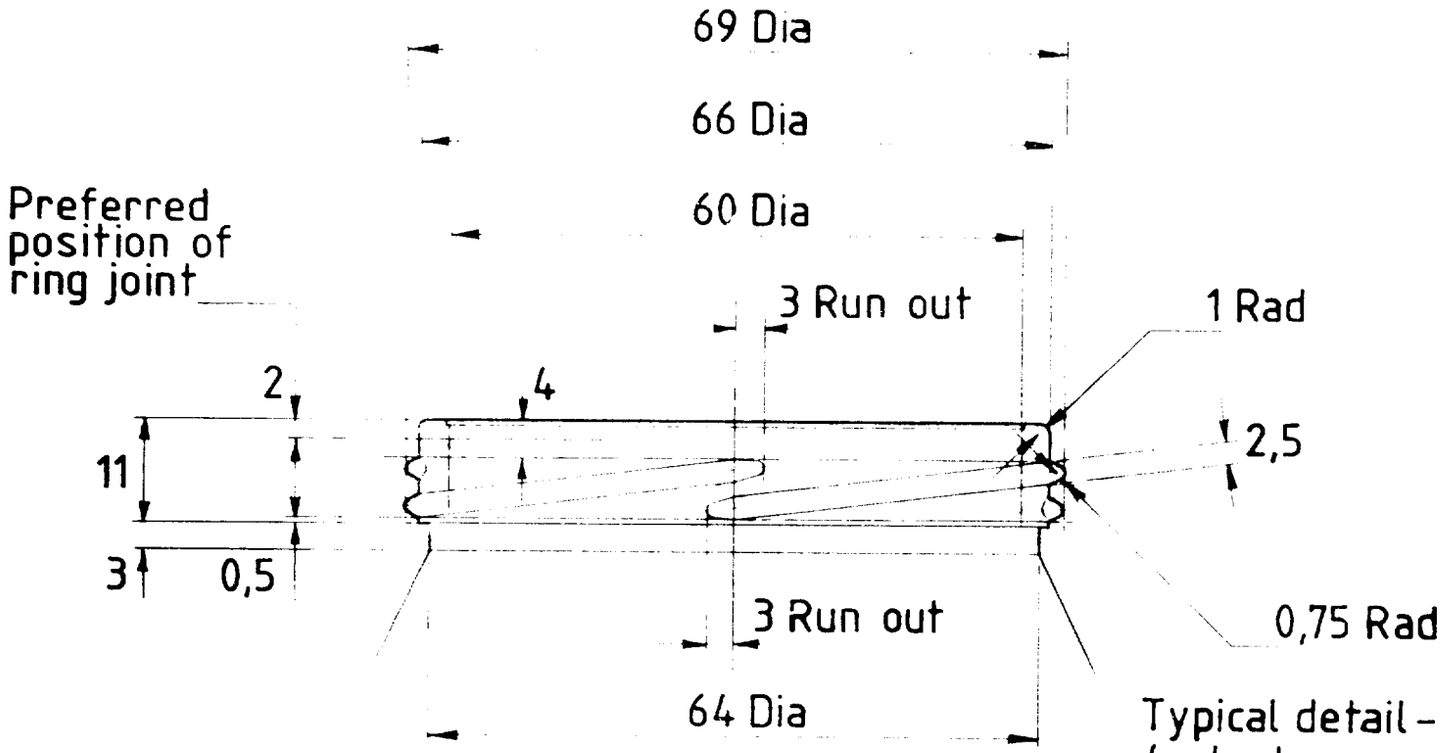
3 Suitable with ACL as multi-trip jar

Outline of tall JAR 70cl capacity

John Cochrane.

24 Dec 1979

Drawing no 1/8



NB. Mould maker must check this detail with a specimen closure

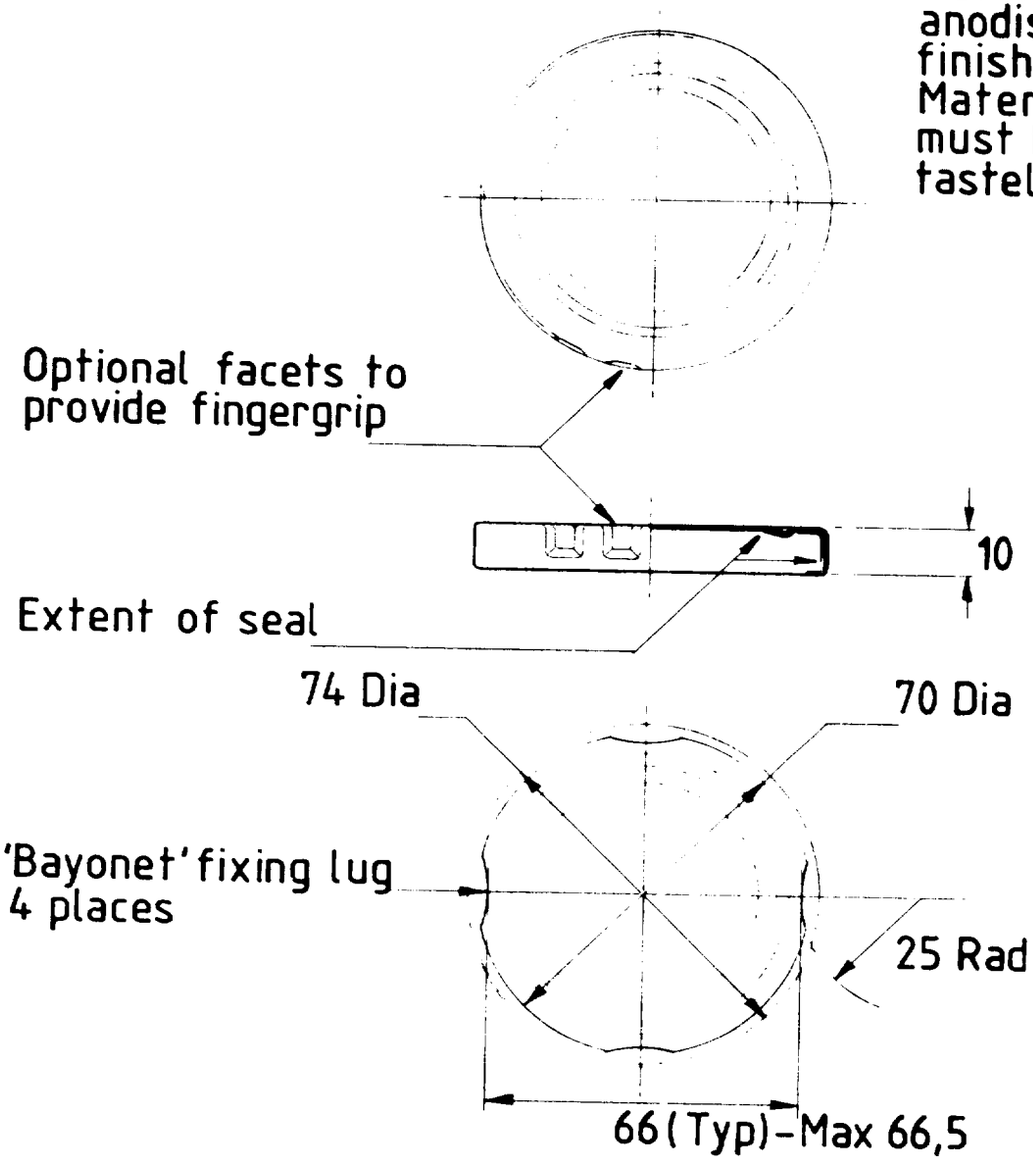
Notes:
1. All dimensions are millimetric

JARS-Detail of finish: 4 start bayonet closure

John Cochrane.
20 Dec 1979

Drawing no 1/9

Material: Aluminium, anodised inside: paint-finished outside. Materials and finishes must be odourless and tasteless



Notes:
1. All dimensions are millimetric
2 This closure must match jar finish: Dwg 1/9

Projection

JARS: specification of self-sealing closure

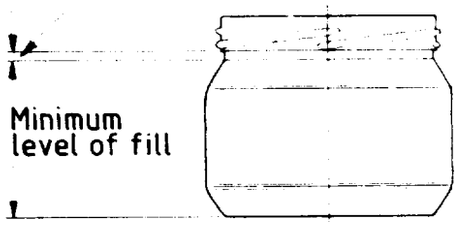
20 Dec 1979

Drawing no 1/10

Finish as per Dwg 1/9

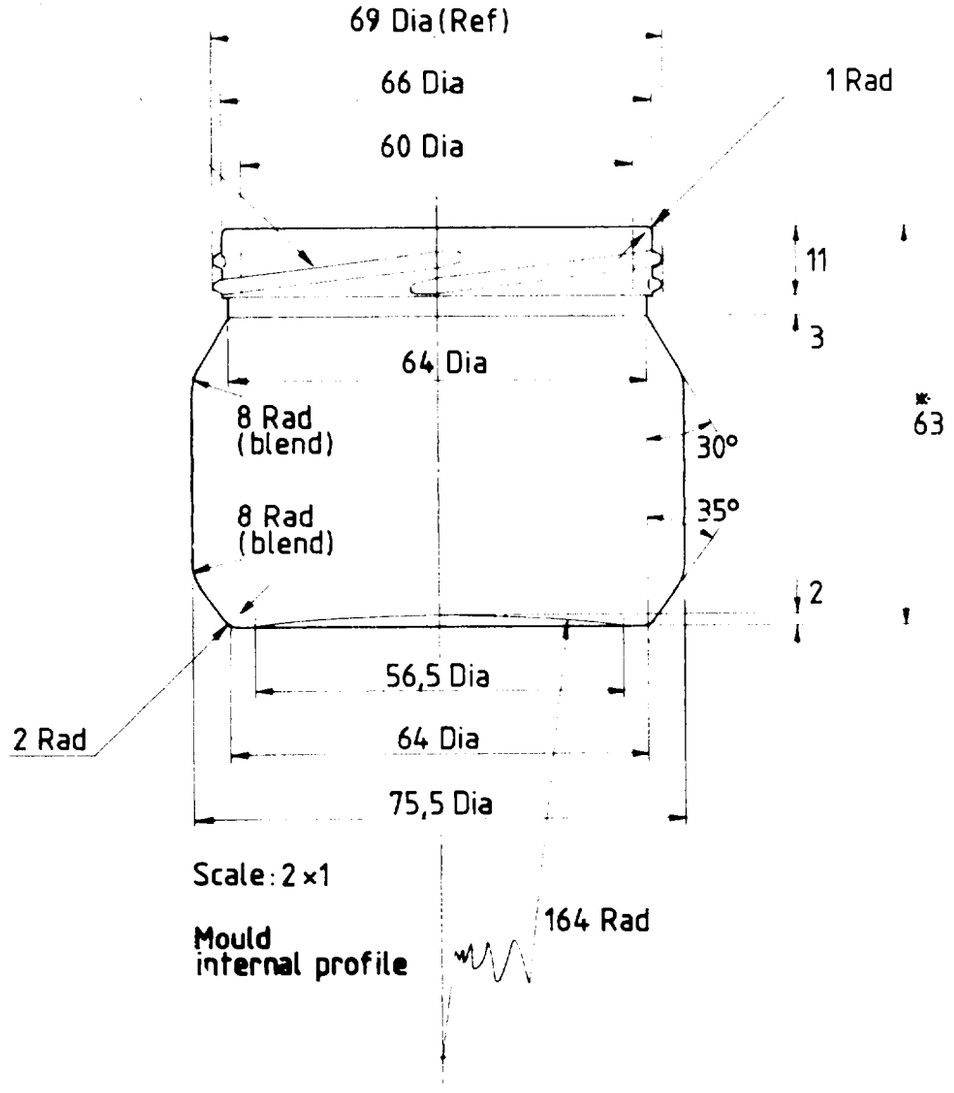
Maximum level of fill

Glass tolerance



Scale: 1:1

Capacity = 150 cm³ = 15 cl



Scale: 2 × 1

Mould internal profile

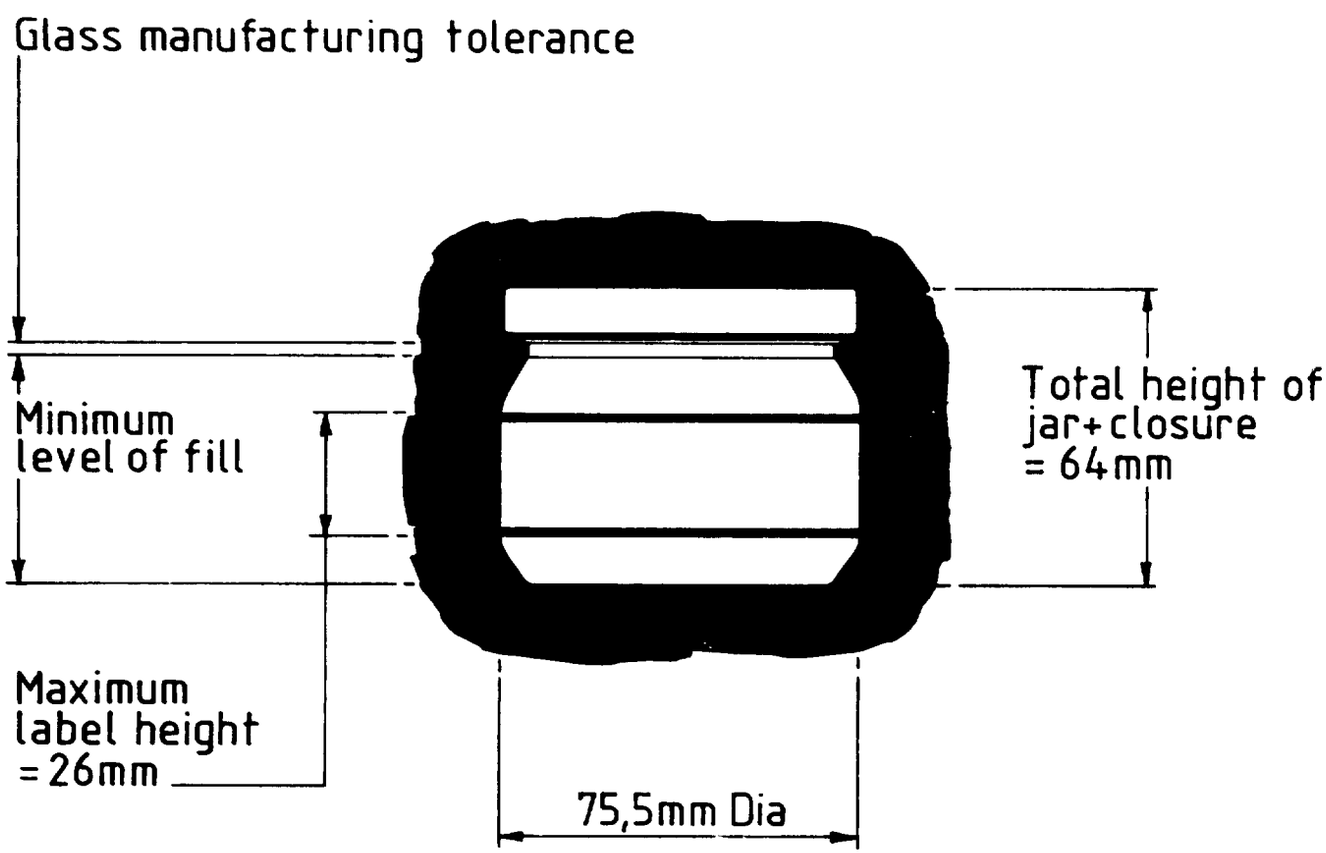
Notes:

1. All dimensions are millimetric
2. Dimensions are for semi-auto set-up. For fully auto reduce *63 to 61 and glass tolerance band from 3 to 1

Standard JAR
15cl capacity

19 Dec 1979

Drawing no 1/11



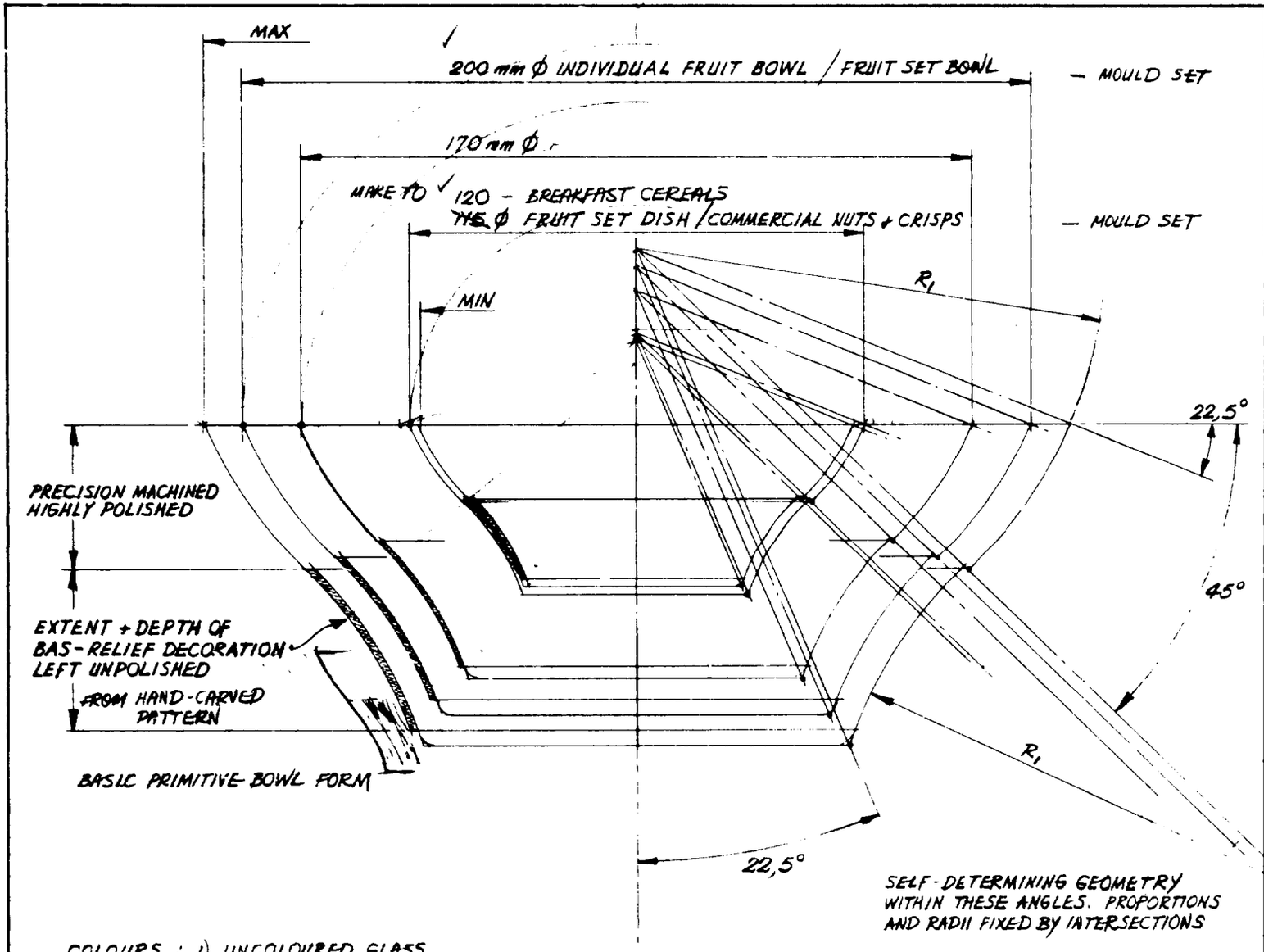
Notes:

1 The quick-action self-sealing closure is interchangeable within the full range of standard and tall jars

2 See Dwg no 1/9 for closure specification

Outline of standard JAR 15cl capacity

Drawing no 1/12



COLOURS : 1) UNCOLOURED GLASS
2) MATCH SOFT SAGE GREEN FOUND IN PALM BARK — TRANSLUSCENT

FOR REFERENCE PURPOSES ONLY

EN SUITE WITH PALM BARK TUMBLERS, ETC

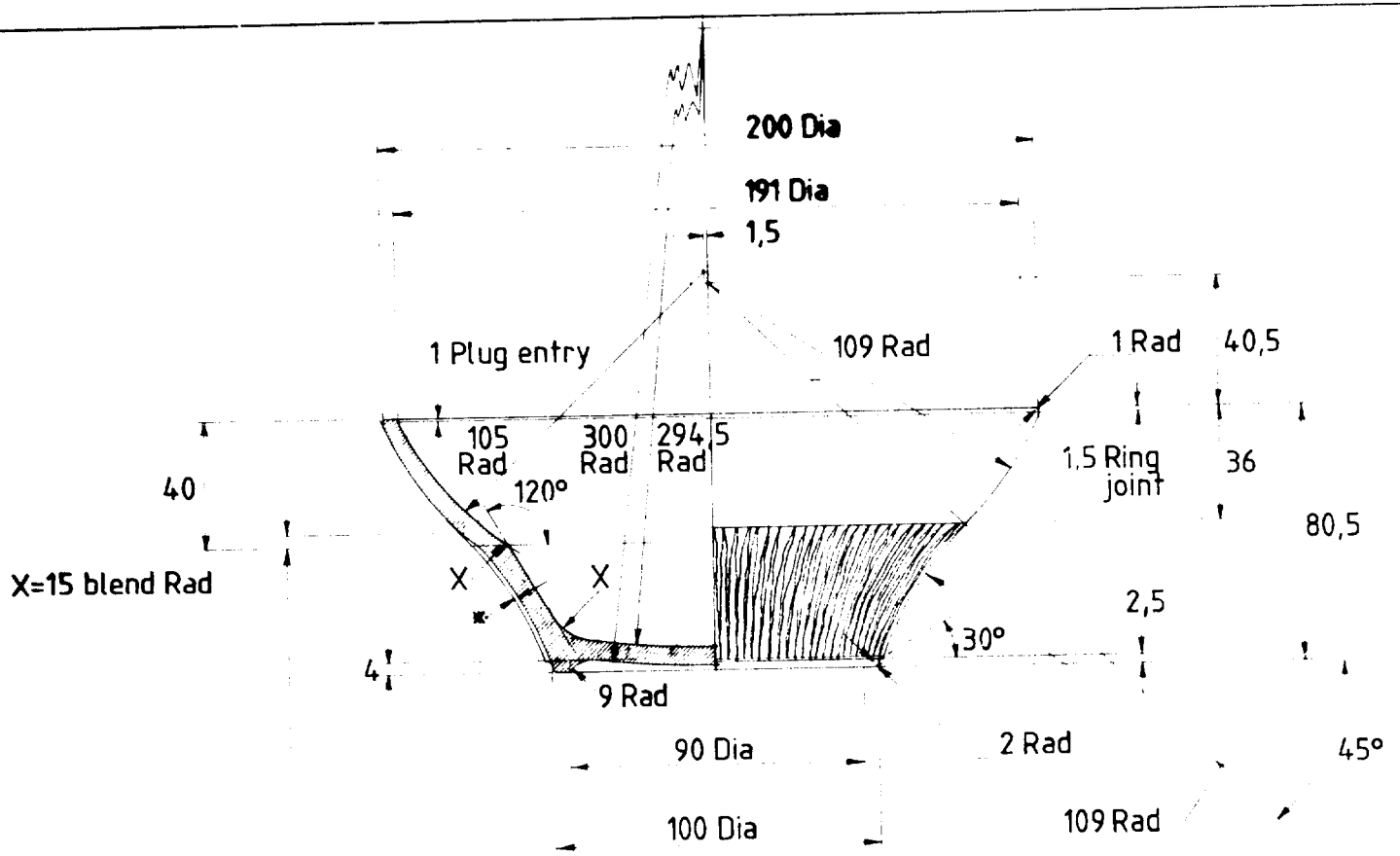
CARRY THIS FORM CONCEPT OVER: TANKARD + BAR JUG - BOTH WITH PRESSED HANDLES

USE 6 ~~OR 8~~ × 120⌀ DISHES WITH CARVED TRAY AS HORS D'OEVRE SET

CONCEPT DRAWING:
MALAWI PALM LEAF
BASIC BOWL FORMS:
PRESSED PRODUCTION

John Cochrane.
27 DEC 1979

DRAWING NO 2/0



Notes:
1. All dimensions are millimetric

*=Max depth of bas-relief decoration=1,25

Allow decoration to taper off to a max of 0,25 over this distance

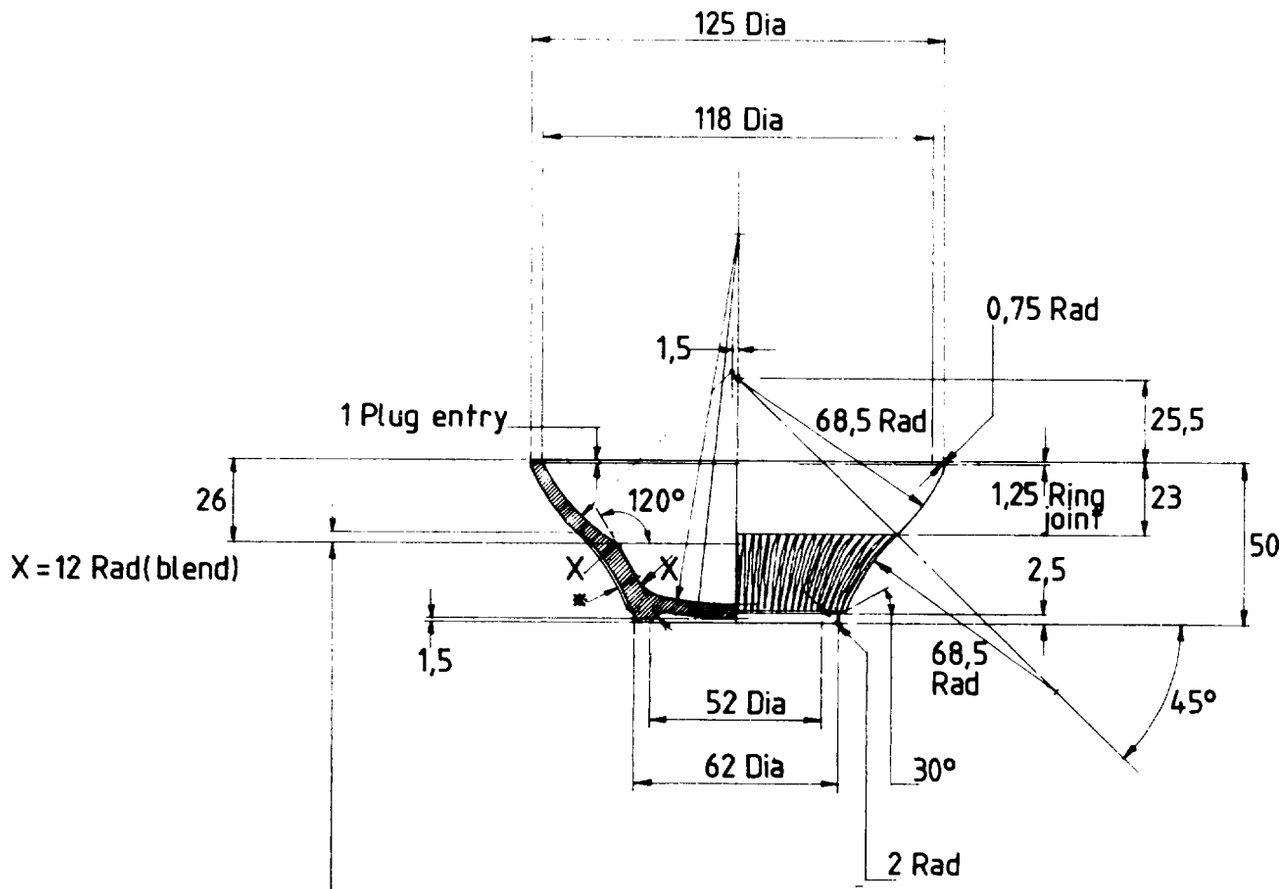
Decoration expressive of Country of origin

Scale: Full size

Fruit BOWL
200mm Dia

3 Jan 1980

Drawing no 2/1



* = Max depth of bas-relief decoration = 1

Allow decoration to taper off to a max of 0,2 over this distance

Decoration expressive of Country of origin

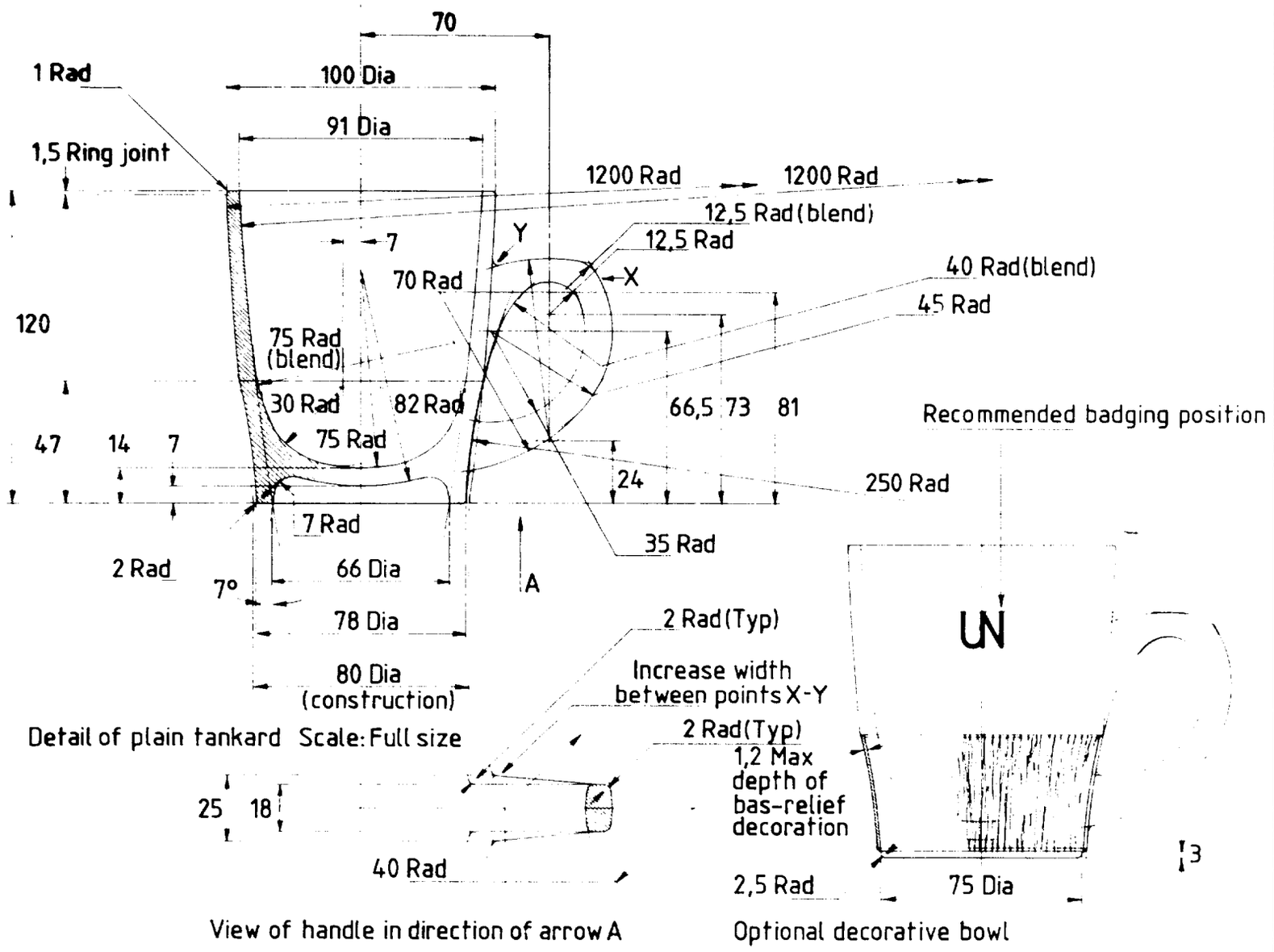
Scale: Full size

Notes:
1. All dimensions are millimetric

Fruit/nuts/crisps/ cereals DISH

18 Jan 1980

Drawing no 2/2



Detail of plain tankard Scale: Full size

View of handle in direction of arrow A

Optional decorative bowl

Notes:

1. All dimensions are millimetric
2. Use this Dwg in conjunction with 2/4 for full detail of Bar Jug & Ice Lip Jug

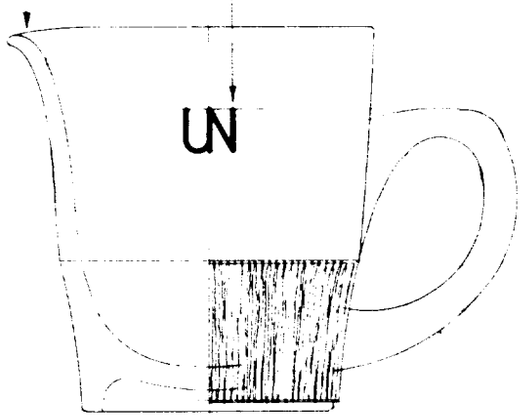
Pressed TANKARD
50cl capacity

31 Dec 1979

Drawing no 2/3

Lip formed as secondary operation
to standard tankard - Dwg 2/3

Recommended badging position

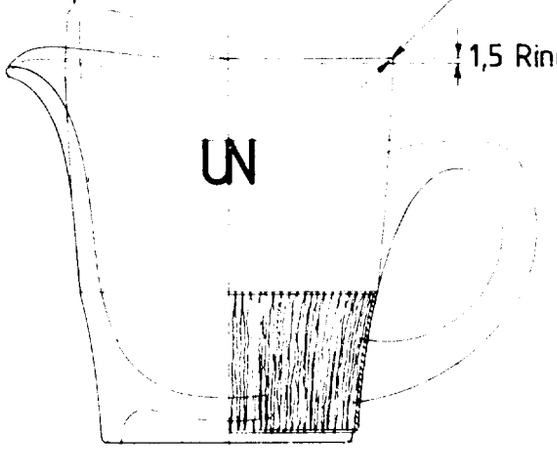


Plain Jug

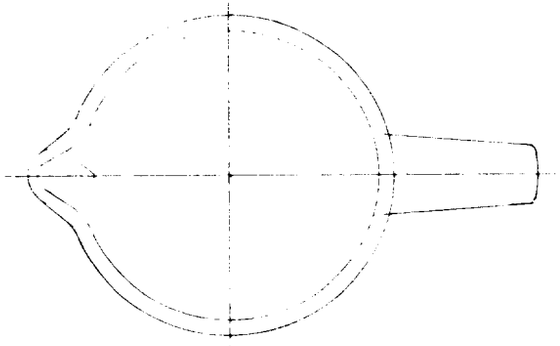
Glass raised as far as practicable (nom 15)
in special neckring
for secondary forming of ice-lip
Remaining mould details as Dwg 2/3

1 Rad

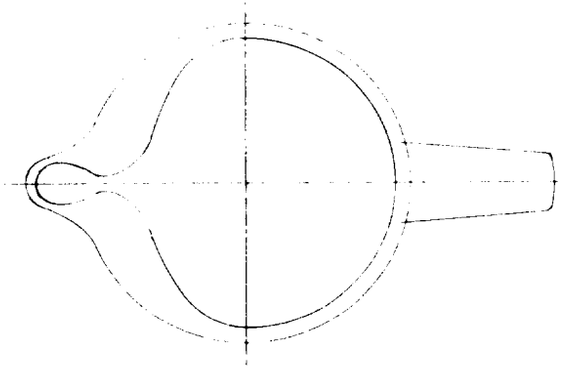
1,5 Ring joint



Decorative Jug -
Decoration expressive of Country of origin



BAR JUG Scale: Full size



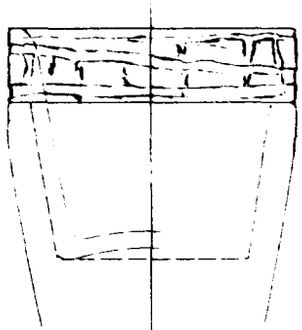
ICE-LIP JUG Scale: Full size

Notes:

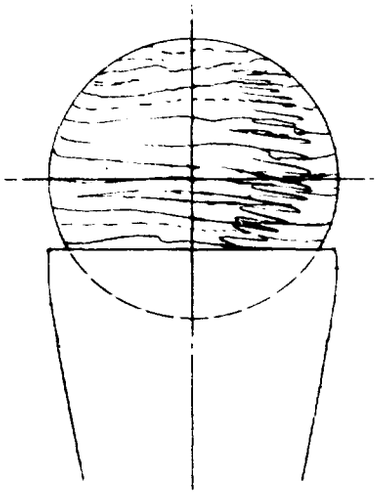
Bar JUG:
Ice-lip JUG
Capacity 50cl

2 Jan 1980

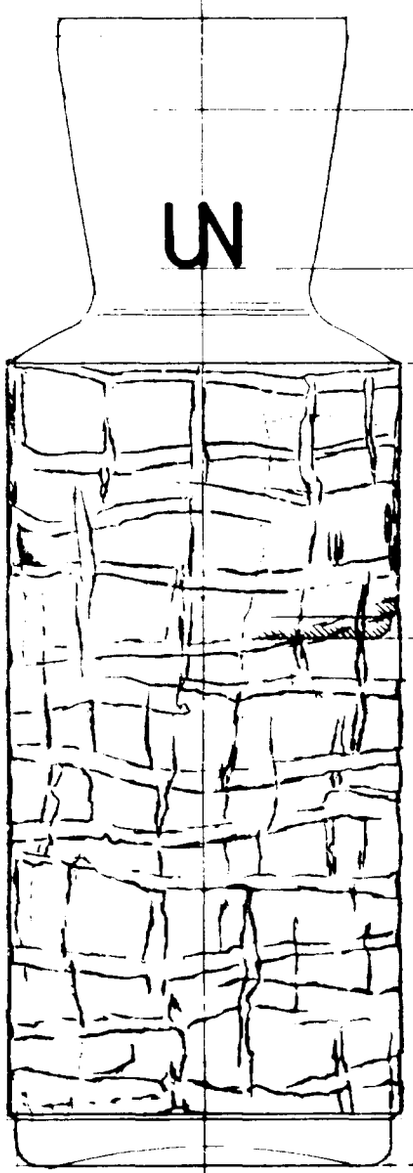
Drawing no 214



P+B or pressed stopper with matching texture



Alternative turned hardwood sphere



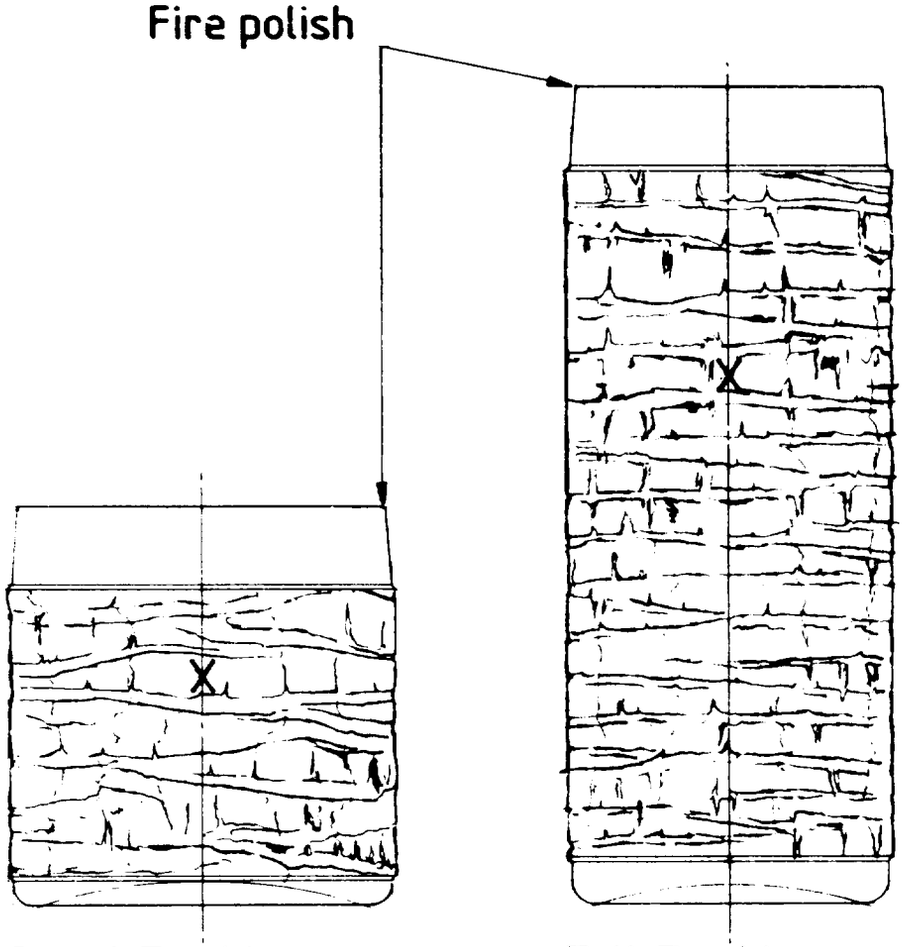
Notes:
1. The bark texture is transcribed from sections of actual tree, incorporated in the mould pattern

Dragonpalm bark
DECANTERS

John Cochrane
4 Jan 1980

Drawing no 2/5

Provision made for badging commercial ware in areas marked X



Squat Tumbler
34 cl
Whisky/Brandy/Juices

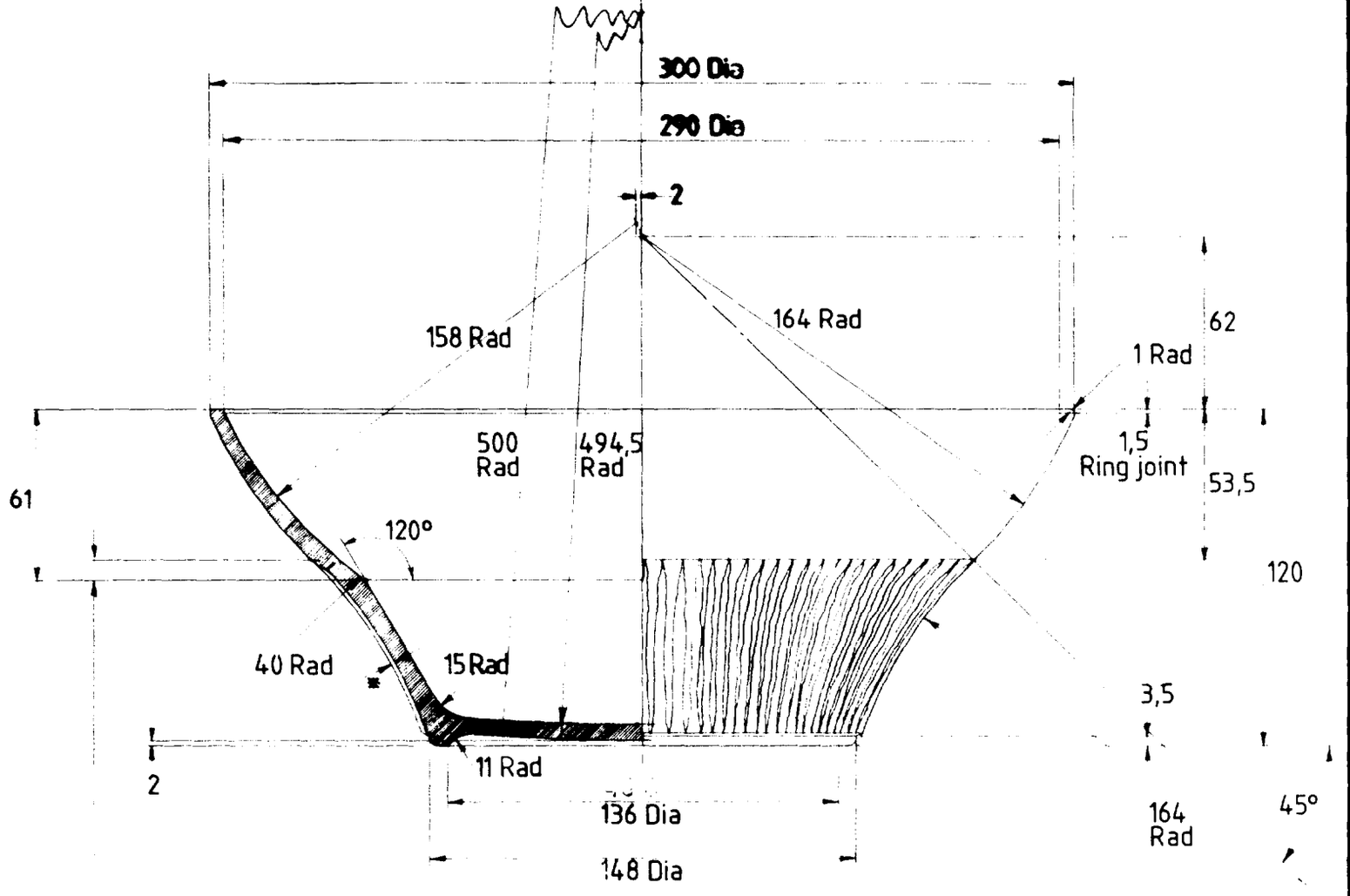
Tall Tumbler
50 cl
MGT/Green/Coke

Notes:
1 The bark texture is transcribed from sections of actual tree, incorporated in the mould pattern

Dragonpalm bark
TUMBLERS

John Cochrane.
5 Jan 1980

Drawing no 216



* =Max depth of bas-relief decoration= 1,5

Allow decoration to taper off to a max of 0,5 over this distance

Decoration expressive of Country of origin

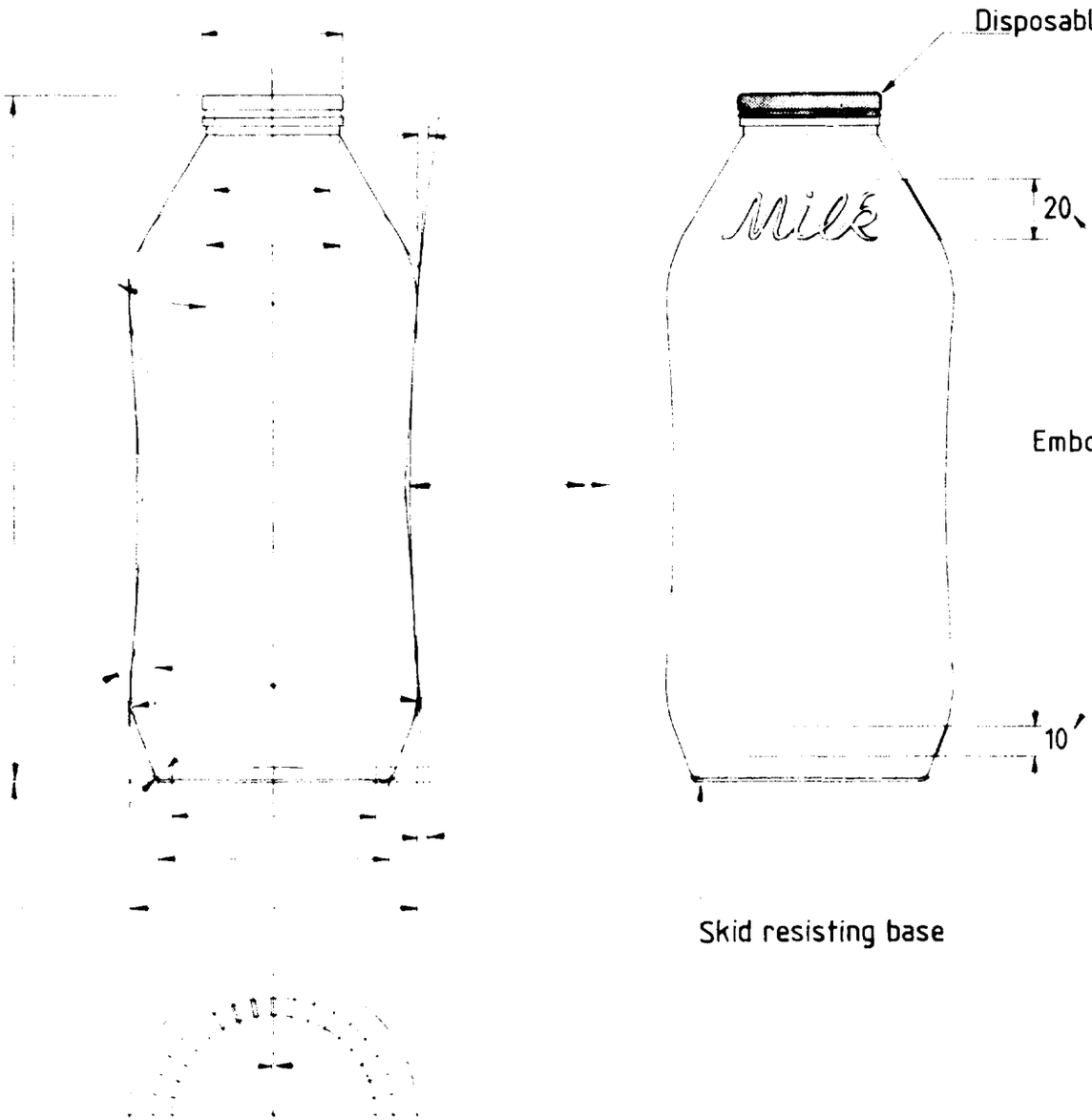
Scale: Full size

Notes:
1. All dimensions are millimetric

Salad/fruit/punch BOWL 300 Dia

24 Jan 1980

Drawing no 2/7



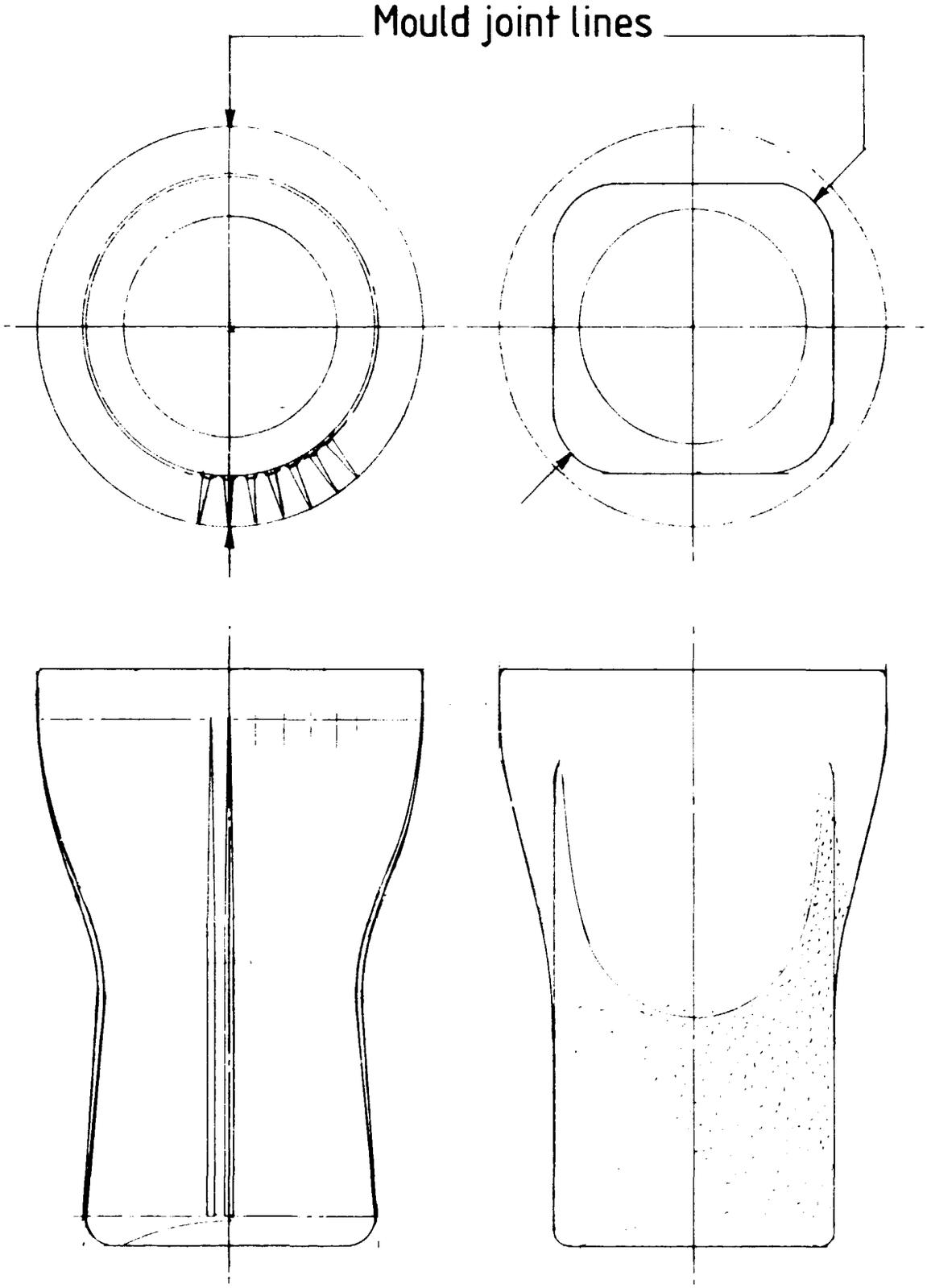
Notes:

© UNIDO

Proposed multi-trip lightweight MILK BOTTLE Capacity 1 litre

8 Jan 1980

Drawing no 3/1



P+B (Jar m/c)

P+B (Jar m/c)

Diametral mould sections fine-machined. Square section left as cast

- 120 ϕ - domestic/commercial
and 200 ϕ - club/hotel

OR SECTION THRU
TREE, WITH BARK
INTACT