
Guide line for weaving process

ICS: 59.080.01

Published by Ethiopian Standards Agency
©ESA

Foreword

This Ethiopian Standard has been prepared under the direction of Technical Committee for Textile-Fabrics (TC 70) and published by the Ethiopian Standards Agency (ESA).

In preparing this Ethiopian Standard the draft is presented by Ethiopian Textile Industries Development Institute (ETIDI)

Acknowledgement is made for the use of information from the above publication.

DRAFT STANDARD

Guide line for weaving process

1. Scope

This Ethiopian standard specifies the guideline for weaving process which deals with production, quality and maintenance.

2. Normative reference

The following referenced documents are indispensable for the application 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.

ES ISO 8116-4 : Textile Machinery And Accessories- Beams For Winding Part 4: Test Methods And Quality Classification Of Flanges For Weavers' Beams, Warpers' Beams And Sectional Beam

ES ISO 9902-6 Textile Machinery—Noise test Code—Part 6:- Fabric Manufacturing Machinery

ES ISO 2012 : Textile Machinery And Accessories - Cone Sectional Warping Machines

ES ISO 9902-5 : Textile Machinery—Noise Test Code—Part 5: Weaving And Knitting Preparatory Machinery

ES ISO 11111-5 : Textile Machinery- Safety Requirements- Part 5: Preparatory Machinery To Weaving And Knitting

ES ISO 11111-6 : Textile Machinery - Safety Requirements - Part 6: Fabric Manufacturing Machinery

ES ISO 10787-3 : Textile Machinery And Accessories - Heald Frames Part 3: Guides For Heald Frames

ES ISO 9473-2 : Textile Machinery And Accessories — Strip Steel For Dents Of Reeds

ES ISO 9001 Quality Management System

ES 6702 Guideline for sustainable Textile production

ES 6583 Code of Practice for Grading of Textile Fabrics

3. Terms and definition

For the purpose of this standard the following definitions shall be apply

3.1.

maintenance planning

the maintenance management activity that is carried out to prepare the maintenance plan. It consists of a "structured set of tasks that include activities, procedures, resources and the time scale required to carry out maintenance".

3.2.

Maintenance Scheduling

a process in which different maintenance tasks or activities are assigned to resources and then placed within certain time windows in order to be accomplished.

3.3.

machine Auditing

a Systematic and documented process generally carried out in textile mills to examine the mechanical condition of the various process machineries.

3.4.

Re-winding

A process that rewind the cone/cheese to get the required package for the purpose of warping process.

3.5. Warping

A process aimed to present a continuous length of yarn to the succeeding process with all ends continuously present and with the integrity and elasticity of the yarn as wound fully preserved.

3.6.

Warping creel

An integral part of the machine which is used to hold the yarn packages in position for warping.

3.7.

direct Warping

a warping process, mostly used for winding the same colored yarns at the same time.

3.8.

Sectional warping

a warping process, in which two successive sections are wound at different time interval.

3.9.

Sizing

A process of applying glue and adhesive chemicals to warp yarn in order to increase the strength of yarn, hence it help to reduce the breakage during weaving.

3.10.

Drawing – in

A process of passing every warp end through the drop wire, heddle eye, and reed dent.

3.11.

Weaving

The interlacing of two systems of yarns (warp yarns which are lengthwise threads and weft yarns which are crosswise threads), which interlaced at right angle to each other.

4. GUIDE LINES FOR PRODUCTION AND QUALITY

4.1. General guidelines for quality and production

4.1.1. Weaving production planning, organizing, leading, controlling and evaluation system should able to clearly define at each level of managements.

4.1.2. Weaving plan should be prepared and machineries to be balanced based on the actual conditions and weaving machines to be allotted to achieve the target.

4.1.3. It should be follow yearly, monthly, weekly and daily production plan

- 4.1.4. Actual woven production should be evaluated at least weekly based on the available data and should be compared with the estimation and standard.
- 4.1.5. There should be a system for continuously monitoring the individual operator's output and efficiency periodically and the low efficiency operators should be re-trained.
- 4.1.6. Necessary waste bins should be provided for collection of waste to make the department housekeeping neatly.
- 4.1.7. Raw material, Work-in-process materials and finished goods should be covered to avoid fluff and dust accumulation.
- 4.1.8. Awareness and refreshment training should be given to employees as it is needed accordingly.
- 4.1.9. The required temperature and humidity should be maintained throughout the production process.
- 4.1.10. Machine break downs should be recorded for analyzing and corrective and preventive actions should be taken.
- 4.1.11. Standard operating procedures (SOP) or work instructions should be given to operators and carried out the work as specified and should be monitored accordingly.
- 4.1.12. Management information system related to activities such as labor, machinery status, raw material, production, etc. should be checked according to the quality and production plan.
- 4.1.13. Quality plan should be developed in order to achieve the customer's requirements
- 4.1.14. Weaving Operators should be aware and trained for better cleaning of machineries.

4.2. Process based guidelines for quality and production in weaving process

4.2.1. Store

- 4.2.1.1. For each processes the package (cone, sheese, and beam) should be colored and labeled to differentiate from others as per the order and material specification.
- 4.2.1.2. The stock lots (bin cards) should have a display of details with quantity.
- 4.2.1.3. Process wastes should be transferring with Transfer Voucher and the actual waste received by the yarn store should be tallied.
- 4.2.1.4. Good housekeeping should be maintained.
- 4.2.1.5. Floor space should be marked with yellow lines and lots should be stored within the lines to avoid mix-up and easy quantification.
- 4.2.1.6. Enough space should be allocated or separate waste store should be established for storage of wastes.

4.2.2. Rewinding

- 4.2.2.1. All the cones shall be identified by color/sticker.
- 4.2.2.2. Depending on the subsequent process requirements, the package should contain to the maximum of yarn laid on it.

- 4.2.2.3.** Separate stocking of remnant cones on count, quality, and lot wise is to be followed accordingly.
- 4.2.2.4.** The duration of remnant cone/cheese that is stored in stock should be limited
- 4.2.2.5.** Separate waste study should be carried out and machine settings need to be change for better rewinding if it is necessary.
- 4.2.2.6.** Quality control should have system to monitor the cob webbing, hard edge, slough off, patterning, irregular shape of package and cleaning efficiency according to the defined quality plan for effective usage

4.2.3. Warping

- 4.2.3.1.** Creel capacity should be fully utilized.
- 4.2.3.2.** The density of the yarn throughout the warper beam shall be uniform as possible and its shape shall be cylindrical
- 4.2.3.3.** Machine setting and process parameters should be uniform among warping machines for the same yarn length and count.
- 4.2.3.4.** Yarn breakage study should be conducted and machine settings should be optimized to reduce breakage.
- 4.2.3.5.** Warping beams should have identification stickers with necessary details
- 4.2.3.6.** To ensure correct warp yarn content in each beam, yarn length and weight monitoring should be recorded.
- 4.2.3.7.** The warping production should be monitored as per machine and shift wise to avoid back process shortage.
- 4.2.3.8.** Shift and machine wise waste should be weighed and recorded for corrective action.
- 4.2.3.9.** The breakage rate should be monitored.
- 4.2.3.10.** Proper working of creel fans should be required.
- 4.2.3.11.** The length measuring motion should be accurate

4.2.4. Sizing

- 4.2.4.1.** Sizing beams should have identification stickers with necessary details
- 4.2.4.2.** Sizing production, efficiency, and stoppage should be recorded for better monitoring of the performance.
- 4.2.4.3.** For every beam, yarn stretch and yarn migration should be checked and recorded for corrective action.
- 4.2.4.4.** Size pickup % should be measured and recorded for every sized beam.
- 4.2.4.5.** Complaint on Bad/soft beams received from loom shed should be recorded for corrective action.
- 4.2.4.6.** Proper stocking of size materials to be ensured as ES 6702

4.2.4.7. The breakage rate should be record and monitored.

4.2.4.8. Sized beams should be stacked neatly with proper identification. Beam to be covered with sheets to maintain quality

4.2.5. Weaving loom

4.2.5.1. Speed should be monitored and deviation to be minimized as per articles

4.2.5.2. Machine should be free from fluff to give good performance.

4.2.5.3. Extra heald wires to be removed at every article change to reduce warp breaks.

4.2.5.4. Utilization % to be improved for productivity. While, the following Performance related points should be checked : beam gaiting and knotting, maintenance, reed change, etc (see Annex B)

4.2.5.5. Different wastes to store at proper places for reconciliation and good housekeeping.

4.2.5.6. Weekly summary of weaver wise defects and defect wise % is to be followed for improving quality.

4.2.5.7. Looms should work with proper droppers as required for the articles

4.2.5.8. It should be followed Yearly, monthly, weakly and daily production plan

4.2.6. Grey fabric Inspection

The grey fabric inspection should be done according to ES 6583

5. GUIDELINE FOR MAINTENANCE

5.1. General guidelines for machinery and equipment's maintenance

5.1.1. Yearly preventive maintenance plan and schedule should be prepared for each machine considering the following main factors and has to be followed strictly: -

- a) Manufacturer's Recommendations.
- b) Quality level required.
- c) Condition of the Machines – Technology & Age
- d) Type of raw material used.
- e) Process parameters Maintained.
- f) Atmospheric conditions.

5.1.2. Working procedures/standard operating procedures should be prepared for preventive maintenance, corrective maintenance, operator care and lubrication so as to have repeatable process, capture knowledge, train new employees, and reduce self-induced failures.

5.1.3. Root cause analysis should be done in the weaving industry.

5.1.4. Minimum stock of critical spares should be identified and maintained based on the machinery manufacturer's recommendation and the factory's actual performance and experience for the sake of effectiveness the management should be proactive to deliver the spares in time.

5.1.5. Basic setting of machineries should be checked and ensured periodically as per the schedules.

5.1.6. Machine history record card should be maintained for each and every machine.(Annex A)

- 5.1.7. Machine audit should be done during schedule cleaning to keep up the machine for better quality and performance. (Annex C)
- 5.1.8. Machineries should be prioritized according to equipment condition, consequence and risk to the business.
- 5.1.9. Total Productive Maintenance (TPM) should be implemented.
- 5.1.10. Consumable spares should be replaced in time as per manufacturer's recommendation and the factory's standard to avoid production loss.
- 5.1.11. Locks should be provided and the machineries doors should be kept in locked condition for safety and good performance.
- 5.1.12. Every break down, stoppage or Failure data should be record machine and reason wise for Failure Reporting, Analysis, Corrective Action System
- 5.1.13. System of periodical checking should be in place to functioning of photo cells, stop motions, door safety, metal detector, fire detectors and housekeeping, etc
- 5.1.14. Suitable lubricant recommended by the manufacturer should be selected and the frequency of applying should be review and optimize according to the existing situation of the company.

5.2. Section based guidelines for machinery and equipment maintenance

5.2.1. Re-winding

- 5.2.1.1. Package holder shall be checked as it holds the package firmly
- 5.2.1.2. Cone holders setting to be done periodically to avoid bad shaped cone formation
- 5.2.1.3. Spinning cop shall be not damaged.
- 5.2.1.4. Tension device shall be checked frequently
- 5.2.1.5. Traverse device shall be checked and corrected periodically
- 5.2.1.6. Cleaning should be done frequently

5.2.2. Warping

- 5.2.2.1. Machine cleaning shall be done regularly once in a shift by the cleaners to improve the performance
- 5.2.2.2. Creel shall be fully utilized
- 5.2.2.3. Package drive mechanism shall be work properly
- 5.2.2.4. Machine setting shall be alter according to article running
- 5.2.2.5. Yarn pre-loader tension setting and beam pressure settings shall be checked

5.2.3. Sizing

- 5.2.3.1. Braking mechanism of the sizing creel shall be checked as it to maintain constant warp sheet tension
- 5.2.3.2. Sizing machine squeezing rollers can be in cracked condition during life service, and it shall be have periodical cleaning program, to be replaced or re-rubberizing shall be done
- 5.2.3.3. Worn out Teflon coated rolls are to be replaced during Preventive maintenance.

5.2.3.4. The flange of weavers beam shall be checked and normal

5.2.3.5. The lease rod shall be straight and less one number than the warper beam on sizing creel.

5.2.4. Drawing- in

5.2.4.1. The reed and harness frame shall be checked periodically and it should not be cracked

5.2.5. Loom shed

5.2.5.1. The let-off should able to release the yarn at the same feeding rate)

5.2.5.2. The back rest of the weaving machine shall not be cracked and should able to give uniform tension to the warp yarn

5.2.5.3. The harness frame with their heald eye wires should be checked

5.2.5.4. Drop wire shall be cleaned and checked as it should not be cracked and twisted

5.2.5.5. Reed on which reed dent is available shall be defect free

5.2.5.6. The take-up roller should able to take the fabric formed at uniform tension, the roller shall be checked

5.2.5.7. Template should able to grip the fabric edge tightly.

5.2.5.8. Weft insertion tools should be smooth, not cracked to minimize the weft yarn breakage

Annex A
(Informative)
Machine History Template

Section:		Machine name:		Manufacturer:		Machine No: 1		power:	
Model:			Country of origin:		manufactured year:		Date of commissioning:		
Manufacturer address:						price:			
						length, width and height:			
Major Replacement on the Machine									
Date	Part Number	Spare Part Used	QTY	Price	Maintenance Done	Type of Maintenance	Engaged Technician	Maintenance Cost	signature

Annex B

(Normative)

Quantitative Guide line for weaving process

SN	Deliverable Parameters	Unit of measure	International Benchmark Values	Existing Factory Situation
1	Winding			
1.1	Rewinding production	Kg/shift	7.2	
1.2	Rewinding efficiency	%	70-73	
1.3	Atmospheric conditions at Rewinding			
1.3.1	Temperature	⁰ C	27-30	
1.3.2	Relative humidity	%	60-65	
1.3.3	Hard waste	%	0.4	
2	Warping			
2.1	High speed warping machine speed	Meter/min.	1000	
2.2	High speed warping machine production	Meters/shift	150000 for 20Ne	
			100000 for 40Ne	
			100000 for 60 Ne	
2.3	High speed sectional warping speed	Meters/min	500	
2.4	High speed sectional warping production	Meters/shift	60000 for 20Ne	
			60000 for 40Ne	
			50000 for 60 Ne	
2.6	Number of ends per wrapper beam	ends	400-500	

SN	Deliverable Parameters	Unit of measure	International Benchmark Values	Existing Factory Situation
2.7	warping knot tail length	mm	5-6	
2.8	Warp breakage			
2.8.1	Super high speed warping machine	Warping stops/400 ends/1000mts	0.2	
2.8.2	Super high speed sectional warping machine	Warping stops/400 ends/1000m	0.4	
2.9	Efficiency of warping machine			
2.9.1	high speed warping machine	%	65	
2.9.2	high speed sectional warping machine	%	50	
3	Sizing			
3.1	High speed 7cylinder sizing machine speed	Meters/min	65	
3.2	High speed 7cylinder sizing machine production	Meters/shift	30000 for 20Ne & 40Ne	
			25000 for 60Ne	
3.3	Mechanical yarn stretch	%	1	
3.4	gain in strength and loss in elongation at break of sized yarn			
3.4.1	Up to 40s	%	>25 Gain in strength	
			<15 Loss in elongation	

SN	Deliverable Parameters	Unit of measure	International Benchmark Values	Existing Factory Situation
3.5	Dead loss	%	15	
3.6	Variation in size pick up	%	±1	
3.7	Migration of ends (for cylinder sizing).			
3.7.1	Up to 40s	No. of ends/1000 ends/1000mtrs	1	
3.8	Set change waste per set	meter	45-50 sized yarn + 25 grey yarn	
3.9	Bad beam/soft beams	%	0.02 of sizing production	
3.10	Doffing time	Min.	3.5	
3.11	Mending time pre lapper	min	1.5	
4	Drawing in			
4.1	Drawing – in production	Ends per pair of persons/shift	5500	
5	Loom shade			
5.1	Knotter productivity	ends/person/shift	13000	
5.2	Knotter speed	Knots/min	88	
5.3	Loom speed			
5.3.1	Dorrier loom	rpm	500	
5.3.2	Dobby loom	rpm	500	
5.3.3	Tappet loom	rpm	500	
5.3.4	Vamatex loom	rpm	500	
5.4	Warp and weft stoppages per hours up to 40s			

SN	Deliverable Parameters	Unit of measure	International Benchmark Values	Existing Factory Situation
	Rapier loom		Warp /Weft stops/hr.	
5.4.1	Twill	stops/hr	1.2/0.7	
5.4.2	Denim	stops/hr	1.1/0.75	
5.4.3	Plain	stops/hr	0.7/0.75	
5.4.4	Poplin	stops/hr	1.4/0.7	
5.5	Cause wise snap Efficiency Losses %	% Total	12	
5.5.1	Interference of warp and weft	%	7.5	
5.5.2	Repair	%	1.0	
5.5.3	Beams Gaiting/knotting	%	2.5	
5.5.4	Lubrication and cleaning.	%	0.5	
5.5.5	Others	%	0.5	
5.6	Man power in shuttle less loom weaving shed	Looms/person	8-16	
5.7	Helper reliever	Weaver/helper	3	
5.8	Material handler (weft and cloth carrier)	Loom/person	48	
5.9	Fitter/maintenance	Looms/person	24	
5.10	Expected operatives per 100 loom shift	No operators per 100 loom shift	23-32	
5.11	Beam Knotting timing	Min/end	0.012	
5.12	Beam gaiting without sort change:			
5.12.1	Single width loom	Hrs.	1-3	
5.12.2	Double width loom	Hrs.	3-8	

SN	Deliverable Parameters	Unit of measure	International Benchmark Values	Existing Factory Situation
5.13	Beam gaiting with sort change:			
5.13.1	Single width loom	Hrs	8	
5.13.2	Double width loom	Hrs	16	
5.14	Loom Hard waste level			
5.14.1	For leno and false selvedge on loom	mm	20-80 per pick	
5.14.2	False selvedge	ends	4-20 in false selvedge	
5.14.3	Total hard waste in weaving	%	1.8	
5.15	Machine productivity per loom	Meters /Day	400(rapier)	
6	Maintenance & utility			
6.1	Total maintenance cost/ Total manufacturing cost	%	10-15%	
6.2	Planned maintenance/ Total maintenance	%	>85%	
6.3	unplanned down time	%	~0%	
6.4	Reactive maintenance	%	<15%	
6.5	Maintenance overtime/ Total company overtime	%	<5%	
6.6	work order reworked/Total work orders	%	~0%	
6.7	Preventive maintenance total hours PM/ Total maintenance hours available.	%	~20%	

SN	Deliverable Parameters	Unit of measure	International Benchmark Values	Existing Factory Situation
6.8	Planned Reactive maintenance: Total hours PRM/total maintenance hours	%	~20%	
7	Overall efficiency			
7.1	Over all Weaving plant utilization	%	98	
7.2	Over all Weaving plant efficiency	%	94	
8	Quality Inspection			
8.1	Missing ends	10.1	Missing ends	
8.2	Float	10.2	Float	
8.3	Brocken	10.3	Brocken	
8.4	Slough off	10.4	Slough off	
6.7	Preventive maintenance total hours PM/ Total maintenance hours available.	%	~20%	
6.8	Planned Reactive maintenance: Total hours PRM/total maintenance hours	%	~20%	
7	Overall efficiency			
7.1	Over all Weaving plant utilization	%	98	
7.2	Over all Weaving plant efficiency	%	94	
8	Quality Inspection			

SN	Deliverable Parameters	Unit of measure	International Benchmark Values	Existing Factory Situation
8.1	Missing ends	10.1	Missing ends	
8.2	Float	10.2	Float	
8.3	Brocken	10.3	Brocken	
8.4	Slough off	10.4	Slough off	
8.5	Stain	10.5	Stain	
8.6	Slubs	10.6	Slubs	
8.7	Hard waste level	10.7	Hard waste level	
8.8	double pick	10.8	double pick	
8.9	Fabric inspection system	10.9	Fabric inspection system	
8.10	Fresh woven fabric percentage (A grade)	%	99	

Annex C (Normative)

Sample Machine Audit Checklist for weaving process

		Grading			Remarks
S.N	Condition Of Components	V.	Good	Poor	
	Re-Winding				
1	Package holder condition				
2	Spinning cop condition				
3	Guide rod condition				
4	Tension device condition				
5	Yarn clearer condition				
6	Traverse condition				
7	Package condition (diameter, yarn coil, strength,				
	Warping				
8	Warping beam flange				
9	Warping creel condition				
10	Tension disc condition				
11	Pressure drum				
12	Machine speed condition				
13	Air fun condition				
14	Brake Torque				
	Sizing				
15	Squeezing roller condition				
16	Rollers alignment				
17	Drying cylinders condition				
18	Lease rod				
19	Adjustable comb				
20	Sized yarn tensioner				
21	Brake Torque				
22	Weavers beam condition				
	Drawing-in				
23	Heald frame condition				
24	Eyelet wire condition				
	Weaving Loom				
25	Let-off condition				
26	Back and front rest				
27	Drop wire condition				
28	Warp stop motion condition				
29	Heald frame condition				
30	Reed condition				

31	Template condition				
32	Weft accumulator				
33	Take-up roller				
34	Rapier tape				
34	Weft yarn selector				

DRAFT STANDARD

Organization and Objectives

The Ethiopian Standards Agency (ESA) is the national standards body of Ethiopia established in 2010 based on regulation No. 193/2010. ESA is established due to the restructuring of Quality and Standards Authority of Ethiopia (QSAE) which was established in 1998.

ESA's objectives are:-

- ❖ Develop Ethiopian standards and establish a system that enable to check whether goods and services are in compliance with the required standards,
- ❖ Facilitate the country's technology transfer through the use of standards,
- ❖ Develop national standards for local products and services so as to make them competitive in the international market.

Ethiopian Standards

The Ethiopian Standards are developed by national technical committees which are composed of different stakeholders consisting of educational institutions, research institutes, government organizations, certification, inspection, and testing organizations, regulatory bodies, consumer association etc. The requirements and/or recommendations contained in Ethiopian Standards are consensus based that reflects the interest of the TC representatives and also of comments received from the public and other sources. Ethiopian Standards are approved by the National Standardization Council and are kept under continuous review after publication and updated regularly to take account of latest scientific and technological changes. Orders for all Ethiopian Standards, International Standard and ASTM standards, including electronic versions, should be addressed to the Documentation and Publication Team at the Head office and Branch (Liaisons) offices. A catalogue of Ethiopian Standards is also available freely and can be accessed in from our website.

ESA has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of ESA.

International Involvement

ESA, representing Ethiopia, is a member of the International Organization for Standardization (ISO), and Codex Alimentarius Commission (CODEX). It also maintains close working relations with the international Electro-technical Commission (IEC) and American Society for Testing and Materials (ASTM). It is a founding member of the African Regional Organization for standardization (ARSO).

More Information?

Contact us at the following address.

The Head Office of ESA is at Addis Ababa.

☎ 011- 646 06 85, 011- 646 05 65

☎ 011-646 08 80

✉ 2310 Addis Ababa, Ethiopia

E-mail: info@ethiostandards.org,

Website: www.ethiostandards.org



Standard Mark