Chapter - I (Chemical)
Item: Lead Alloy Tube for FLSC-4.3

B.F. Specification No.: 1-50
Date: 28-01-2021
Supersede Spn. No.: NA
Date: NA

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1. **Scope:** This standard covers the requirement of lead alloy tubes used for manufacturing of FLSC-4.3
2. **Sampling:** Samples shall be drawn and prepared in accordance with IS : 1817-1961 Methods of sampling Non-Ferrous Metals for Chemical Analysis.

3. **Quality requirements:**
Lead Alloy Tube Specification no.: HEMRL/HE I/FLSC/2019/1.

A) Chemical composition:

SL. No.	Element	Specified Limit
01	Lead	93 ± 2 %
02	Antimony	4 ± 1 %
03	Tin	2 ± 0.5 %
04	Others	1 % max (unspecified)

B) Dimensions of lead tube:

SL. No.	Parameter	Specified Limit
01	I.D.	4.80 + 0.1 / - 0.05 mm
02	O.D.	10.00 ± 0.1 mm
03	Length	600 ± 10 mm

C) Acceptance Criteria:

a. ID of each tube shall be checked with balls of diameter 4.7 mm and 4.95 mm respectively.
b. 4.7 mm ball will be used as GO gauge and 4.95 mm ball will be used as NO GO gauge.
c. Uniformity in wall thickness throughout the length of each tube shall be maintained.
d. Internal and outer surfaces must be smooth.
e. Inspection will be carried out in presence of QA representative.

D) Testing:

The vendor shall arrange to analyses the samples of lead alloy tube from NABL/ Govt. approved laboratory. Testing will be carried out as per IS : 403 - 1964 (Reaffirmed 2016) or any other established instrumental/chemical method. In case of dispute, the procedure specified in IS : 403 - 1964 shall be the referee method.

E) Packaging of Lead Tubes:

a. Each tube should be protected using suitable polythene wrapping over it. It should be done in such a way that no atmospheric air enters into the tube after wrapping it with polythene cover.

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b. Ends of each tube should be plugged with soft material.
c. The tubes are to be packed in suitable cushioning material (preferably thermocole) having grooves of suitable size. These tubes packed in thermocole packing, in turn, are to be packed in wooden boxes of suitable size.
d. In one layer of cushioning material, 10 no. of tubes should be accommodated. There can be 5-6 such layers in one wooden box.

F) Note:

Production agency can be slightly modify I.D. and O.D. of lead alloy tube to get specified linear explosive loading if required in consultation with design agency.

(V. K. TIWARI)
GENERAL MANAGER

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APPENDIX 'I'

TABLE-I

CHECK LIST FOR THE PREPARATION OF FLSC (4.3 g/m)

Parameter	Observed values				
FLSC No.					
Length of lead tube, 600±10 mm					
Dimensions of tube OD 10 ± 0.1 mm ID 4.8 +0.1 mm -0.05 mm					
RDX filled in tube, g					
Final length of FLSC, mm					
Linear explosive loading in FLSC, 4.3±0.2 g/m					
Visual inspection of FLSC (No scratches should be present)					
X-Ray of FLSC					
Remarks Accepted/Rejected					

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APPENDIX 'A'

Lead Alloy Tube Specification: Specification no.: HEMRL/HE I/FLSC/2019/1

Lead alloy tube shall have the following properties:

A. Chemical composition

1. Lead : 93 ± 2%
2. Antimony: 4 ± 1%
3. Tin : 2 ± 0.5%
4. Others: 1% max (unspecified)

The vendor shall arrange to analyse the samples of lead alloy tube from NABL / Govt approved laboratory.

B. Dimensions of lead tube

1. I.D. : 4.80 + 0.1/ - 0.05 mm
2. O.D.: 10 ± 0.1 mm
3. Length : 600 ± 2 mm

C. Acceptance Criteria

a. ID of each tube shall be checked with balls of diameter 4.70 mm and 4.95 mm respectively.
b. 4.70 mm ball will be used as GO gauge and 4.95 mm ball will be used as NO GO gauge.
c. Uniformity in wall thickness throughout the length of each tube shall be maintained.
d. Internal and outer surfaces must be smooth.
e. Inspection will be carried out in presence of QA Rep.

D. Packaging of lead tubes

a. Each tube should be protected using suitable polythene wrapping over it. It should be done in such a way that no atmospheric air enters into the tube after wrapping it with polythene cover.
b. Ends of each tube should be plugged with soft material.
c. The tubes are to be packed in suitable cushioning material (preferably thermocole) having grooves of suitable size. These tubes packed in thermocole packing, in turn, are to be packed in wooden boxes of suitable size.
d. In one layer of cushioning material, 10 no. of tubes should be accommodated. There can be 5-6 such layers in one wooden box.

E. Note:

1. Production agency can slightly modify I.D. and O.D. of lead alloy tube to get specified linear explosive loading if required in consultation with design agency.
2. The vendor must give 5 no. of lead tubes as sample for linear density test. After confirmation from production agency bulk production of lead tube should start.

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4.2.2 Process Details

Note: 1. Characteristics of explosives to be checked: acidity and melting point Validity period of analysis report: 1 year

2. Hardware provided should be checked and accepted as per ARDE/HEMRL drawing by inspection authorities

3. **Lot size of FLSC are 12 nos each.**

(A) Preparation of FLSC:

1. Cut the lead tube of 600 ± 10 mm length using hack saw.
2. Weigh the empty lead tube.
3. Seal/Crimp one end of it using wooden mallet.
4. Weigh the RDX Grade-I, -15g
5. Fill RDX Gr-I in lead tube
6. Seal/Crimp the other end.
7. Weigh the filled tube and determine the filling weight.
8. All the above weights should be within the limit given in the checklist Table-I (APPENDIX'I'), Reject the tube if not within limit.
9. Check the Rolling machine for its working by running it under no load condition for 5 minutes.
10. Feed the filled tube into grooves of the machine one by one by passing it again at 90° in each of the grooves. Handle the filled tube gently while feeding.
11. Pass the rolled tube through a die of 5.5 mm diameter using Draw Bench. Follow the following steps for this operation.
    (i) Insert the rolled tube into die from the side having higher hole diameter.
    (ii) Pull it gently through the hole of the die using a plier to such an extent that length pulled through die is sufficient to hold it on the locking strip of the Draw bench.
    (iii) Secure the tube on the drum tightly.
    (iv) Lubricate the cord each time using machine oil soaked in cotton cloth.
    (v) Start the machine and guide the tube gently through die by hand.
    (vi) Continuously remove the lead debris deposited on the die during the process.
12. Repeat the activities mentioned under Sl.no 11 using other required dies in descending order of dia.
13. Roll the above tube in flat and shaped rolling machine.

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