MINISTRY OF DEFENCE

PROVISIONAL SPECIFICATION FOR

Hardner EH 411

(Specification No.HEMRL/TRIM/PROP/IM/15)

HEMRL,
SUTARWADI, PUNE - 411021

CONTENTS

0 FOREWORD

0.1 This specification has been prepared by High Energy Materials Research Laboratory, Sutarwadi, Pune-411021

0.2 This specification will be approved by the Ministry of Defence after appropriate sealing action by Controllerate of Quality Assurance (Military Explosives) and will be mandatory for use by Defence Services

0.3 Before sealing action, any queries regarding this specification may be referred to "The Director High Energy Materials Research Laboratory, Sutarwadi, Pune-411021."

1 SCOPE

This specification is intended to govern, supply and assure the quality of Hardner EH 411.. This material is intended for use as an inhibition ingredient .for the booster propellant of "AKASH" Missile/ booster & sustainer propellant of "TRISHUL" Missile/Pinaka/RZ-61/Pechora.

2 RELATED SPECIFICATIONS AND DOCUMENTS - Nil

3 DESCRIPTION OF THE MATERIAL

The material shall be in the form Yellowish brown coloured and viscous liquid.

4 MANUFACTURE

4.1 Hardner EH 411shall be manufactured by a process which will produce the product conforming to this specification.

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

5. **TENDER SAMPLE**

The contractor / supplier shall submit a tender sample of 1 Kg free of each individual (primary sample) batch and 1 Kg from the blended lot (composite sample). Acceptance of the tender will denote that the tender sample is accepted as a standard of supply, in accordance with the terms of this specification.

6. **INSPECTION**

6.1 Hardner EH 411and the containers in which it is packed shall be subjected to inspection and the final approval will be given by the Quality Assurance Officer / Quality Assurance Authority.

6.2 Samples of the material may be withdrawn at random from any portion of the batch /lot / consignment.

6.3 If on examination any sample is found not conforming to the requirements of this specification the whole batch / lot / consignment is liable for rejection.

7 **SAMPLING**

Each sample shall be labelled with date, lot number, and manufacturer's container identification number.

8. **TEST REQUIREMENTS**

Samples taken from any portion of the batch / lot/ consignment of the material shall conform to clause 3 and shall also conform the following test requirements.

Tests:

Sl No.	Characteristics	Passing Standard	Reference to Test Method
1.	Type	Polyamide	-------
2.	Appearance	Yellowish brown colored and viscous liquid	------
3.	Specific gravity, g/cc, at25 ^{0} C	0.97 ± 0.02	Appendix –IM/15/ I DIN 51757
4.	Viscosity CPS at 25 ^{0} C	20000 ± 10000	Appendix –IM/15/II
5.	Amine value mg KOH/g	350 - 400	Appendix –IM/15/III DBI 1012

9 SUPPLIERS INSPECTION OF STORES / CONSIGNMENT

Before tendering the store for inspection the supplier shall carry out a thorough inspection of each delivery to satisfy himself that the store fully conforms to this specification and shall render certificate to that effect to the Quality Assurance Officer / Quality Assurance Authority.

10 WARRANTY

The stores supplied against the contract shall deem to have been warranted against defective material and performance by the contractor / manufacturer for a period of 12 months from the date of receipt of the stores at the consignee's end and if during this period any of the stores supplied is found defective the same shall be replaced by the contractor / manufacturer free of charge at the consignee's premises.

11 PACKING AND MARKING

11.1 Hardner EH 411shall be packed in suitable galvanized steel drums.

11.2 When the material is required to be transported by rail the packing shall conform to the provisions of Indian Railways Conference Association, Red Tariff No.18.

11.3 The inclusion of any foreign matter or impurities in any of the packages shall render the whole consignment liable to rejection.

11.4 All packages containing the material shall be durably and legibly marked with the following details (as applicable):

i. Nomenclature and specification number of the material.
ii. Name and address of the consignee.
iii. S.O. Number and date
iv. Consignment number
v. Lot / Batch number and date of manufacture
vi. Batch No. & date of manufacture
vii. Gross and net weight
viii. Consecutive number of package and total number of packages in the consignment
ix. Date of Supply
x. Contractor's initials or recognized trade mark
xi. Storage temperature limit.

11.5 In addition to the above the Quality Assurance Officer / Quality Assurance Authority may suggest some more markings / identifications considered suitable at the time of inspection.

11.6 The paint used for marking shall conform to IS :138 –1981 and to the satisfaction of the Quality Assurance Officer / Quality Assurance Authority.

12 DEFENCE STORES CATALOGUE NUMBER

Defence Stores Catalogue Number allotted to this store is not allotted.

13 SUGGESTIONS FOR IMPROVEMENT

Any suggestion for improvement in this particular document may be forwarded to "The Director High Energy Materials Research Laboratory, Sutarwadi; Pune-411021"

14 SUGGESTED SOURCE OF SUPPLY

Yuvaraj Chemicals, Pune; Schenectady-Beck India Ltd., Pune; M/s Rakhee Chemicals, Pune

15 SAFETY REQUIREMENT

Supplier should mention about storage conditions and safety measures during handling and transport.

16 APPENDICES

Appendix – IM/15/I

Density

1 **Apparatus:-**

1.1 Thermostatic bath

1.2 Hygrometer (spindle)

2 **Procedure:-** It is determined by DIN 51757 method i.e. determination of density with hydrometer (spindle). Hardner EH411 is filled into the cylinder which is kept in a thermostatic bath having temperature 25°C. When the sample achieves the temperature of the bath (30-40 minutes approx), density is found out by exploring with different hydrometers (spindles), and then correct density is found out with the help of selected hydrometer.

APPENDIX – IM/15/II

Viscosity

1. **Apparatus:-**
   c. Brookfield viscometer (model RVT)
   d. Glass beaker

2. **Procedure:-** It is determined by Brookfield viscometer (Synchro-electric Viscometer, Model RVT) manufactured by Brookfield Engineering Laboratory, USA. Hardner EH411 is taken in a clean cup, which is immersed, in a thermostatic bath at 25° C. When the material attains temperature of 25° C, selected spindle (no.1) is dipped in the material unto the mark. The spindle is rotated at a speed of 0.5 rpm and dial reading is taken when it is constant and viscosity is calculated by multiplying dial reading with the factor.

APPENDIX – IM/15/III

Amide Value

1. **Apparatus:-**
   a. Conical flasks – capacity 100 ml
   b. Graduated glass cylinder – 100 ml
   c. Burette – capacity 10 ml min. div. 0.05 ml
   d. Precision balance (div. 0.0001 gm)
2. **Reagent : -**
   a. Ethylene glycol – Butanol mixture in the proportion 1:1
   a. Hydrochloric acid 0.2 /0.5 N (standardised)
   b. Methyl orange indicator
3. **Procedure:-**
   - Weigh accurately 0.2 – 0.4 gm (sample size as per the expected amine value i.e. higher the amine value lower the sample size & vice versa) in a clean & dry conical flask .
   - Dissolve in about 40 ml Ethylene glycol – Butanol mixture (Reagent 1). Warm if necessary, cool to room temperature.
   - Titrate against standardised HCl using methyl orange as indicator
   - Note the reading (R ml)
4. **Calculation: -**

$$\text{Amine value} = \frac{56.1 \times N \times R}{\text{Weight of sample}}$$

N = Normality of HCl

R= ml. Of HCl required