

*Draft for  
Public Comments*

---

**Draft Zambian Standard**

**BITUMENS FOR BUILDING AND CIVIL ENGINEERING**  
**PART 1: PENETRATION GRADE BITUMENS – Specification**

---

*This draft is for Public Comments  
**ONLY** and should, therefore, **NOT**  
be used or referred to as a  
Zambian Standard*

**ZAMBIA BUREAU OF STANDARDS**

## DATE OF PUBLICATION

This Zambian Standard has been prepared and published under the authority of the Standards Council of the Zambia Bureau of Standards on .....

## ZAMBIA BUREAU OF STANDARDS

The Zambia Bureau of Standards is the Statutory National Standards Body for Zambia established under an act of Parliament, the Standards Act, No 4 of 2017, of the Laws of Zambia for the preparation and promulgation of Zambian Standards.

## REVISION OF ZAMBIAN STANDARDS

Zambian Standards are revised, when necessary, by the issue of either amendments or of revised editions. It is important that users of Zambian standards should ascertain that they are in possession of the latest amendments or editions.

## CONTRACT REQUIREMENTS

A Zambian standard does not purport to include all the necessary provisions of a contract. Users of Zambian standards are responsible for their correct application.

## TECHNICAL COMMITTEE RESPONSIBLE

The preparation of this Zambian Standard was undertaken by the Petroleum Products Technical Committee (TC 4/14) upon which the following organizations were represented:

Afrox Zambia Limited  
Alfred H. Knight (Z) Limited  
Bio Fuels Association of Zambia  
Energy Regulation Board  
INDENI Petroleum Refinery Company Limited  
Konkola Copper Mines Plc  
Lublend Limited  
Ministry of Energy and Water Development – Department of Petroleum  
Mopani Copper Mines Plc  
Puma Energy Zambia Plc  
Tazama Pipelines  
Zambia Bureau of Standards  
Zambia Compulsory Standards Agency  
Zambia Environmental Management Agency

---

**Zambia Bureau of Standards**  
**Lechwe House**  
**Freedom Way South-end**  
**P.O. Box 50259**  
**Lusaka**

**Email:** [zabs@zamnet.zm](mailto:zabs@zamnet.zm) or [infozabs@zamnet.zm](mailto:infozabs@zamnet.zm)  
**Website:** [www.zabs.org.zm](http://www.zabs.org.zm)

## CONTENTS

<b>FOREWORD</b> .....	iii
ACKNOWLEDGEMENT .....	iii
1 SCOPE.....	1
2 NORMATIVE REFERENCES .....	1
3 DEFINITIONS .....	1
4 REQUIREMENTS .....	2
5 SAMPLING AND COMPLIANCE .....	4
6 TEST METHODS .....	4

Draft for Public Comments

## **FOREWORD**

This National Standard has been prepared by the Petroleum Products technical Committee (TC4/14), in accordance with the procedures of ZABS. All users should ensure that they have the latest edition of this publication as standards are revised from time to time.

No liability shall attach to ZABS or its Director, employees, servants or agents including individual experts and members of its Technical Committees for any personal injury, property damage or other damages of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon this ZABS publication or any other ZABS publication.

Over the past years, technological changes in the Petroleum Products sector have occurred. In endeavoring to match up with the regional and international advancements, it was necessary to revise ZS 426.

## **ACKNOWLEDGEMENT**

The Zambia Bureau of Standards would like to acknowledge the invaluable material and financial support of the Energy Regulation Board and all the institutions and stakeholders that contributed in the promulgation of this standard.

**COMPLIANCE WITH A ZAMBIAN STANDARD DOES NOT OF ITSELF CONFER  
IMMUNITY FROM LEGAL OBLIGATIONS**

## ZAMBIA BUREAU OF STANDARDS

### Draft Zambian Standard

# BITUMENS FOR BUILDING AND CIVIL ENGINEERING PART 1: PENETRATION GRADE BITUMENS – Specification

## 1 SCOPE

This part of the Draft Zambian Standard specifies the requirements for penetration grade bitumens which are suitable for use in road construction in Zambia. The penetration grade bitumens are classified into a number of grades for each of which an appropriate designation and properties are specified.

This part of the standard does not cover bitumen emulsions, cut back bitumens or bitumen mixtures containing lake asphalt, coal tar or pitch; such materials are specified in a separate standard. Advice on handling and packaging, and on sampling and testing is given in the Appendices A and B.

## 2 NORMATIVE REFERENCES

The following Publications contain provisions which, through reference in this text, constitute provisions of this standard. All standards are subject to revision and, since any reference to a publication is deemed to be a reference to the latest edition of that publication, parties to agreements based on this standard are encouraged to take steps to ensure the use of the most recent editions of the standards indicated below;

ASTM D 5	Test Method for the Penetration of Bituminous Materials
ASTM D 36	Test Method for the Softening Point of Bitumen (Ring and Ball Apparatus)
ASTM D 113	Test Method for the Ductility of Bituminous Materials
ASTM D 2042	Test Method for the Solubility of Asphalt Material in Trichloroethylene
ASTM D 2872	Test Method for the Effect of Heat and Air on a Moving Film of Asphalt (Rolling Thin Film Oven Test)
ASTM D 4402	Test Method for Viscosity of Bituminous Materials
ZS 396	Sampling Petroleum Products Part 1: Manual sampling of liquid hydrocarbons
ASTM D 92	Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester
EN 1426	Bitumen and bituminous binders – determination of needle penetration
AASHTO T102	Standard Method of Test for Spot Test of Asphaltic Materials
ASTM D140	Standard Practice for Sampling Asphalt Materials

## 3 DEFINITIONS

For the purpose of this standard the following shall apply

### 3.1 Bitumen:

A viscous liquid, or solid, consisting essentially of hydrocarbons and their derivatives, which is soluble in trichloroethylene and is substantially non-volatile and softens gradually when heated. It is black or brown in colour and possesses waterproofing and adhesive properties. It is obtained by a refinery process from petroleum, and is found as a natural deposit or as a component of naturally occurring asphalt, in which it is associated with mineral matter.

## 4 REQUIREMENTS

### 4.1 General

When tested in accordance with the methods of test given in Table 1, the penetration grade bitumen shall be within the limiting requirements given in the table

- 4.1.1 Numbers representing the penetration range designate penetration grade of bitumen specified in this part of the standard. Penetration grades are also referred to using the suffix pen

### 4.2 Storage stability

#### 4.2.1 General

Penetration grade bitumens require storage and handling plant equipped with heating facilities. However, this depends on the grade of bitumen being handled.

- 4.2.2 After conventional storage under normal conditions for a period of up to 6 months after the date of manufacture, the penetration grade bitumen shall comply with all the requirements of this standard.

- 4.2.3 In the case of penetration grade bitumen that is stored for more than 6 months, the product shall comply with the requirements of Table 1. It shall comply with such other requirements as are agreed upon between the supplier and purchaser.

### 4.3 Marking

The following information shall appear in legible and indelible marking on each container or in the case of product being transported in a road tank vehicle, in the storage and consignment documents:

- a) the supplier's name and address
- b) the date of manufacture
- c) the name of the product, e.g. 50/70 pen bitumen
- d) the quantity in kg
- e) the batch/lot number
- f) a statement of safety, health and environment

TABLE 1. REQUIREMENTS FOR PENETRATION GRADED BITUMENS

CHARACTERISTIC	LIMIT	35/50 pen	50/70 pen	70/100 pen	TEST METHOD
Penetration @ 25 °C, 0.1 mm (100 g/ 5s)	Range	35 - 50	50 - 70	70 - 100	EN 1426
Softening Point (ring and ball), °C	Min	49	46	42	ASTM D 36
	Max	59	56	51	
Dynamic viscosity @ 60°C, Pa.s	Min	220	120	75	ASTM D 4402 <sup>a</sup>
Dynamic viscosity @ 135°C, Pa.s	Min	270	220	150	ASTM D 4402 <sup>a</sup>
	Max	700	500	400	
Flash Point, °C		240	230	230	ASTM D 92
<b>Performance when subjected to the rolling thin film oven test:</b>					
a) Mass change, % (by mass fraction)	Max	0.3	0.3	0.3	ASTM D 2872
	Max	300	300	300	ASTM D 4402M <sup>a</sup>
b) Viscosity at 60°C, % of original,	Min	52	48	44	ASTM D 36 <sup>1</sup>
c) Softening Point (ring and ball), °C	Max	7	7	7	ASTM D 36
d) Increase in softening point, °C,	Min	60	55	50	EN 1426
Spot test <sup>2</sup> % xylene	Max	30	30	30	AASHTO T102

<sup>a</sup> Recommended apparatus is the RV viscometer, using SC4 spindles with thermosel system

## **5 SAMPLING AND COMPLIANCE**

### **5.1 General**

This clause applies to the sampling for inspection and testing before acceptance or rejection of single lots (consignments) in cases where no information about the implementation of quality control or testing during manufacture is available to help in assessing the quality of the lot. It is also used as the procedure for adjudicating in cases of dispute.

### **5.2 Sampling**

The relevant sampling procedure as described in ASTM D140 shall be applied in determining whether a lot complies with the appropriate requirements of this part of this standard. The samples so drawn shall be deemed to represent the lot.

### **5.3 Compliance**

The lot shall be deemed to comply with the requirements of this part of ZS 422 if, after inspection and testing, the sample taken in accordance with 5.2 is found to comply with all the appropriate requirements of this part of ZS 422.

Compliance of bitumen with this standard does not guarantee compatibility with various modifiers. Consequently the onus rests with the manufacturer of modified binders to ensure compatibility through testing.

## **6 TEST METHODS**

For all characteristics, use the applicable methods listed in column 7 of Table 1