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Sprinkler head-rotating impact driven type — Test methods

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In order to match with technological development and to keep continuous progress in industries, standards are subject to periodic review. Users shall ascertain that they are in possession of the latest edition

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Foreword

Rwanda Standards are prepared by Technical Committees and approved by Rwanda Standards Board (RSB) Board of Directors in accordance with the procedures of RSB, in compliance with Annex 3 of the WTO/TBT agreement on the preparation, adoption and application of standards.

The main task of technical committees is to prepare national standards. Final Draft Rwanda Standards adopted by Technical committees are ratified by members of RSB Board of Directors for publication and gazettment as Rwanda Standards.

DRS 271 was prepared by Technical Committee RSB/TC 023, *Road vehicles.*

In the preparation of this standard, reference was made to the following standard:

PAES 126: 2002, *Agricultural Machinery — Rotating Sprinkler head — Methods of Test*

The first edition (RS 271: 2015) has been reaffirmed by the Board on dd-mm-2021.

Committee membership

The following organizations were represented on the Technical Committee on *Road vehicles* (RSB/TC 023) in the preparation of this standard.

ATECAR

KENSRIN COMPANY Ltd

MOTA ENGIL

PASCAL Technology Ltd

PURE PRO Ltd

Rwanda Polytechnic/Integrated Polytechnic Regional College Ngoma (IPRC Ngoma)

Rwanda Polytechnic / Integrated Polytechnic Regional College Kigali (RP/IPRC Kigali)

University of Rwanda/College of Science and Technology (UR-CST)

VW Rwanda Ltd

Rwanda Standards Board (RSB) – Secretariat

Sprinkler head-rotating impact driven type — Test methods

1 Scope

This Draft Rwanda Standard specifies the test and inspection methodsfor rotating sprinkler head

It applies to verify the dimensions, weight and materials of construction of sprinkler head and to determine the performance of the device by measuring the discharge capacity, radius of throw and distribution pattern at different base pressures.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

RS 241, *Agricultural Machinery — Methods of sampling*

3 Terms and definitions

For the purposes of this standard, the following terms and definitions apply

3.1

base pressure

pressure measured at a point on the riser with a distance of at least five times the nominal sprinkler inlet diameter from the last upstream direction change or change in pipe cross sectional area

3.2

nozzle

aperture of the sprinkler through which the liquid is discharged

3.3

radius of throw

farthest distance measured from the sprinkler head centreline to a point at which liquid is deposited

3.4

rotating sprinkler head

rotating sprinkler device which by its rotating motion around its vertical axis distributes liquid over an area

4 General conditions for test and inspection

4.1 Sprinkler head on test

In the case of commercially manufactured sprinkler head, the sprinkler head submitted for test shall be taken from production model or series of production and shall be sampled in accordance with RS 241.

4.2 Role of the manufacturer/dealer

The manufacturer/dealer/client should comply with the test procedures of national testing authority.

4.3 Site conditions and test equipment

4.3.1 Sprinkler site

4.3.1.1 The sprinkler shall be located in an area where the surface is smooth or where vegetative growth is less than 8 mm in height.

4.3.1.2 Land shall have a maximum slope of 2 %. A map showing location and heights of windbreaks (trees, shrubs, and other obstructions) shall be included on the test report.

4.3.1.3 Tests shall not be run when these conditions are not satisfied.

4.3.2 Sprinkler mounting

4.3.2.1 The sprinkler nozzle height above the nearest collector(s) for test purposes is defined in Table 1.

Table 1 — Sprinkler nozzle height above collectors

Sprinkler type	Sprinkler inlet size (nominal pipe diameter)	Maximum nozzle height above collector
Riser mounted; rotating	32 mm or smaller	915 mm
Riser mounted; rotating	38 mm or larger	1830 mm
Riser mounted; non-rotating	all	460 mm

4.3.2.2 The sprinkler shall remain vertical (within 1 degree) throughout the duration of the test.

4.3.2.3 The sprinkler riser shall be made from schedule 40 steel pipes. The riser nominal pipe size shall be the same size as the sprinkler inlet connection.

4.3.2.4 The base pressure measurement location shall be defined as a point with a distance of at least five times the nominal sprinkler inlet diameter from the last upstream direction change or change in pipe cross-sectional area.

4.3.2.5 The pressure tap shall be perpendicular to the riser and shall not extend into the inside diameter of the riser. Riser stream straightening vanes may be used when data are collected if such vanes are supplied as standard equipment with the sprinkler.

4.3.3 Collector description and location

4.3.3.1 All collectors used to measure distribution shall be identical. They shall be such that the water does not splash out and such that evaporation is kept to a minimum.

4.3.3.2 The type of collector shall be identified and recorded on the data sheet. If an evaporation suppressant is used, its type and method of application shall be identified and recorded on the data sheet.

4.3.3.3 A square grid pattern of collectors shall be used, with the spacing between collectors being any whole number. The sprinkler shall be located in the centre of a grid square (midway between 4 adjacent collectors).

4.3.3.4 A minimum of 80 collectors shall be maintained such that the tops are level at all times. The maximum spacing of collectors for a predetermined radius of throw is shown in Table 2.

Table 2 — Maximum spacing of collectors for predetermined sprinkler radius of throw

Sprinkler radius of throw (m)	Maximum collectors spacing centre to centre (m
< 3	0.30
3 - 6	0.6
6 – 12	0.75
> 12	1.50

4.3.3.5 The average above ground height of the tops of the 4 collectors near the sprinkler shall either be 0.9 m or 0.3 m above the ground.

4.3.3.6 This measurement shall be reported as collector height.

4.3.3.7 Collectors shall be placed such that the vertical change in height between successive collectors shall not exceed a grade of 2 %.

4.3.4 Wind measuring equipment and location for outdoor tests

4.3.4.1 Wind velocity during the test period shall be determined with a rotating cup anemometer or device of equal or better accuracy.

4.3.4.2 The wind direction shall be determined with a wind vane on the basis of 8 points of the compass (N, S, E, W, NE, NW, SE, SW).

4.3.4.3 Wind velocity sensing equipment shall be located at a minimum height of 4 m.

4.3.4.4 For sprinklers with trajectory height of more than 4 m, the sensor height shall be equal to the highest point of the main stream + 10 %.

4.3.4.5 The wind sensing equipment shall be located outside the wetted area and at a location that is representative of the wind conditions at the sprinkler location.

4.3.4.6 The maximum distance of the sensor location shall not exceed 45 m from the wetted area of the sprinkler under test.

5 Test and inspection

5.1 Verification of the manufacturer's technical data and information

5.1.1 Inspection is carried out to verify the main dimensions, weight and materials of construction of sprinkler head in comparison with the list of manufacturer's technical data and information.

5.1.2 A plain and level surface shall be used as reference plane for verification of dimensional sprinkler head specifications.

5.1.3 The items to be inspected and verified shall be recorded in Annex B.

5.2 Field performance test

5.2.1 The test is carried out to obtain the discharge capacity, speed of sprinkler rotation and radius of throw and sprinkler distribution pattern at base pressures ranging from 170 kPa up to 485 kPa at increments of 35 kPa.

5.2.2 The base pressure shall not vary by more than 3 % during the test period.

5.2.3 Pressure shall be measured and recorded at a point on the riser using pressure measuring devices accurate within + 3 % of the sprinkler test pressure.

5.3 Discharge capacity determination

5.3.1 The test shall be conducted by operating the sprinkler at base pressures indicated in 5.2.1.

5.3.2 The discharge capacity shall be measured using volumetric method.

5.3.3 The rotating sprinkler head is kept stationary by restraining the impact arm from swinging. A hose is then connected to the sprinkler nozzle while a container is placed on the other end of the hose opening.

5.3.4 The container shall have sufficient capacity to prevent the liquid from overflowing during measurement, and it shall be sufficiently rigid to prevent deformation when it is filled with liquid.

5.3.5 The liquid shall be obtained in a container of known volume for a definite time usually one minute.

5.3.6 The discharge capacity or sprinkler flow rate shall be computed using the following formula:

$$Q = \frac{V}{t}$$

where

Q is the discharge, L/s;

V is the volume of liquid introduced into container in t seconds;

t is the time required to introduce liquid of volume V, s.

5.3.7 The flow through the sprinkler shall be measured to an accuracy of ± 3 % of the sprinkler flow rate.

5.4 Radius of throw determination and sprinkler's speed of rotation

5.4.1 The test shall be conducted by operating the sprinkler at base pressures indicated in 5.2.1.

5.4.2 The radius of throw shall be taken by computing the average of two measurements (r1 and r2) made when the sprinkler base is rotated a quarter revolution (90°) about its axis (See Figure 1).

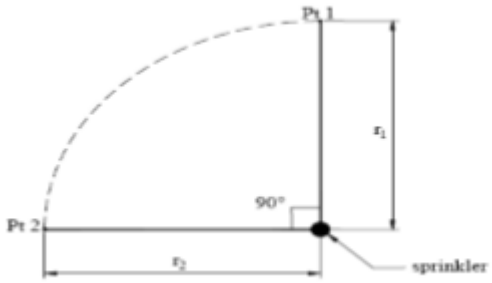

Figure 1 — Measurement of radius of throw

5.4.3 Three test trials shall be conducted.

5.4.4 The sprinkler's speed of rotation shall be measured only while the sprinkler is rotating from its own drive mechanism.

5.5 Distribution pattern

5.5.1 The conditions for testing shall be in accordance with 4.3.

5.5.2 The test shall be conducted by operating the sprinkler at base pressures indicated in 5.2.1.

5.5.3 The depth of application in each collector shall be determined to an accuracy of + 2 % of the average application depth and recorded in a table showing the location of the collector relative to the sprinkler.

5.5.4 Items to be measured shall be recorded in Annex C.

6 Test report

Test report shall include the following information:

a) name of testing agency;

b) test report number;

c) title;

d) summary;

e) purpose and scope of test;

f) methods of test;

g) table 1 — Machine specifications;

h) table 2 — Field performance test data;

i) observations; and

j) name and signature of test engineer.

Annex A
(normative)

Inspection sheet for sprinkler head

Name of applicant:.....

Address:.....

Telephone No.:.....

Name of distributor:.....

Address:.....

Name of Manufacturer:.....

Factory address:.....

General information

Brand:.....Model:.....

Type:.....

Production date of sprinkler head to be tested (if available):.....

Table A.1 — Items to be inspected

Items	Manufacturer's specification	Verification by testing authority
A.1 Dimensions and weight of the sprinkler		
A.1.1 Overall length, mm		
A.1.2 Overall width, mm		
A.1.3 Overall height, mm		
A.1.4 Weight, kg		
A.2 Specifications		
A.2.1 Sprinkler head		
A.2.1.1 Type		
A.2.2 Nozzle		
A.2.2.1 Type		

A.2.2.2 Size, mm		
A.2.2.3 Material		
A.2.2.4 Mode of attachment		

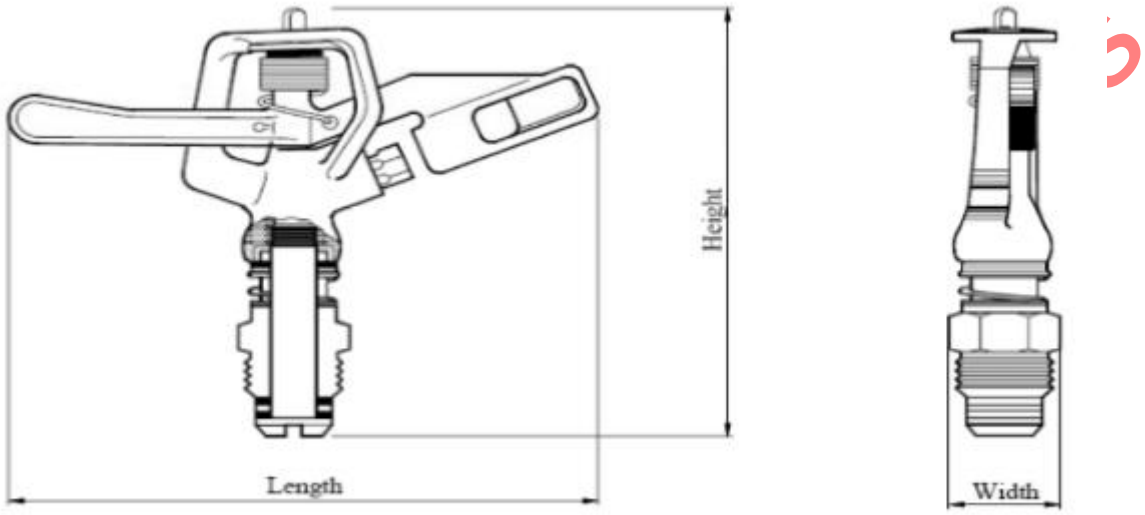

Figure A.1 — Measurement of length, width and height of sprinkler head

Annex B
(normative)

Field performance test data sheet

B.1 Sprinkler head on test

Brand.....

Model:.....

Date of test:.....

B.2 Test conditions

Ambient temperature

Dry bulb, oC:.....

Wet bulb, oC:.....

Relative humidity, %:.....

Atmosphere pressure, mb:.....

Wind speed at 4 m elev., m/s:.....

B.3 Discharge capacity, sprinkler's speed of rotation and radius of throw

Table B.1 — Measurement values

Base Pressure kPa	Discharge capacity* L/s			Discharge capacity* L/s		Time for one rotation* s
	Nozzle 1	Nozzle 2	Total	300 mm riser	1000 mm riser	
170						
205						
240						
275						
310						
345						
380						
415						

450						
485						
*Average of three test trials						

B.4 Sprinkler distribution test data sheet

B.4.1 Collector height: .....

B.4.2 Collector entrance diameter: .....

B.4.3 Sketch of test area: .....

B.4.3.1 Location of sprinkler: .....

B.4.3.2 Location of climatic measuring equipment: .....

B.4.3.3 Wind direction during test period: .....

B.4.3.4 Distance from sprinkler to all windbreaks (upwind, downwind, and to side): .....

B.4.3.5 Heights of all windbreaks

B.4.3.6 Map of sprinkler distribution pattern.....

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