

SCHEDULE – 12

Washing Machines

1. Scope

This schedule specifies the requirement for participating in the energy labelling scheme for Domestic Semi Automatic Washing Machines and Fully Automatic Washing Machines i.e. Front load and Top Load Washing machines.

The Standard adopted is Indian Standard for Washing machine i.e. IS 14155 ‘Domestic **Electric Clothes Washing Machines for Household Use-Specifications**’. The referred standard is **IEC 60456**.

2. Schedule of tests

Test Parameters

Test Parameters for initial verification and check testing of Domestic washing machines are as given below:

Performance Tests:

- a. Energy and Water consumption
- b. Determination of Wash Performance
- c. Water Extraction Efficiency
- d. Rinsing efficiency

Safety Tests:

- a. Protection against Electric Shock
- b. Input
- c. Temperature Rise Test
- d. IR and Leakage Current at Operating temperatures
- e. IR and Electric Strength
- f. Endurance

Method of Tests:

The testing code and method of tests for washing machine will be IS 14155 with following exceptions/additions.

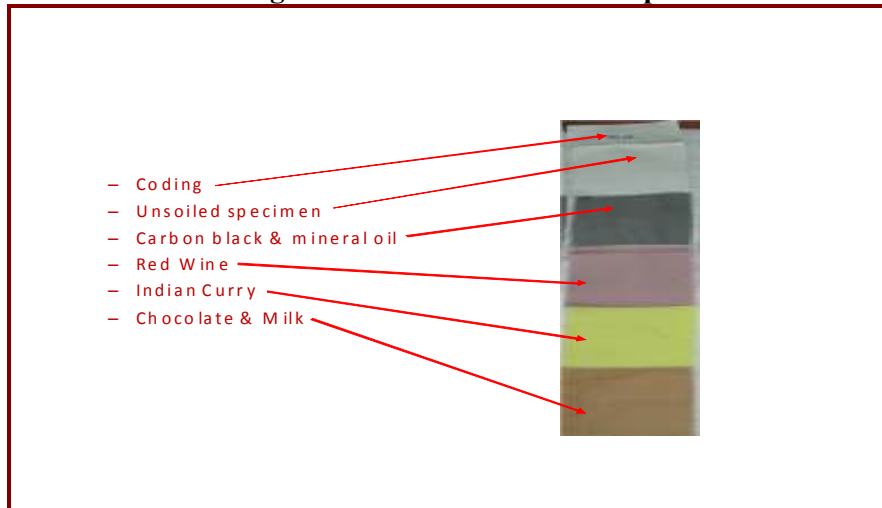
- (i) Water temperature for all performance tests except Energy and water consumption to be maintained as given in **table 2.1**

Table 2.1: Water temperatures

Machine Type	Temperature in °C
Semi Automatic	48±2
Top Loading fully automatic	48±2
Front Loading fully automatic	50±2

- (ii.) Water temperature for Energy and water consumption test is to be maintained at $27^{\circ}\text{C} \pm 1$.
- (iii.) For washing performance test, total 3 number of cycles need to be performed to get average soil removal.
- (iv.) For preparation of soiled strips for carrying out wash performance test, Pig's blood soiling is replaced with Indian Curry soiling considering its practical aspect and day-to-day usability under Indian condition
- (v.) Red Wine soiling is to be done with Indian Red Wine 'Riviera' in place of Alicant's Red Wine.
- (vi.) Composition of soiling solutions and details/brands of constituents used is at **Appendix-A**. Schematics of a soiled strip are provided at **Fig 1**.

Fig 1: Schematics of Soiled Strip



(vii.) Soiling Standards

Soiling standards to be followed for unwashed soiled strips are at **table 2.2**.

Table 2.2: Proposed reflectance standards

S. No.	Type of Soiling	% R values to be maintained
1	Carbon Soiling	25±5
2	Indian Curry	25±5
3	Red Wine	40±5
4	Cocoa & Milk	19±5

- (viii.) Detergent to be used for the testing of washing machines is :
 - Surf Excel Matic for Front load fully automatic washing machines
 - Surf Excel Matic for Top load machines/Semi Automatic machines.

* This detergent brand is to be used for testing as it was used for evolving labels for this program. Once standard detergent composition is reviewed and evolved for this

program, surf excel would be replaced by standard detergent composition in the schedule.

- (ix.) Dosage of detergent to be used for testing of washing machines will be as given under in **Table 2.3**.

Table 2.3: Detergent Dosage for Different machines

Semi Automatic		Front Loading		Top Loading	
Rated Capacity (Kg)	Dosage (gms)	Rated Capacity (Kg)	Dosage (gms)*	Rated Capacity (Kg)	Dosage (gms)*
5-6	55	5.5	55	6-7	65
6-6.5	60	6.5	60	-	-
6.5-7.0	65	-	-	-	-
7.0-7.5	70	-	-	-	-

* For Front Loading and Top loading fully automatic machines, first priority should be given to feed detergent as per the requirement of the machine for specific program selection. In case, machine doesn't instruct regarding quantity of detergent to be fed, detergent should be fed as per quantity provided in **table 2.3**.

- (x.) Method of loading the base load and strips in the washing machine will be per IEC 60456 procedures. Sample feeding pattern for one type of machine is at **Appendix -B**.
- (xi.) As per IS14155, heavy cotton load is to be used for testing along with soiled strips. So the program selection would be '**Heavy cotton/linen normal soiled**'. The selected program for individual machine should match with this standard program.
- (xii.) Duration of various cycles for Semi automatic machines are as given in **table 2.4**. The program time for fully Automatic washing machines would be as per the program selection for that machine.

Table 2.4: Time duration of different cycles

Cycle time	
Operation	Time (minutes)
Wash	15
Rinse	10
Spin*	5+5

* As most of the Semi Automatic machines give cycle time of 5 minutes in one go for one cycle of spinning, two cycles of spin of each of 5 minutes duration would be required to do spinning of the entire washed/rinsed load.

- (xiii.) Built in water heating system in washing machine is not considered for this program.
- (xiv.) Total number of wash cycles/machine/annum is assumed as 317.

3. Tolerance

Tolerance as specified in the IS 14155 can be taken. However there shall be no tolerance for star rating band. The average product tested must be at par or better than the label threshold.

4. Safety Criteria

Washing machines shall qualify to the minimum safety standard as per IS 302-2-7

5. Star Rating Plan

The star Rating plan for various category/capacity washing machines is given in **table 5.1 to table 5.2.**

Table 5.1: Semi Automatic Category Washing Machine

Energy Consumption (kWh/kg) Semi Automatic		
MAX.	MIN.	Star Band
0.0173 \geq	\geq 0.0157	1 Star
0.0157 $>$	\geq 0.0143	2 Star
0.0143 $>$	\geq 0.0130	3 Star
0.0130 $>$	\geq 0.0117	4 Star
$<$ 0.0117		5 Star

Table 5.2: Fully Automatic Category Washing Machine

Energy Consumption (kWh/kg) Fully Automatic		
MAX.	MIN.	Star Band
0.0186 \geq	\geq 0.0169	1 Star
0.0169 $>$	\geq 0.0154	2 Star
0.0154 $>$	\geq 0.0140	3 Star
0.0140 $>$	\geq 0.0126	4 Star
$<$ 0.0126		5 Star

6. Additional Parameters

The following benchmarks should be ensured by the manufacturer with relevant test reports .These would be additional parameters verified other than energy consumption in the BEE check/challenge testing of the sample drawn.

6.1 % Soil removal of soiled strips for the machine after wash performance test should be \geq 80%.

6.2 All washing machines should inform water consumption for the complete cycle on the label. Actual water consumption should not be more than 110% of the stated water consumption by manufacturer.

6.3 Water retention in Water Extraction test shall not exceed (<) 75%.

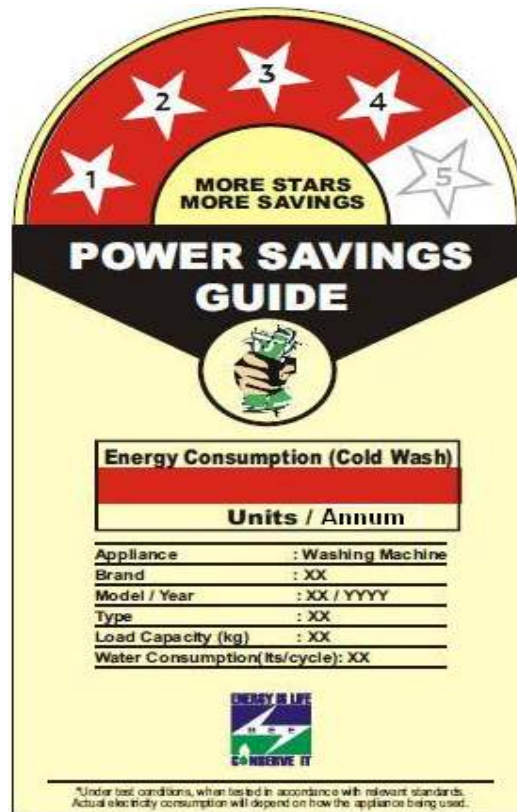
6.4 Rinsing Efficiency should be ≤ 2.25 .

7. Sampling Plan

The samples will be picked up by BEE or its designated agency for testing from either manufacturer facility or warehouse or the dealer. Sample size will be one per each capacity.

8. Label Design, Manner of Display

8.1 The sample label on the product will be as given below.



9. Manner of Display of Label

The label shall be applied on the Front/ Top base of the product, so as to be prominently visible on the product.

10. Test report Format

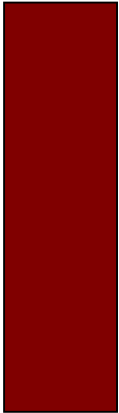
Test report format for reporting of results shall be as per **Appendix- C**

11. Fees

- a)** Registration fee is payable on application for assignment of authority is Rs.1000/- (One thousand only).
- b)** Registration fee is payable on application for renewal of authority to affix labels is Rs. 500/- (Five hundred only).
- c)** Labelling fee for affixation of label on each piece of Washing Machine is Rs.30/- (Thirty only).

Appendix-A

Composition of Various Soiling Solutions



Composition of Various Soiling Solutions

1. Composition for Carbon Soiling Mixture:

The soiling mixture was prepared by using 10% (w/w) carbon powder paste in a mineral oil. The requisite paste (16g/l) and mineral oil (4g/l) were diluted to 1 liter using carbon tetrachloride as a solvent.

2. Composition for Red Wine Soiling:

The red wine (brand name –Riviera) was used for red wine soiling.

The wine was diluted with acetone (1:1 ratio) and applied on the fabric. To get even deposition on the fabric even passages were given.

3. Composition for Indian Curry Soiling:

The mixture was made by mixing the turmeric powder (1g), chilly powder (1g), common salt (1g) and 10 ml of distilled water in an edible oil (refined sun flower oil) (90ml). The stock solution was heated to fuming state (for 5 min.), cooled and used for experiment. The water present in oil was evaporated during cooking at due to high temperature. The requisite amount of stock solution (30g) was diluted to 1 liter using carbon tetrachloride as solvent.

4. Composition for Cocoa Milk Mixture:

The cocoa powder (32 g) and sugar (15 g) was dispersed in 1 liter hot milk (full cream – Amul Gold), mixed thoroughly and cooled to 40°C and applied on the fabric.

List of material manufactures / suppliers used for preparation of Soiled Strips in Washing Machine Labeling program

- 1 **Carbon Powder** (1000 mesh)
Laboratory reagent
- 2 **Mineral Oil**
MFG: Castrol GTX Extra
Castrol India Ltd.
Technical knowledge partner -Mahakali Caves Road Chakala
Andheri (east) Mumbai.
- 3 **RED WINE**
Brand name: Riviera (batch no. RR-!/08)
Mfg.-sayadari valley, champagne Indage Ltd.
Narayan gaon.-Maharashtra
- 4 **Cocoa Powders**
MFG –Cadbury India Ltd.
19 Bhulabhai Desai Road
Mumbai-400026
- 5 **Milk-**
MFG ‘AMUL GOLD’
PASTURISED MILK containing Fat 6.0% (Minimum SNF 9.0%)
MFG. BY AMUL
Gujarat co-op- milk marketing federation ltd
Aanand -388001
- 6 **SUGAR**
Available From Local Market
- 7 **EDIBLE OIL (Refine edible sun flower oil)**
Mfg: Agro Tech Foods Ltd
31, Sarojini Devi Road, Secunderabad-500 003 A.P.
- 8 **TURMERIC POWDER**
MFG: KITCHEN XPRESS OVERSEAS Ltd
29/p Santej –Vadsar Road Kalol (N.G) - 382 721
Dist. Gandhinagar, Gujarat
- 9 **Chili Powders**
Mfg: Ramdev Food products Pvt. Ltd
Spice World, Changodar-382 213

10 Salt (Tata salt iodine –vacuum vaporated)

Mfg: TATA chemicals Ltd.

Bombay House, 24 Homi Modi Street, Fort
Mumbai 400 001

11 Fabrics for Standard Soiling

M/S Arvind Ltd.

Naroda Road Ahmedabad-380025

12 Fabrics for White Load

M/S Ashima Textiles

Near Anupam talkies, Khokhara Ahmedabad





13 Spectro photometer –Spectra flash SF-600

Supplied by:

Data color Asia Pacific HK Ltd.

Hong Kong




























Appendix-B











































LOADING SEQUENCE for HORIZONTAL AXIS WASHING MACHINE				
FRONT LOADING WASHING MACHINE				
TEST LOAD 5.5 KG				
SR. NO.	GROUP	CLOTHS	PICTURE	NO. OF CLOTHES
1	1	BED SHEET		1
2		T-SHIRT		2
3		STRIP WITH TEA TOWEL		1
4		HANDKERCHIEVES		3
5		BED SHEET		1
6		T-SHIRT		2
7		STRIP WITH TEA TOWEL		1
8		HANDKERCHIEVES		3
9	2	BED SHEET		1
10		T-SHIRT		2
11		STRIP WITH TEA TOWEL		1
12		HANDKERCHIEVES		3
13		BED SHEET		1
14		T-SHIRT		2
15		STRIP WITH TEA TOWEL		1
16		HANDKERCHIEVES		3
17	3	BED SHEET		1
18		T-SHIRT		2
19		STRIP WITH TEA TOWEL		1
20		HANDKERCHIEVES		3
21		BED SHEET		1
22		T-SHIRT		2
23		STRIP WITH TEA TOWEL		1
24		HANDKERCHIEVES		3


































LOADING SEQUENCE for HORIZONTAL AXIS WASHING MACHINE

FRONT LOADING WASHING MACHINE

TEST LOAD 6.5 KG

SR. NO.	GROUP	CLOTHS	PICTURE	NO. OF CLOTHES
1	1	BED SHEET		1
2		T-SHIRT		2
3		STRIP WITH TEA TOWEL		1
4		HANDKERCHIEVES		3
5		BED SHEET		1
6		T-SHIRT		2
7		STRIP WITH TEA TOWEL		1
8		HANDKERCHIEVES		3
9		BED SHEET		1
10		T-SHIRT		1
11		HANDKERCHIEVES		3
12	2	BED SHEET		1
13		T-SHIRT		2
14		STRIP WITH TEA TOWEL		1
15		HANDKERCHIEVES		3
16		BED SHEET		1
17		T-SHIRT		2
18		STRIP WITH TEA TOWEL		1
19		HANDKERCHIEVES		3
20	3	BED SHEET		1
21		T-SHIRT		2
22		STRIP WITH TEA TOWEL		1
23		HANDKERCHIEVES		3
24		BED SHEET		1
25		T-SHIRT		2
26		STRIP WITH TEA TOWEL		1
27		HANDKERCHIEVES		3

LOADING PATTERN FOR WASH PERFORMANCE TEST						
TOP LOADING WASHING MACHINE (5-6 Kg)						
SR. NO.	GROUP	CLOTHS	PICTURE	POSITION	QUADRANT	NO. OF CLOTHES
1	1	BED SHEET		LEFT		1
2		T-SHIRT		FRONT		3
3		STRIP WITH TEA-TOWEL		FRONT		1
4		BED SHEET		RIGHT		1
5		T-SHIRT		REAR		1
6		HANDKERCHIEVES		REAR		5
7		STRIP WITH TEA-TOWEL		REAR		1
8	2	BED SHEET		FRONT		1
9		T-SHIRT		RIGHT		3
10		STRIP WITH TEA-TOWEL		RIGHT		1
11		BED SHEET		REAR		1
12		T-SHIRT		LEFT		1
13		HANDKERCHIEVES		LEFT		5
14		STRIP WITH TEA-TOWEL		LEFT		1
15	3	BED SHEET		RIGHT		1
16		T-SHIRT		REAR		3
17		STRIP WITH TEA-TOWEL		REAR		1
18		BED SHEET		LEFT		1
19		T-SHIRT		FRONT		1
20		HANDKERCHIEVES		FRONT		5
21		STRIP WITH TEA-TOWEL		FRONT		1

LOADING SEQUENCE for VERTICAL AXIS WASHING MACHINE						
TOP LOADING WASHING MACHINE						
TEST LOAD 6.5 KG						
SR. NO.	GROUP	CLOTHS	PICTURE	POSITION	QUADRANT	NO. OF CLOTHES
1	1	BED SHEET		FRONT		1
2		T-SHIRT		LEFT		2
3		STRIP WITH TEA TOWEL		LEFT		1
4		HANDKERCHIEVES		REAR		4
5		BED SHEET		RIGHT		1
6		T-SHIRT		FRONT		2
7		BED SHEET		LEFT		1
8		HANDKERCHIEVES		REAR		2
9		STRIP WITH TEA-TOWEL		REAR		1
10		T-SHIRT		RIGHT		2
11		HANDKERCHIEVES		RIGHT		2
12	2	BAD SHEET		FRONT		1
13		STRIP WITH TEA-TOWEL		FRONT		1
14		T-SHIRT		LEFT		2
15		HANDKERCHIEVES		REAR		4
16		BAD SHEET		RIGHT		1
17		STRIP WITH TEA-TOWEL		RIGHT		1
18		T-SHIRT		FRONT		2
19		HANDKERCHIEVES		REAR		2
20		T-SHIRT		RIGHT		1
21		HANDKERCHIEVES		RIGHT		2
22	3	BED SHEET		FRONT		1
23		T-SHIRT		LEFT		2
24		STRIP WITH TEA-TOWEL		LEFT		1
25		HANDKERCHIEVES		REAR		4
26		BED SHEET		RIGHT		1
27		T-SHIRT		FRONT		2
28		HANDKERCHIEVES		REAR		2
29		STRIP WITH TEA-TOWEL		REAR		1
30		T-SHIRT		RIGHT		1
31		HANDKERCHIEVES		RIGHT		2

LOADING SEQUENCE for VERTICAL AXIS WASHING MACHINE						
TOP LOADING WASHING MACHINE						
TEST LOAD 7.0 KG						
SR. NO.	GROUP	CLOTHS	PICTURE	POSITION	QUADRANT	NO. OF CLOTHES
1	1	BED SHEET		LEFT		1
2		T-SHIRT		FRONT		2
3		STRIP WITH TEA-TOWEL		FRONT		1
4		BED SHEET		RIGHT		1
5		T-SHIRT		REAR		1
6		HANDKERCHIEVES		REAR		3
7		BED SHEET		FRONT		1
8		T-SHIRT		LEFT		2
9		STRIP WITH TEA-TOWEL		REAR		1
10		T-SHIRT		RIGHT		1
11		HANDKERCHIEVES		RIGHT		2
12	2	BED SHEET		RIGHT		1
13		T-SHIRT		FRONT		2
14		STRIP WITH TEA-TOWEL		LEFT		1
15		BED SHEET		REAR		1
16		T-SHIRT		LEFT		1
17		HANDKERCHIEVES		LEFT		3
18		BED SHEET		REAR		1
19		T-SHIRT		REAR		2
20		STRIP WITH TEA-TOWEL		RIGHT		1
21		BED SHEET		RIGHT		1
22		T-SHIRT		FRONT		1
23	HANDKERCHIEVES		FRONT		2	
24	3	BED SHEET		REAR		1
25		T-SHIRT		LEFT		2
26		STRIP WITH TEA-TOWEL		LEFT		1
27		HANDKERCHIEVES		FRONT		3
28		BED SHEET		LEFT		1
29		T-SHIRT		REAR		2
30		STRIP WITH TEA-TOWEL		RIGHT		1
31		HANDKERCHIEVES		FRONT		2

Appendix-C

Test Report

Sr. No.	Parameters	Requirement as per Schedule	Actual values	Remarks
1	Energy Consumption (kwh/complete cycle)			
Performance Tests				
2.	Washing Performance	% Soil Removal \geq 80%		
3.	Rinsing Efficiency (Amount of Wash Alkali/kg of load)	\leq 2.25		
4.	Determination of Water Extracting Efficiency	Water retention < 75%.		
5.	Water Consumption	\leq -----		
Safety Tests				
6.	Protection against Electric Shock			
7.	Input			
8.	Temperature Rise Test			
9.	IR and Leakage Current at operating practices			
10.	IR and Electric Strength			
11.	Endurance			