

PHILIPPINE NATIONAL STANDARD

PNS/BAFS 323:2021

Agricultural Tramline System – Methods of Test



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Foreword

In 2016, the Philippine Council for Agriculture and Fisheries (PCAF) –Agricultural and Fishery Mechanization Committee (AFMeC) issued Resolution No. 6, series of 2016 (Endorsing to the DA Secretary through the BAFS the Identified Agricultural Fisheries Machinery, Equipment and Infrastructures for Philippine Agricultural Engineering Standards [PAES]/ PNS Development and Updating) endorsing the development of a PNS for ATS. A Technical Working Group (TWG) was created to develop the PNS under Special Order No. 817, series of 2021 (Addendum to Special Order No. 81 series of 2021 entitled, “Creation of TWG for the Development of PNS for Agriculture and Fishery Products, Machinery, and Equipment”), which is composed of representatives from relevant government agencies, academe, research institution, and private sector. The draft PNS underwent a series of TWG meetings and stakeholder consultations conducted via online platforms before their endorsement to the Secretary for approval.

This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2.

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1 Scope

This standard specifies the method for the conduct of a system test for the completely installed Agricultural Tramline System (ATS). Specifically, it shall be used to:

- 1.1 verify the mechanism, dimensions, materials, accessories of the system, and the list of specifications submitted by the test applicant;
- 1.2 determine the performance of the system;
- 1.3 evaluate the ease of handling and safety features; and
- 1.4 prepare the report for the test results.

2 Normative References

The following documents are referred to in the text in such a way that some or all of their contents constitute the 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:

Bureau of Agriculture and Fisheries Standards (BAFS) — Department of Agriculture (DA). (2021). Agricultural Tramline System — Specifications (PNS/BAFS 322:2021).

3 Terms and Definitions

For the purpose of this standard the following terms and definitions shall apply.

3.1 Agricultural Tramline System (ATS)

used for the conveyance of agriculture and fishery products/inputs on farm areas not accessible by any service road, and where hauling is a problem brought about mainly by different obstacle of terrain such as rivers, ravines, and steep mountain slopes

3.2 carriage

A device that supports the carrier along the traction cable of the ATS

3.3 carrier

part of the ATS where agriculture and fisheries products and inputs for transport are loaded

3.4 carrier capacity

maximum weight carried from Tower A to B

3.5

maximum cable linear speed

maximum allowable speed of the carrier moving through the traction cable

3.6

cable sag

ratio of the difference in deflection of the cable without the carrier and the deflection of the cable when the carrier is positioned at the midpoint without any load to the horizontal distance from Tower A to Tower B expressed in percentage, %

3.7

traction cable

cable that facilitates the movement of the carrier from tower A to tower B

3.8

tower

serves as support to pulleys and cables

3.8.1

tower A

tower near the service road (see Figure 1)

3.8.2

tower B

tower near the production area (see Figure 1)

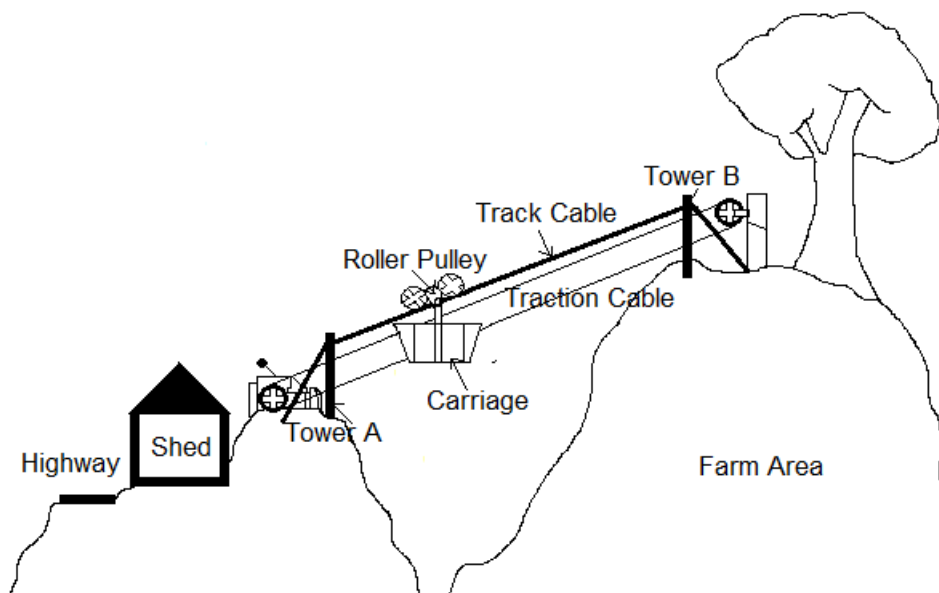


Figure 1. Typical drawing setup of a bicable ATS

4 General Conditions for Test

4.1 Role of the Test Applicant

The test applicant shall submit specifications, signed brochure, system design, and other relevant information about the ATS. They shall abide with the terms and conditions set forth by the recognized testing authority.

4.2 Role of the Test Representative of the Test Applicant

The test applicant may designate an official representative to operate, demonstrate, adjust, and witness the actual testing. It shall be the duty of the representative to make all decisions on matters of adjustment and preparation of the system for testing.

4.3 Role of the Test Engineer

The certified test engineer shall lead the conduct of the performance testing in accordance with the provisions of this standard. Furthermore, the test engineer shall oversee other relevant activities prior to and after the conduct of the testing.

4.4 Test Site Conditions

The following conditions shall be ensured prior to the conduct of the system test:

4.4.1 The test shall be conducted on a completely installed system.

4.4.2 There shall be provision for workspace that is suitable for normal working condition.

4.5 Suspension/Termination of Test

If during the test run, the system stops due to major component breakdown or malfunction that could affect its performance, the test may be suspended. Troubleshooting should be done within four hours. In the event that troubleshooting extends to more than prescribed time or the system will not be able to continue to operate, the test shall be terminated.

5 Material Inspection

5.1 Sample materials shall be provided by the test applicant and submitted to Metals Industry Research and Development Center (MIRDC) for compliance to the reference standards specified in PNS/BAFS 322:2021 (Agricultural tramline system – Specifications). Certifications from MIRDC shall then be submitted to a recognized testing authority for verification.

6 Test Preparation and Pre-test Observation

6.1 Preparation of the ATS for Testing

The representative of the test applicant and recognized testing authority shall check the ATS so as to ensure that the system has been assembled and installed in accordance with the instruction of the manufacturer. The recognized testing authority

shall test the ATS according to the recommended settings and conditions set by the test applicant.

6.2 Test Instruments and other Materials

The suggested list of minimum field test equipment needed to carry out the ATS system test is shown in Annex A (List of minimum field test equipment and materials). The test instruments shall be calibrated regularly and physically checked and cleaned for operation before and after each test. The testing authority shall prepare a checklist of instruments and materials to be used shall before departure for and returning from the site.

6.3 Running-in and Preliminary Adjustments

The ATS shall undergo a running-in period before starting the test. During the running-in period, the various adjustments of the ATS shall be made according to the recommendation of the test applicant.

6.4 Verification of Specifications

The specifications claimed by the manufacturer and the physical details given in Annex B (Specifications of ATS) shall be verified by the testing agency.

7 Performance Test

7.1 Operation of the ATS

The ATS shall be operated for sufficient duration with and without load at the recommended setting of the test applicant using the manufacturer's recommended setting. The recognized testing authority shall record all necessary measurements, which form part of the test. No other adjustments shall be permitted during the test.

7.2 Test Trials

A minimum of three test trials shall be adopted.

7.3 Data Collection

7.3.1 Duration of Test

The duration of each test trial shall start from the loading of agriculture and fishery products to the carrier at Tower B, and shall end until the carrier returns to Tower B without the load.

7.3.2 Carrier Capacity

Before the test, load the carrier with materials (e.g. sand or stone) with total weight equal to 100% of the maximum carrier capacity as specified by the manufacturer. The loads shall be uniformly distributed throughout the carrier.

7.3.3 Noise Level

The noise emitted by the system, with and without load, shall be measured using a sound level meter both at the location of the operators and haulers. The noise, expressed in dB(A), shall be taken approximately 5 cm away from the ear level of the operators and haulers.

7.3.4 Speed of Components

The speed of the rotating shaft of the major components of the ATS shall be taken using a tachometer, with and without load.

7.3.5 Maximum Cable Linear Speed

Along the traction cable, mark two points, A and B, with at least a 5-m distance. Record the time it takes for point A to pass through any reference point until the time it takes for point B to pass through the same reference point. Calculate the linear speed using the formula in Annex C (Formula used during calculations and testing).

7.3.6 Maximum Cable Sag

The cable sag of both track and traction cable shall be determined based on calculations from Annex C (Formula used during calculations and testing) and as shown in Figure 2.

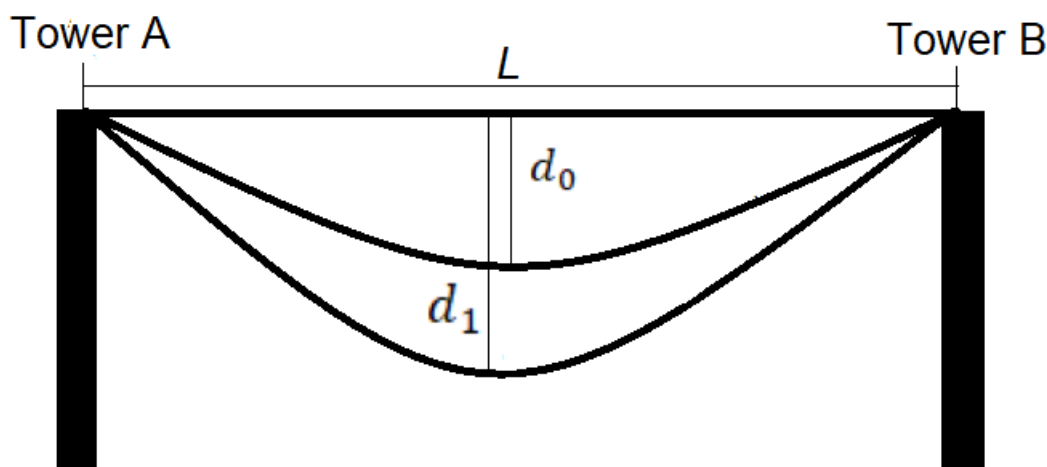


Figure 2. Drawing setup for determining the cable sag

7.3.7 Fuel Consumption

Total operating time of the engine from the time it started until the time it stopped shall be recorded. To get the amount of fuel consumed, refill method shall be used. Fill the tank to full capacity or to a certain level before the test. After the test, fill the tank with measured fuel to the same level before the test. When filling up the fuel tank, extra attention shall be paid to keep it horizontal and to ensure that empty space is not left inside.

7.4 Data Recording and Observations

Record sheet for all data and information during the test is given in Annex D (Performance test data sheet). Observations to be taken during the performance test shall be recorded.

8 Data Analysis

8.1 Presentation of Results

System specifications and the results of the test shall be presented in tabular form in which data shall be taken from Annexes A (Specifications of ATS) and D (Performance test data sheet). A schematic diagram of the system layout shall also be included. Observations made on the system while in operation shall be supported with photographs.

9 Formula

The formulas to be used during calculations and testing are given in Annex C (Formula used during calculations and testing).

10 Test Report

The test report shall include the following information in the order given:

10.1 Name of Testing Authority;

10.2 Test Report Number;

10.3 Title;

10.4 Summary of Results (including the performance compared with the criteria);

10.5 Observations;

10.6 Purpose and Scope of Test;

10.7 Methods of Test;

10.8 Description of the System;

10.9 Specifications;

10.10 Results and Discussions;

10.11 Other observations (include pictures); and

10.12 Names, Signatures and Designations of Test Engineer/s.

Annex A
(Informative)

List of minimum field test equipment and materials

EQUIPMENT/MATERIAL	QUANTIY
A.1 Tachometer (contact type or photo electric type)	1
A.2 Sound level meter Range: 30 to 130 dB(A)	1
A.3 Measuring tape (minimum: 100 m)	2
A.4 Caliper	3
A.5 Weighing scale (100 kg capacity)	1
A.6 Graduated cylinder (1000 mL)	
A.7 Camera	
A.8 Timer	1

Annex B
(Informative)

Specifications of ATS

Name of Applicant : _____
Address : _____
Tel. No. : _____

Name of Manufacturer : _____
Address : _____
Tel. No. : _____

GENERAL INFORMATION

Make : _____ Type : _____
Serial No. : _____ Brand/Model : _____
Date of Manufacture : _____
Testing Agency : _____ Test Engineer : _____
Location of Test : _____ Date of Test : _____

Item		Manufacturer's Specification	Verification by the Testing Authority
B.1	Engine House		
B.1.1	Material of construction		
B.2	Engine		
B.2.1	Brand		
B.2.2	Model		
B.2.3	Make or manufacturer		
B.2.4	Serial number		
B.2.5	Type		
B.2.6	Rated power, kW		
B.2.7	Rated speed, rpm		
B.2.8	Displacement, cm ³		
B.2.9	Fuel type		
B.2.10	Fuel tank capacity, L		
B.2.11	Cooling system		
B.2.12	Starting system		
B.2.12.1	Battery		
B.2.13	Condition (brand new/remanufactured)		
B.3	Drive Sheave Assembly		
B.3.1	Drive sheave pulley diameter, mm		
B.3.2	Bearing		
B.3.2.1	Number		
B.3.2.2	Type		
B.3.2.4	Material		
B.3.3	Shaft diameter, mm		

Item		Manufacturer's Specification	Verification by the Testing Authority
B.3.4	Frame material		
B.4	Carrier Assembly		
B.4.1	Carrier		
B.4.1.1	Overall dimensions, L x W x H, mm		
B.4.1.2	Material		
B.4.1.2.1	Gate		
B.4.1.2.2	Wall		
B.4.1.2.3	Base		
B.4.1.2.4	Carriage		
B.4.2	Roller hitch assembly		
B.4.2.1	Roller pulley diameter		
B.4.3	Traction cable hitch assembly		
B.4.3.1	Material		
B.5	Cable		
B.5.1	Track cable		
B.5.1.1	Material		
B.5.1.2	Diameter, mm		
B.5.1.3	Length, m		
B.5.2	Traction cable		
B.5.2.1	Material		
B.5.2.2	Diameter, mm		
B.5.2.3	Length, m		
B.6	Tower		
B.6.1	Number		
B.6.2	Material		
B.7	Loading/Unloading Platform		
B.7.1	Tower A		
B.7.1.1	Material		
B.7.1.2	Dimensions, m		
B.7.2	Tower B		
B.7.2.1	Material		
B.7.2.2	Dimensions, m		
B.8	Type of Brake System		
B.9	Safety Devices		
B.10	Special Features		

Annex C (Normative)

Formula used during calculations and testing

C.1 Fuel Consumption

$$F_{cr} = \frac{F_v}{T}$$

where:

F_{cr}	is the fuel consumption rate (L/h)
F_v	is the volume of fuel consumed (L)
T	is the fuel time (h)

C.2 Cable Sag

$$s = \frac{d_1 - d_0}{L} \times 100$$

where:

s	is the cable sag (%)
d_1	sag of cable with cable dead load and carrier dead load (m)
d_0	sag of cable with cable dead load (m)
L	horizontal distance from Tower A to Tower B (m)

C.3 Cable Linear Speed

$$S_l = \frac{D_t}{T_t}$$

where:

S_l	is the cable linear speed (m/min)
D_t	is the traveling distance (m)
T_t	is the traveling time (min)

Annex D
(Informative)

Performance test data sheet

Test Trial No. : _____ Date : _____
 Test Engineers : _____ Location : _____
 Assistants : _____ Machine : _____
 Test Applicant : _____ Manufacturer : _____

ITEM	Trial 1	Trial 2	Trial 3	Average
D.1 Weight of load, kg				
D.2 Speed of components, rpm				
D.2.1 Engine shaft				
D.2.1.1 Without load				
D.2.1.2 With load				
D.2.2 Intermediate shaft				
D.2.2.1 Without load				
D.2.2.3 With load				
D.2.3 Traction cable pulley shaft				
D.2.3.1 Without load				
D.2.3.2 With load				
D.3 Linear speed of traction cable pulley, m/min				
D.3.1 Without load				
D.3.2 With load				
D.4 Noise level, dB(A)				
D.4.1 Operator				
D.4.1.1 Without load				
D.4.1.2 With load				
D.4.2 Hauler				
D.4.2.1 Without load				
D.4.2.2 With load				
D.5 Cable sag, %				
D.5.1 Track cable				
D.5.2 Traction cable				
D.6 Fuel time, min				
D.7 Fuel consumed, L				
D.8 Fuel consumption, L/h				

D.1 Other observations

D.1.1 Ease of cleaning the system

D.1.2 Ease of adjusting and repairing of parts

D.1.3 Safety

D.1.4 Failure or abnormalities that may be observed on the system during and after the operation.

D.1.5 Others

Annex E
(Informative)**Description of system****E.1 Coordinates**

Components	Coordinates	
	Longitude	Latitude
Towers		
Engine house		
Shed		

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