SPECIFICATION FOR SQUIB HOUSING (FILLED) FOR 'SAM'

HEMRL Specification No. HEMRL/PYRO/PS/207(c)

This specification supersedes the earlier specification No. ERDL/Pyro/PS/207(b)

1. SCOPE

This specification governs manufacture and inspection of squib housing (filled) for Safety Arming Mechanism of fuze for 'PRITHVI & TRISHUL'

2. RELATED DOCUMENTS/DRAWINGS

a) This specification is to be read in conjunction with following documents:

(i)	Squib for SAM	ERDL/DRG/1096	
(ii)	Squib plug (Bridged)	--"--	detail no. 1
(iii)	Squib plug (empty)	--"--	detail no. 2
(iv)	Squib holder	--"--	detail no. 3
(v)	Squib wire	--"--	detail no. 4

For Proof

(i)	Firing Jig Assembly	ERDL/DRG/1287	
(ii)	Firing Jig for SAM	--"--	detail no. 1
(iii)	Washer	--"--	detail no. 2
(iv)	Holder Assembly	--"--	detail no. 3
(v)	Holder	--"--	detail no. 4
(vi)	Sleeve	--"--	detail no. 5
(vii)	Sheering pin	--"--	detail no. 6
(viii)	Squib Housing (filled)	ERDL/DRG/1295	
(ix)	Squib Housing (empty)	--"--	detail no. 1

b) Wherever reference is made to any standard document in this specification, it shall be taken as a reference to the latest edition of that document unless specified otherwise.

3. COMPONENTS AND MATERIALS

3(a) Components

The complete squib housing (filled) (ERDL Drg. No. 1295) is to consist of the following components as per Drg. No. mentioned against it.

Sr. No.	Component	Drg. No.	Qty.
1.	Squib for SAM	ERDL Drg No. 1096	1
2.	Squib housing empty (for proof)	ERDL Drg. No.1295 detail no. 1	1

3(a) Materials:

Materials shall comply with specifications quoted against them.

Sr. No.	Materials	Specification No.
1.	Enamelled copper wire 26 SWG dia over insulation 0.5 mm	IS 4800 – 1968
2.	'Advance' wire (copper 58/nickel 42) Diameter 0.040 mm, nominal resistance 376.7 ± 12.5% Ohm per meter, in annealed condition, bright finish, conforming to type-2, Gr. C-4 Gp.a.	BS – 1117, Pt. 2, 1964
3.	Solder (Tin/Lead 60:40)	IS-193-1982
4.	Ortho phosphoric acid	CP Grade
5.	Flux all – 205 consisting of	Diammonium hydrogen Phosphate – 20 parts Glycerin – 5 parts Distilled water – 75 parts
6.	Araldite AW 106 & Hardener HV 953U in a proportion 10:8 by weight	Proprietary product of M/s CIBATUL Pvt. Ltd.
7.	Lead styphnate (RD-1303)	Specn CS-5347-A
8.	Ammunition protective compn. no. 217	JSS-8010-42
9.	Ammunition protective compn. no. 219	JSS-8010-48
10.	Thinner i) Acetone - 40 parts ii) Amyl acetate - 40 parts iii) Toluene - 20 parts	As specified in JSS-8010-42

3(e) **Equipments, Tools etc.**

Sr. No.	Equipments / Tools	
1.	Soldering Iron	65 Watts
2.	Ohm meter	Range: 0 to 10 Ohms with measuring current less than 10 mA
3.	Camel Hair Brush (No. 6) or Artist's Brush No. 6	Commercial

4. **GENERAL**

a) Requirements:

i) Any sample lent to the manufacturer shall be used only as a general guide to workmanship and finish and not a guide to dimensioning or detail.

ii) Neither the completed store nor any component shall be altered or rectified, in any way other than that provided for in the drawings or specification without the authority of the inspecting officer.

b) Arrangements for Inspection:

i) The contractor shall notify the inspecting officer when he is in a position to start work and shall inform him of sub-contracts placed in this connection.

ii) During the execution of the order, the inspecting officer shall have access, at all times, to all departments of manufacturing plant, which are concerned with the production and storage of materials or components, either at the manufacturer or sub-contractor's premises. He shall also arrange for inspection to be carried out by his representative as and when considered necessary.

c) Inspection of materials:

i) Before proceeding to manufacture, all materials shall be submitted in batches to the inspecting officer. Each batch shall comprise of a quantity of material prepared under uniform conditions as regards composition and manufacturing processes.

ii) The contractor shall not take into 'use' any material or component until it has been accepted for its purpose by the inspecting officer who may require the bulk of the materials or components to be sealed or bonded until results of tests or analysis of samples are available.

d) **Samples for Testing:**

i) The contractor shall supply and prepared free of charge the material or components required by the Inspecting Officer for testing purpose and shall also provide the necessary facilities and apparatus which may be required for carrying out the test called by the drawing or by this specification.

ii) Test pieces or samples will invariably be selected by the Inspecting Officer and will remain the property of Government.

e) **Submission and Inspection of Materials:**

i) The contractor is expected to submit for inspection only satisfactory materials and he shall be required to assume full responsibility for any material submitted which is found to be unsatisfactory.

ii) If examination of a portion of a batch of materials or components reveals unacceptable standard of quality the whole batch will be rejected. At the discretion of the Inspecting Officer the manufacturer may be permitted to resubmit the batch after he has re-examined the whole and eliminated those parts which are defective.

iii) Formal acceptance of materials or components by the Inspecting Officer shall not relieve the manufacturer of his responsibility for any parts which may subsequently prove to be defective.

MANUFACTURING SCHEDULE:

Preparation of Squib Plug (Empty) (as per ERDL Drg. No. 1096, det. no. 2)

265 ± 10 mm length of enameled wire (as per ERDL Drg. No. 1096, det. no. 4) is taken and folded into two in the middle. The insulation over two free ends of this folded wire is removed with the help of a blade and fine emery paper or by chemical insulation remover to a distance of about 10 ± 2 mm. These two ends are then passed through the two holes of the squib holder (ERDL Drg. No. 1096, det. no. 3) till the folded end remains at 5 mm distance above the top surface of the holder. This folded end is then held tightly in the fingers and 8 to 12 twists are given to the wires at the bottom of the squib holder. The squib holder is then lifted by about 2 mm distance and thin coats of Araldite (a mixture of AW 106 and hardener HV 953U) are applied over this 2 mm length of twin wires.

The holder is again restored to its original position and a small drop of Araldite is plied around the twisted portion of the wires at the bottom of the plug. This assembly is then owed to cure at a ambient temperature for 24 hours. Then folded end is cut off at a distance 3 mm from the surface of the squib holder and the insulation of the two wires is removed the help of a small blade and a fine emery paper or by chemical insulation remover.

These two bare wires are dipped in syrupy phosphoric acid and then in molten solder bath to get an uniform smooth shining surface of tin / lead coating. The tinned squib plug is then washed in running water for a period of one hour, remove all the traces of the acid used. The plugs so washed are then dried in electric oven at 90 °C to 95 °C for one hour.

5.2 **Bridging Operation (ERDL Drg. No. 1096 det. 1)**

A small length of bridge wire (30 cm approx) is soldered across two brass block in a stretched condition. The tips of the tinned wires are dipped in Flux-all solution and held below the stretched wire. The tips of the tinned wires soldered with the cupronickel wire to give a firm and smooth joint using soldering iron and tin / lead solder. After soldering a series of squib plugs, the intervening wires are cut and the plugs are separated. The extra lengths of the cupronickel wire are cut away from the squib plugs. The bridged squib plugs are washed in running water for one hour and dried in an oven at 95 °C for one hour. The resistance of the squib plugs are checked and those which are within the specified limits are taken for coating with squib composition.

5.3 **Coating of Squib Composition**

The squib composition consists of –

i)	Lead Styphnate (RD-1303)	-	100 parts
ii)	Ammunition protective composition (APC-217) volume sufficient to give 2 parts of solid)	-	2 parts

Notes:

i) Safety goggles should be worn by the operator while preparing the squib composition.
ii) An earthed Aluminium sheet platform with safety screen should be used while mixing the dry ingredients and also while mixing the final composition with NC varnish using brush.
iii) The preparation and filling of squib composition shall be carried out in a room with a relative humidity between 45% and 60% at ambient temperature.

Preparation of Composition:

The required quantity of APC-217 is pipetted out in to aluminium dish (approx. 40 mm diameter) and approx. equal quantity of thinner as stipulated for APC-217 is added to it. 2.5 g of Lead Styphnate is weighed and transferred to this dish. The composition is mixed carefully with an Artist's brush no. 6. The composition shall have good consistency required for coating. Not more than 2.5 g of squib composition shall be mixed at a time. Before coating of squib composition, each squib plug (bridged) (ERDL Drg. No. 1096, det. no. 1) should be numbered and weighed on a Mettler balance / top loading electronic balance.
The tinned copper wires connected by the cupronickel wire are brought near by pressing with the fingers (care being taken to avoid shorting of the two wires) and the bridges are dipped in the squib composition two or three times to build a charge weight of 8 to 12 mg on the bridge wire. A drying time of at least 30 minutes is allowed in between the two consecutive dips. Small quantities of thinner as specified under sl.no.10, para 3 may be added during the coating process to maintain the consistency of squibs composition suitable for coating. The coated squibs are then dried for two hours at 55 °C. Each squib is again weighed on Mettler / top loading electronic balance (after coating and drying of squib composition) for the correct charge mass of squib composition (8 to 12 mg) as per ERDL Drg. No. 1096. Thus the individual charge mass of all squibs should be checked and recorded by inspector before waterproof coating). After drying the squib beads, three coats ammunition protecting composition No. 219 are given with a drying time of not less than 30 minutes in between two consecutive coats. The water proof coat should extend up to the top surface of the squib plug and cover the bead completely. The squibs are again dried for 2 hours at 55 °C.

6. ELECTRICAL TESTING

The resistance of the squibs are then checked with a meter whose measuring current is not more than 10 mA.

7. PROOF

7.1 Each lot of the squib should meet the following requirements:-

Visual - The squib beads should be free from visual defects like blow holes, incomplete water proofing etc.

Functional

Sr. No.	Test	Requirement	Qty. to be tested	Method
1.	Resistance	0.5 ± 0.1 Ohm	100%	With a meter whose measuring current does not exceed 10 mA. Appendix A.
2.	Max. No-fire current	500 mA	10 nos.	Appendix – B
3.	Min. All-Fire Current	1 A	10 nos.	Appendix – C
4.	Delay of functioning at 2 A current	Less than 10 ms	10 nos.	Appendix – D
5.	Performance test (for squibs)	The shear wire should shear and slider should be released.	10 Nos. (Assembled in squib housing (Ambient)	Appendix – E

7.2 Sentencing

TEST	PROOF	
	No. of failure	Decision
Max. No-fire current	Nil	Accept
Min. All-fire current	One or more	Reject
Delay of functioning at 1A	--"--	--"--
Performance test	--"--	--"--

8. LOTTING

A lot shall normally consist of approximately 200 nos. of squibs, plus 60 nos. will be required for proof.

9. PACKING

(a) The squibs shall be packed in sealed metallic container with silica gel bags, to the satisfaction of the Inspection Officer.
(b) All packages shall be painted / stenciled / labeled in accordance with approved particulars.

10. RESPONSIBILITY FOR SAFETY

Nothing in this specification shall relieve the contractor of his responsibility for safety of his operations.

11. ASSEMBLY OF SQUIB HOUSING WITH SQUIB

The squib will be assembled to Squib Housing empty (for proof) to ERDL Drg. 1295 det. 1 using Araldite AW-106 and Hardener 953U in the proportion 10:8 by weight as shown in ERDL Drg. No. 1295 and allowed to stand overnight for curing of Arladite.

12. PROOF OF SQUIB HOUSING (FILLED) (ERDL Drg. No. 1295)

Sr. No.	Test	Requirement	Qty to be tested	Method
1.	Performance Test	The shear wire should shear and the slider should be released.	10 nos. each at Hot and Cold conditions.	Appendix – F

13. SHELF LIFE

The shelf life of squib is ten years but the squib housing (filled) to ERDL Drg. No. 1295 should be used for assembly in SAM (Prithvi/Trishul) within six months from the date of manufacturing failing which the lot should be subjected for check proof as per HEMRL Specn. No. HEMRL/PYRO/PS/207(C) para No. 7.1, 7.2 & 12.

APPENDIX – A

Resistance Test:

The resistance value of all the squibs shall be checked by an approved ohm-meter whose measuring current does not exceed 10 mA. The resistance value should be between 0.4 and 0.6 Ohm.

APPENDIX – B

Maximum 'No-Fire' Current:

A steady D.C. of 500 mA should be passed through the squib for a period of 1 minute. No squib should fire. All the squibs used in this test will be destroyed immediately after the test by firing at 2 A current.

APPENDIX – C

Minimum 'All-Fire' Current:

A steady D.C. of 1 A should be passed through the squib for a period of 5 seconds. All squibs should function.

APPENDIX – D

Delay of Functioning:

The delay of functioning of the squibs at a steady D.C. of 2 A, measured by a photocell and timer should be not more than 10 ms.

APPENDIX – E

Performance Test for Squibs:

10 nos. of squibs duly assembled with Araldite in the squib housings (empty) from accepted lot of squib housing, as per ERDL Drg. No. 1295 are further assembled in the firing jig (ERDL Drg. No. 1287 detail 1) along with Teflon washer (ERDL Drg. No. 1287 detail 2) in between squib housing and slider assembly. A layer of Teflon tape is applied over the threads of squib housing before its assembly in the firing jig. Ensure that no gap is left in between squib housing, Teflon washer and slider assembly. This should be confirmed by measuring the dimensions of empty and filled assemblies. For assembly procedures see Appendix – G. Ten nos. of squib housings (filled) thus assembled in the firing jig assembly (as-per ERDL Drg. No. 1287) are then fired at 1 A current at ambient condition.

APPENDIX – F

Performance test for Squib Housing:

Assemble 20 nos. of Squib Housing (filled) in the firing jig assembly (ERDL Drg No. 1287). Subject 10 Nos. of these assemblies to each temperature conditions i.e. + 55 °C and – 30 °C for 3 hours. Carry out the performance test of the conditioned assembly immediately after withdrawal from the conditioning chamber (i.e. fire the squib in firing jig assembly at 1 A current).

Requirements:

(i) The shear wire should be sheared off and slider should be released.
(ii) If any failure for the release of the slider is observed, (even after firing of the squib), the cause should be investigated in the slider assembly.

APPENDIX – G

Procedure for Assembly of Squib Housing (filled) in the SAM fuze body or firing jig:

(i) Ensure that sleeve-slider assembly is put in the SAM Body or firing jig.
(ii) Check the depth on the top of slider by Vernier Caliper.
(iii) Check the length of Squib Housing (filled) by Vernier Caliper (14 + 1 mm = 15 mm) on the step of squib housing.
(iv) Record the different between 3 & 2.
(v) Assemble the Squib Housing (filled) in the SAM body. This is to check the smooth fitness of threads of each other. See the top portion of squib housing outside the SAM body is in agreement with the above mentioned difference i.e. Sr. No. 4.
(vi) Remove the Squib Housing (filled) from SAM body.
(vii) Put the Teflon washer on the top of slider assembly in the SAM-body.
(viii) Reassemble the Squib Housing (filled) (along with Teflon tape on the threads) in the SAM body till it sits tight over Teflon washer.
(ix) Confirm that the top portion of squib housing projecting outside SAM body is in agreement with the above mentioned difference i.e. Sl. No. 4.
(x) Record the resistance of Squibs assembled in the SAM Fuze Body.

ORDNANCE FACTORY CHANDA
UNIT II - PROCESS SCHEDULE

QF/OFCH/U-II/SQUIB FOR SAM/PC-PS
GSD NO-U-II/64R Dt 31.03.2010

TORE: SQUIB FILLED FOR SAM (AKASH/PRITHVI)
RAWING No: ERDL DRG No.1096

SL.NO	OPERATION / PROCESS	PROCESS PAREMETER	PROCESS MATERIAL REQUIRED	MACHINE/ EQUIPMENT	JIGS / FIXTURES	TOOL / ACCESSORIES	GAUGE / MEASURING INSTRUMENT	REMARK
1	Receipt of Empty Components(Squib bridges)	Acceptance verification						
2	Weighing of Empty Squib Bridged	Proper Weighing						
3	Bringing of Two Terminal near By pressing with finger	Terminal should not touch each other						
4	Receipt of RD 1303	Acceptance verification				Aluminium Dish		
5	Weighing of RD 1303	Proper Weighing	RD 1303					
6	Receipt of APC 217	Acceptance verification	APC 217					
7	Pipette out APC 217 & Transfer to Aluminium Dish	Determining correct volume				Pipette		
8	Mixing of Composition	Proper Mixing				Brush		
9	Addition of Thinner	Required quantity	Thinner					3 Dips to achive the correct chargemass
10	Dipping of Empty Squib Bridges in Composition	Proper Dipping						
11	Drying of Squib filled at Room temperature	Proper Drying						Drying Temp 55 °C for 2 Hrs
12	Drying of squib in hot air	Proper Drying	-	Hot air dryer				
13	Weighing of Filled Squib	Proper Weighing					Electronic Weighing Balance	Chargemass - 8 to 12 mg

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JLG/WF1

WM/F3

JW/WU-II

(P T O)

ORDNANCE FACTORY CHANDA

UNIT II - PROCESS SCHEDULE

STORE: SQUIB FILLED FOR SAM (AKASH/PRITHVI)
DRAWING No: ERDL Drg No. 1096

QF/OFCH/U-II/SQUIB FOR SAM/PC-PS
GSD NO-U-II/64R Dt 31.03.2010

Sl.NO	OPERATION / PROCESS	PROCESS PARAMETER	PROCESS MATERIAL REQUIRED	MACHINE/ EQUIPMENT	JIGS / FIXTURES	TOOL / ACCESSORIES	GAUGE / MEASURING INSTRUMENT	REMARK
14	Receipt of APC 219	Acceptance verification						
15	Dipping of filled Squib in APC 219(Water proof coating)	Proper Coating	APC 219 (Red)			Aluminium Bowl		3 Dips
16	Drying of Squib at Room Temp	Proper Drying						
17	Drying of Squib in hot air	Proper Drying		Hot air Dryer				2 Hours at 55°C
18	Resistance Checking (Final Inspection)	Proper Checking					Safety Ohmmeter	Resistance 0.4 to 0.6 Ω
19	Proof Selection							Proof Quantity 60 Nos.
20	Walleting / Packing	Proper Walleting	Tin Wallet					
21	Temporary Storage	Proper Storage						

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JGM/I

WM/I-3

JWM/U-II

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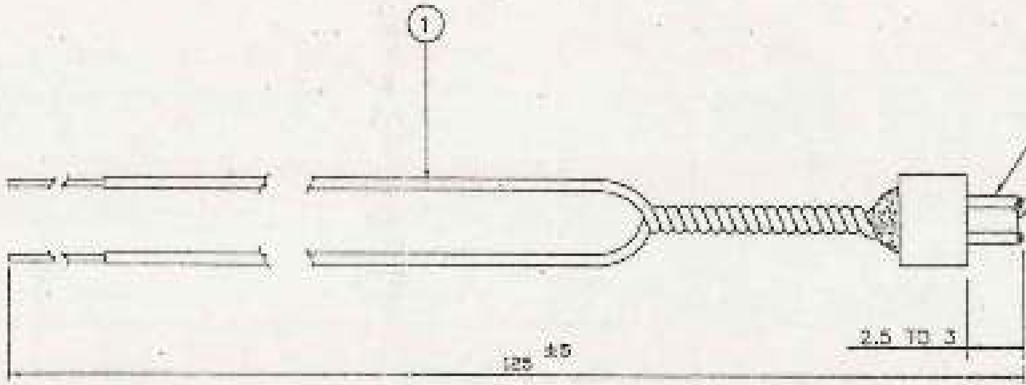
DRG CONVENTIONS CONFORM TO IS: 696
DIMNS ARE IN mm UNLESS OTHERWISE STATED

SHT.No.	SHTS.	DET.No.1	PART No.
ERDL DRG 1096			DRG No.

TOLERANCES FOR UNTOLERANCED DIMNS								
ABOVE	–	6	30	120	315	1000	2000	4000
UPTO	6	30	120	315	1000	2000	4000	–
TOLS	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3

LIST OF COMPONENTS

SR NO	DESCRIPTION	DRG NO	DET NO	NO OFF
1	SQUIB PLUG (EMPTY)	ERDL DRG 1096	2	1



ENAMELLED COATING TO BE REMOVED. STRAND TINNED AND LENGTH TO BE CUT TO 2.5 TO 3mm.

'ADVANCE' WIRE (COPPER 58/NICKEL42) DIAMETER 0.040mm NOMINAL RESISTANCE 376.7 ± 12.5% OHMS PER METER, IN ANNEALED CONDITION, BRIGHT FINISH CONFORMING TO TYPE 2, GRADE C–4, GROUP–c OF SPECIFICATION BS 1117 PART2: 1964 – TO GIVE RESISTANCE OF 0.5 ± 0.1 OHMS. SOLDERED ACROSS THE LEAD WIRES AT THE TIPS USING SOLDER TIN/LEAD (60:40) TO SPECN IS:193–1982

NOTE:-

1) THE SOLDERED PLUGS SHOULD BE WASHED IN RUNNING WATER FOR 2 Hr. AND DRIED AT 95°C FOR 1Hr.
2) TOTAL LENGTH OF THE SQUIB PLUG (BRIDGED). SHOULD BE 125 ±5.

ALL AMENDMENTS UPTO 8-3-95 INCLUDED

No.	DATE	AUTHORITY	BRIEF RECORD	ZONE	CD.	DD. SIG.

DRG. SEALED :-

DRN: CHD :- TRD :- COMP:-
SCALE :- 5:1
EST.MASS :-
GAUGE SCHD :-
APPD. FOR DIRECTOR DATE :- 12-4-98
MATL:-
PROTECTIVE FINISH :-

ASSY.DRG. ERDL DRG 1096
DESIGN AUTHORITY
ERDL PUNE-411 021

DRG No.
ERDL DRG 1096
DET.No.1 SHTS. SHT.No.
PART No.

TITLE:-

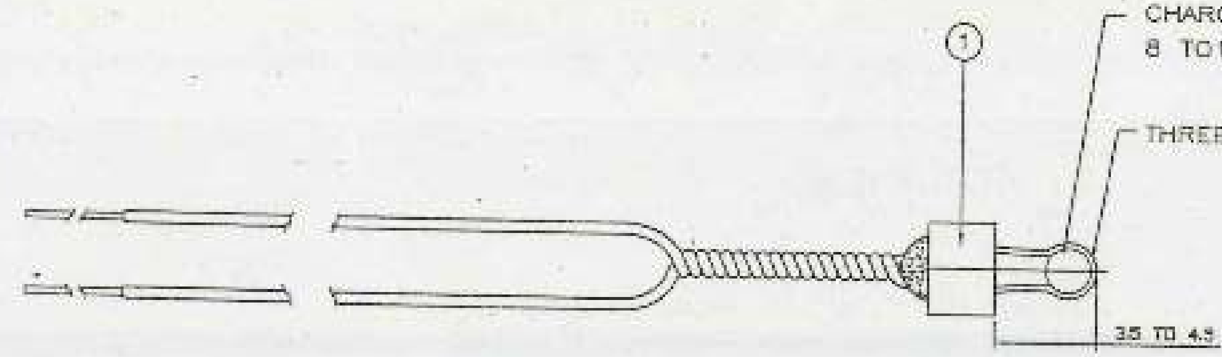
FIG-2 SQUIB PLUG (BRIDGED)

DRG NO.	ERDL DRG 1096

ABOVE	–	6	30	120	315	1000	2000	4000
UPTO	6	30	120	315	1000	2000	4000	–
TOLS	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3

LIST OF COMPONENTS

SR NO	DESCRIPTION	DRG NO	DET NO	NO OFF
1	SQUIB PLUG (BRIDGED)	ERDL DRG 1096	1	1



COMPOSTITION:-

i) LEAD STYPHNATE (RD-1303) 100 PARTS

ii) APC NO 217 – 2.0 PARTS (BINDER TO GIVE 2.0% SOLIDS)

ALL AMENDMENTS UPTO 11-3-95 INCLUDED

FIG-1

R. No.	DATE	AUTHORITY	BRIEF RECORD	ZONE	ED.	GO.
					SIG.	

DRG. SEALED :-

DRN: | CHD :- | TRD :- | COMP:-
C.D'MAN | OIC D.G. | SCALE :- 5:1 | EST.MASS :-
APPD. FOR DIRECTOR | GAUGE SCHD :- | DATE :- 12-4-88
MATL :- ——
PROTECTIVE FINISH :- ——

ASSY.DRG. ERDL DRG 1295
DESIGN AUTHORITY
ERDL PUNE-411 021

DRG No. ERDL DRG 1096
DET.No. | SH. | SHT.No.
PART No.
D.S.CAT.No.
AHSP:-

TITLE:-

FIG-1 SQUIB FOR SAM