CLUSTER DEVELOPMENT PROJECT

BHAGALPUR BIHAR
2008/2009

DESIGN DOCUMENT

FABRIC DEVELOPMENT
PRODUCT CONCEPTUALISATION AND DEVELOPMENT

CLUSTER NAME	Nath Nagar
CITY	Bhagalpur
STATE	Bihar
CRAFT	**HANDLOOM**

submitted to ILFS ***by*** **HRISHIKESH,** Design Consultant, Delhi - 20 April 2009

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1
INTRODUCTION

Design and Product Development with weavers cluster in Nathnagar, Bhagalpur is based on the observations and assessments of the existing designs, skill, infrastructure and equipment. During last few interventions I worked with master weavers on various possibilities of Fabric Development. The method was direct as well as distant design support. We developed a specification sheet format based upon their looms. It helps tremendously in record keeping as well as in fast communication. We also worked upon developing multiple weave structures on a single warp through Blanket Technique and Tie-up Changing Technique.

Through my experience and knowledge of working with weavers' clusters I planed to implement The Design Intervention in following stages -

- Assessment of Skill, Infrastructure, Products and Process

- Developing Specification sheet format in accordance with skill and equipments

- Conceptualizing Themes, Seasons and Color Pallette.

- Conceptualising Product Range

- Meeting Master Weavers and Traders to explain the concept of specification and its implementation

- Introducing Specification Sheet for new fabric development

The New Fabrics developed in accordance with the above stages will be used for developing co-ordinated product ranges.

2

RESEARCH AND ANALYSIS

Equipments, Raw Materials, Dyeing, Fabrics and Weave Designs, Product Range

2
RESEARCH AND ANALYSIS

Analysis of Reeling and Warping Equipment

Reeling Equipment - Cycle-wheel *Charkha*
Bobbins - Wooden or Plastic bobbins
Warping Equipment - Creel and Warping Drum
Creel Capacity - Mostly 60 -80 to 110, sometimes 140 also
Drum Width - 50 to 70 inches
Drum Circumference - Mostly 1.5-2.5, sometime bigger also
Length Measurement -Spring & Lock System

Analysis of Weaving Equipment

Loom -	Pit-loom
Width -	40 inches to 60 inches
Warp beam -	Mostly 1, rarely use extra beam
Headles -	Cotton or nylon headles, rearly use metal headles
No. of Frames -	Mostly 2 - 8; sometimes 10-12 also
Reed -	Normal Iron Reed; No Bamboo or Steel reed
Reed Count -	8s - 80s; sometimes above 80s also
No. of Peddles -	2 - 10
Technique -	Independent Frame Technique
Fly-wheel -	No fly-wheel on beater
Take-up Motion -	No 5-wheel take-up motion
Gear system -	No gear system for uniform ppi
Dobby -	No Dobby
Jacquard -	No Jacquard

2
RESEARCH AND ANALYSIS

Analysis of Various Yarns

Cotton - 10s, 20s, 32s, 40s, 8/2s, 10/2s, 20/2s, 40/2s, 60/2s, 80/2s.
Mercerized Cotton - 80/2s, 100/2s, 120/2s
Spun Silk - 60/2, 120/2, 140/2, 210/2, 240/2
Tussar Silk- 33/37
Staple - 14/2, 15/2, 10/2, 20/2, 34/2
Noil - 2s, 4s, 6s, 7s, 10s, 20s, 30s
Throster (85) - 20/2, 25/2, 27/2, 30/2
Matka Noil - 20s, 6s, 10s
Muga Silk - 72/2, 60/1, 33/1
Linen - 10, 14, 20, 25, 40, 50, 60
Fancy Yarns - Acrylic, Wool, Tussar *Gheecha,* Viscose *Lub-Lub*, Moti *Lub-Lub*, Viscose Flag *(Jhandi),* Fancy Cotton, *Kela* Silk, Lurex, *Payal* etc. in Various Counts

Throster (85) - Silk

Lub-Lub - Viscose

Spun Silk

Acrylic

Noil 7s - Silk

Noil 4s - Silk

Jhandi - Viscose

Moti Lub-Lub - Viscose+Cotton

Stapel - Viscose

Analysis of Dyes for Silk

Acid Dyes -

Pros -Best dye for solid color dyeing of silks
-Economical and simple to use
-Beautiful vibrant colors

Cons -Needs hot simmering water
-Most have poor fastness to washing
-Light fastness varies from color to color

Fibre Reactive Dyes -

Brand names include Remazol (Multifilla), Procion, Levafix (USA) & Dylon

Pro's-Excellent wash and light fastness
-Economical and Easy to use
-Does not need hot water.

Con's-Colors are still vibrant, but shift on silks
-Need to use with the proper chemicals

Analysis of Production Technology and Equipment Upgradation

No loom have basic dobby and jacquard as an attachment however most of the weavers can handle upto 10 frames with 10 peddles using *Independent Frame Technique* for complicated designs and booties - **and they know it as dobby which shows their sheer ignorance and lack of knowledge about dobby.**

- Dobby is an equipment mounted above frames on the top of the loom or besides frames at the side of the loom and helps weavers to impart complicated weaves through only one peddle as design is punched on a card and mounted on dobby which automatically lifts frame/s (2-16) as per design requirement only through peddling of one peddle!

The weavers know *Independent Frame Technique* as dobby due to lack of knowledge and ignorance of Weavers' Service Center. However, the purpose of *Independent Frame Technique* and Dobby is same but dobby is much more convenient, faster and versatile than its counterpart.

Also, no loom is fitted with **5-Wheel Motion, Fly Wheel and Drop Box** which help enormously in enhancing design possibility, quality and speed of weaving.

This clearly has an adverse impact on the design possibility and productivity of looms. While the weavers feel the need for upgradation of their pit looms to frame looms or with other technical attachments to enhance design possibilities and productivity, financial resources remain a constraint..

2
RESEARCH AND ANALYSIS

Fabrics and Designs

The traditional raw material of Bhagalpur is Tussar and a variety of fabrics are being woven using various tussar yarn. However, now a days weavers are also using cotton, linen, noil and other silk, lurex and other fancy yarns for fabric development as per market requirement. During resent past weavers observed a lot of changes in the design and variety of fabrics as more an more weavers started using varied raw materials and more frames on the loom. The various designs and weaves can come under following categories -

Silk Leno

TT (Tasar-Tasar)

Korea-Kores

Crape

Silk-Noil

Silk-Dupion

Tasar-mulbery

TS (Tasar-Stepal)

Tasar-Viscose

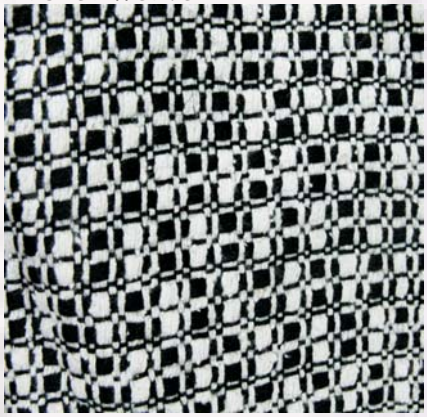
Noil-noil

2
RESEARCH AND ANALYSIS

Type of Weaves and Designs

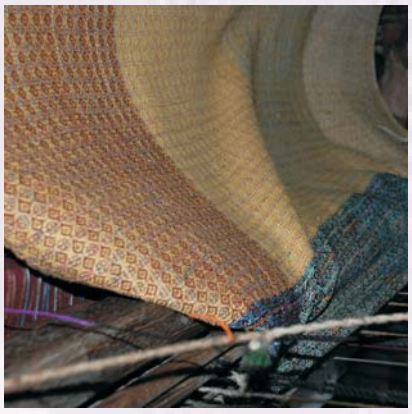
Plain weave

Basket Weave



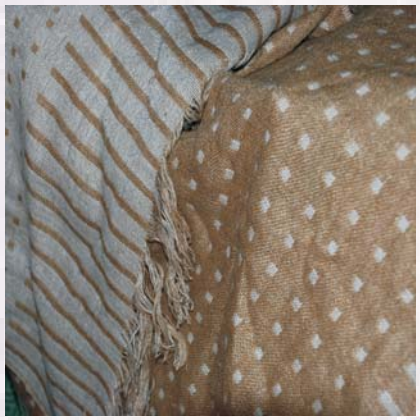
Twill weave

Diamond Twill

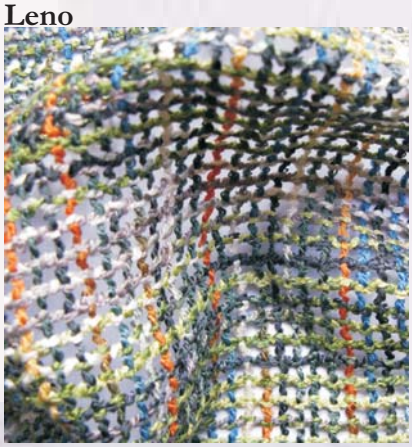


Herringbone

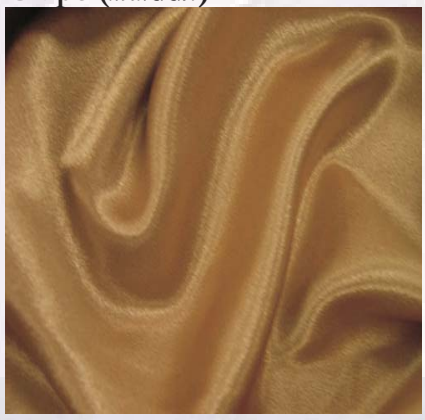
Double cloth



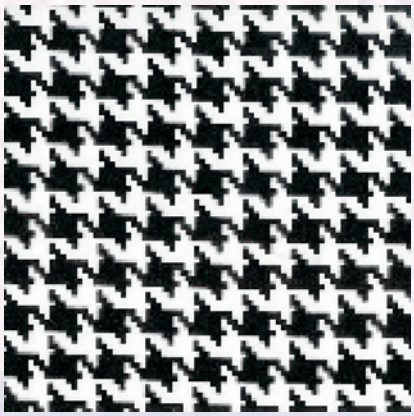
Leno



Crape (*makkhi*)

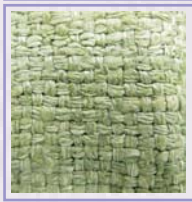


Houndstooth



2
RESEARCH AND ANALYSIS

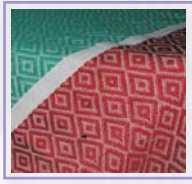
PLAIN WEAVE
No of Frames - 2
Yarns Used - Cotton, Spun silk, Noil, Linen, Tussar and Every other yarns!
Patterns - Plain, Checks and Stripes; Produce various textures using various yarns as weft.



BASKET WEAVE
No of Frames - 2, 4 or 8
Yarns Used - Cotton, Spun silk, Noil, Linen, Tussar and Every other yarns!
Patterns - Plain, Checks and Stripes; Produce various textures using various yarns as weft.

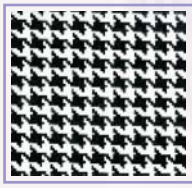
TWILL WEAVE
No of Frames - 4, 6 or 8
Yarns Used - Cotton, Spun silk, Noil, Linen, Tussar and Every other yarns!
Patterns - Plain, Checks and Stripes; Produce various textures using various yarns as weft.

ZIG-ZAG TWILL
No of Frames - 4 or 8
Yarns Used - Cotton, Spun silk, Noil, Linen, Tussar
Patterns - Overall, Stripes; Produce various textures using various yarns as weft.



DIAMOND TWILL
No of Frames - 4-8
Yarns Used - Cotton, Spun silk, Noil, Linen, Tussar
Patterns - Overall in combination with zig_zag twill, Stripes; Produce various textures using various yarns as weft.

HERRINGBONE
No of Frames - 4
Yarns Used - Cotton, Spun silk, Noil, Linen, Tussar and Every other yarns!
Patterns - Overall, Stripes; Produce various textures using various yarns as weft.



HOUNDSTOOTH
No of Frames - 4
Yarns Used - Cotton, Spun silk, Noil, Linen, Tussar
Patterns - Houndstooth

LENO WEAVE
No of Frames - 2
Yarns Used - Cotton, Spun silk, Noil, Linen, Tussar
Patterns - Plain, Stripes; Produce various effects using various yarns as weft.

FACT FILE - Design Development & Skill Upgradation

Design Development

In majority of cases (87%), the designs were provided by the traders, while about 9% of them claimed to have developed designs on their own. Others 4% were following traditional designs.

Design, the unique selling point of handloom products, remains an ignored area in the state. Barring some sporadic attempts by the traders, based on feedback from the major buyers, there is no organized effort in the state to help weavers adapt to new designs. Any revival effort for the sector has to have a major focus on this matter.

Skill Upgradation

Among the sample weavers, only one-third of the weavers had gone through a process of upgrading their skills, while majority admitted to not going through any skill upgradation programme. District-wise variation shows that minimum skill upgradation was reported among weavers of Darbhanga district (25%) and maximum among weavers of Bhagalpur district (33%) closely followed by Patna (district 32%). Further, only 15-20 % of weavers talked about upgrading their skills in tune with the trade.

All those who upgraded the skills had done it through state agencies. However, an environment of ignorance with regard to government schemes and programmes for the betterment of their lot pervaded the clusters. In spite of various state govt. training institutions for the weavers, most of weavers have not been able to take advantage of them. It was clear that state govt. institutions, supposed to work for the purpose, have been mostly at disconnect with the status of the sector and weavers. However, this has also happened largely because of a severe lack of resources with state govt. organizations, both in terms of physical and financial resources. Any effort at revival of the sector in the state would therefore have to necessarily involve complete revamping of such state government institutions.

Product Range

The weavers produce various handloom articles. The major products are saris, bed sheets, towels, curtains, stoles, plain fabrics and items such as gamcha, dusters etc. While Siwan and Patna are producing mainly saris and yardage, Bhagalpur has the largest range of items. The handloom clusters in the state are thus mainly engaged in traditional items like towels, bed sheets, saris and plain fabric. There is no effort to reorient production to modern dress materials and such other value added items which have a lion's share in today's handloom market. A business plan would therefore have to look at this aspect closely.

DOUBLE CLOTH
No of Frames - 4-8
Yarns Used - Cotton, Spun silk, Noil, Linen, Tussar
Patterns - Plain, Stripes; Produce various effects using various yarns as weft.

CRAPE'
No of Frames - 4
Yarns Used - Cotton, Spun silk, Noil, Linen, Tussar
Patterns - Plain, Stripes; Produce various effects using various yarns as weft.

3
NEED OF DESIGN INTERVENTION

New Designs

Weavers need to be educated and trained to impart various weaves & designs. Most of the weavers don't have knowledge of various weave structures. Most commonly used weaves are Plain & Twill weave and this design intervention can be used to introduce various other weave structures and their derivatives like – Broken twill, Curved twill, Huck-a-back, Mock-leno, Summer-Winter weaves, Derivatives of Basket weaves, Overshot, Double Cloth with warp and/or weft wadding etc...

It has been observed that most of the weavers work quiet efficiently with 8-10 frames and this skill can be used to impart various booties through block drafting and extra-warp patterning.

New Raw Materials and Equipments

Bhagalpur is famous for its wide range of fabrics, mostly in plain weave, and woven with a variety of yarns. Tussar in its various form is the traditional raw material for weaving and core of Bhagalpuri Silk. However, weavers have started procuring and using various raw materials like cotton, linen, wool, mulberry, mooga, erri and other silks. Quality analysis of raw materials show that most of the weavers use medium to low grade of raw materials which is not suitable for good quality weaving of international standard. Also, eco friendly organic fibers and Ahimsa Silk should be promoted. Now the world is getting more and more aware of Ethical Fashion so necessary steps should be taken to produce products in tune with Ethical Fashion.

Dye fastness is a big problem and most of the weavers say that their dyers can't dye light-fast and wash-fast shades. This is because of inappropriate knowledge of fiber nature and dyes behavior. Dyers need modern equipment and appropriate dyes and chemicals along with suitable training to tackle this problem.

Skill Enhancement

Most of the weavers are not aware of the wide range of weaves they can weave on their looms. They don't have knowledge of planning their own woven designs on graph or even implementing weaves through graphs. Also, there is not much awareness of various quality parameters.

Equipment Enhancement

We can discuss one case – There is no Dobby or Jacquard in the area; and most of the weavers can work on 10-12 frames with upto 12 peddles. This is quite inconvenient and time consuming and also limit design possibilities and hence makes the product expensive. However if dobby can be used to weave a design which require 10 frames the weaving would be much faster and there is less chance of mistake to get better quality fabric.

Also, looms should be upgraded with 5-wheel take-up motion and fly-wheel for even ppi and auto winding of warp and fabric on the loom.

Dyers need modern equipment and appropriate dyes and chemicals along with suitable training to tackle this problem.

Quality Improvement

Weavers should get aware of various quality parameters related to loom, raw materials, dyeing, weaving and finishing.

Business Development

Most of the weavers are dependent on the traders for work and to market their products. Not many Self-help groups are in existence. Also, traders don't do marketing in a planned way. They lack in basic marketing materials like logo, tags, brochures, catalogue and also, most of them don't participate in any national or international fares to promote their products.

4, 5, 6, 7, 8

PLANNING & CONCEPTUALISATION

**Story Board, Theme Board,
Conceptualisation, Shade Card, Yarn Selection, Weave Selection**

4
FABRIC STORY BOARD

Product Range
- Scarves and Stoles
-Fabrics for bags
-Fabric For Bed Room Collection

Colour Range
- Mauve, Lilac, Purple, Plum, Sky,

Weave Range
Double cloth, Single face double cloth, Tubular fabric, Plain stripes, Tube with Floats

Yarn Range
Spun silk- 120/2
Tussar - 33/37
Lub-lub - fine
Flag

Sampling Technique
Blanket Technique
-Multiple patterns through block drafting
-Myltiple designs through various peddling

Fabric Specifications
- H1 - Double layered tubular with floats -for stoles and scarves
- H2 - plain stripes and Double cloth for Home Range

5
THEME BOARD

6

CONCEPTUALIZATIONS AND SPECIFICATIONS

Product Range

- Scarves and Stoles
-Fabrics for bags
-Fabric For Bed Room Collection

Colour Range

- Mauve, Lilac, Purple, Plum, Sky,

Weave Range

Double cloth, Single face double cloth, Tubular fabric, Plain stripes, Tube with Floats

Yarn Range

Spun silk- 120/2; Tussar - 33/37; Lub-lub - fine; Flag

Sampling Technique

-Blanket Technique
-Multiple patterns through block drafting
-Myltiple designs through various peddling

Fabric Specifications

- H1 - Double layered tubular with floats -for stoles
- H2 - plain stripes and Double cloth for Home Range

Color Story

DRAFT NO.

FABRIC SPECIFICATION SHEET

BHAGALPUR

DRAFTING | REED | WIDTH In. cms.

WARPING ORDER

WARPING DETAILS & DENTING

WARP DETAILS				NO. OF
Color Code	Count	Content	Spinning	ENDS

TOTAL ENDS

DENTING

WIDTH - on the loom	In.	cms.
Length of Warp	m	ft
SHRINKAGE		

PEDDLING AND TIE-UP

FABRIC CODE	PEDDLING	WEFT DETAILS / REPEAT					
		Color Code	Count	Content	Ply	weft In.	Spinning

TIE-UP

PEDAL	left	6	5	4	3	2	1	right
FRAME	back							front

YARN		CODE
COUNT		
COLOR		

CLUSTER DEVELOPMENT PROJECT

BHAGALPUR HANDLOOMS – October-2008

SHADE CARD – Spring-Summer 2009-10
THEME – EVERGREEN DESIRES


265


210


167


845


208


202

SHADE CARD – Spring-Summer 2009-10
THEME – REGAL LONGINGS


117

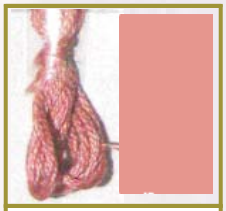

873


118


871


120

SHADE CARD – Autumn-Winter 2010
THEME – IMPERIAL WINTER


895


378


371


905

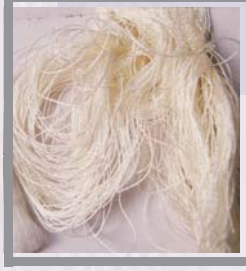

311


376

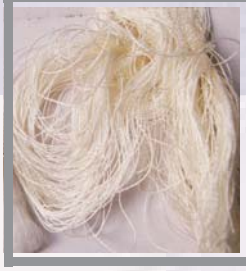
HRISHIKESH-Aug 2008

8
YARN SELECTION AND CODING

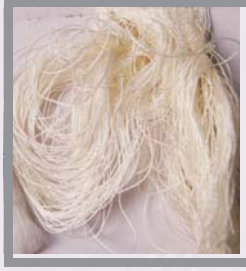
YARN	Spun Silk	CODE
COUNT	120/2	A'
COLOR	873	



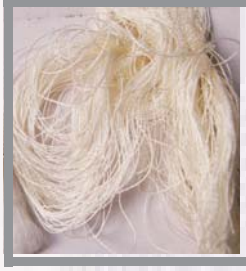
YARN	Spun Silk	CODE
COUNT	120/2	B'
COLOR	118	



YARN	Spun Silk	CODE
COUNT	120/2	C'
COLOR	871	



YARN	Spun Silk	CODE
COUNT	120/2	D'
COLOR	117	



YARN	Tussar	CODE
COUNT	33/37	E'
COLOR	117	



YARN	Lub-Lub	CODE
COUNT	fine	F'
COLOR	118	



YARN	Flag	CODE
COUNT		G'
COLOR	873	



YARN	Flag	CODE
COUNT		H'
COLOR	118	



9, 10, 11, 12, 13, 14

FABRIC AND PRODUCT DEVELOPMENT

Specifications, Fabric Concepts, Product Concepts, Product Development

FABRIC SPECIFICATION SHEET - H1

FABRIC SPECIFICATION SHEET
BHAGALPUR

DRAFT NO.	H1

DRAFTING — REED: 48 — WIDTH: 45 In. — cms.

1	2	1	2	1	2	1		3	4	3	4	3	4	3
A'	A'	A'	A'	A'	A'	A'		B'	B'	B'	B'	B'	B'	B'
							x50							
1	2	1	2	1	2	1		3	4	3				
C'	C'	C'	C'	C'	C'	C'		D'	D'	D'				
					x70									
1	2	1		3	4	3	4	3						
A'	A'	A'		B'	B'	B'	B'	B'						
				x90										

WARPING ORDER: {A' 7, B' 7} x50 — {C' 7, D' 3} x70 — {A' 3, B' 5} x90

WARPING DETAILS & DENTING

Color Code	Count	Content	Spinning	NO. OF ENDS
A'	120/2	Silk	Mach.	620
B'	120/2	Silk	Mach.	800
C'	120/2	Silk	Mach.	490
D'	120/2	Silk	Mach.	210
TOTAL ENDS				2120

DENTING

WIDTH - on the loom	44	In.		cms.
Length of Warp	25	m		ft
SHRINKAGE				

PEDDLING AND TIE-UP

FABRIC CODE		PEDDLING	Color Code	Count	Content	Ply	weft	In.	Spinning
H1	a	1, 4, 2, 3	A'	120/2	Silk	2	1.5 meters		mach.
H1	b	1, 4, 2, 3	B'	120/2	Silk	2	1.5 meters		mach.
H1	c	1, 4, 2, 3	C'	120/2	Silk	2	1.5 meters		mach.
H1	d	1, 4, 2, 3	D'	120/2	Silk	2	1.5 meters		mach.
H1	e	1, 4, 2, 3	E'	33/37	Silk	2	1.5 meters		mach.
H1	f	1, 4, 2, 3	F'	fine	Lub-lub		1.5 meters		mach.
H1	g	1, 4, 2, 3	G'		Flag		1.5 meters		mach.
H1	h	1, 4, 2, 3	H'		Flag		1.5 meters		mach.
H1	i	1, 6, 2, 5	A'	120/2	Silk	2	1.5 meters		mach.
H1	j	1, 6, 2, 5	B'	120/2	Silk	2	1.5 meters		mach.
H1	k	1, 6, 2, 5	C'	120/2	Silk	2	1.5 meters		mach.
H1	L	1, 6, 2, 5	D'	120/2	Silk	2	1.5 meters		mach.
H1	m	1, 6, 2, 5	E'	33/37	Silk	2	1.5 meters		mach.
H1	n	1, 6, 2, 5	F'	fine	Lub-lub		1.5 meters		mach.
H1	o	1, 6, 2, 5	G'		Flag		1.5 meters		mach.
H1	p	1, 6, 2, 5	H'		Flag		1.5 meters		mach.

(Color Code, Count, Content, Ply, weft, In. and Spinning are grouped under WEFT DETAILS / REPEAT.)

TIE-UP

PEDAL	left	6	5	4	3	2	1	right
FRAME	back	2,4	1,3	123	124	2	1	front

YARN	COUNT	COLOR	CODE
Spun Silk	120/2	873	A'
Spun Silk	120/2	118	B'
Spun Silk	120/2	871	C'
Spun Silk	120/2	117	D'
Tussar	33/37	117	E'
Lub-Lub	fine	118	F'
Flag		873	G'
Flag		118	H'

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PRODUCT CONCEPTS - H1

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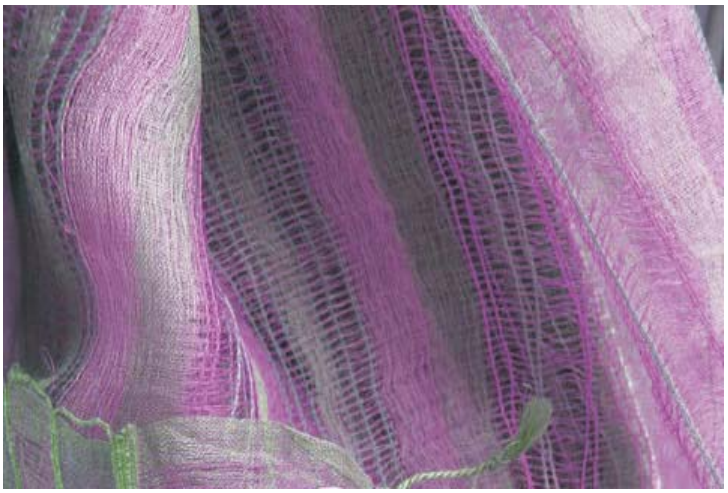
PRODUCT DEVELOPMENT - H1



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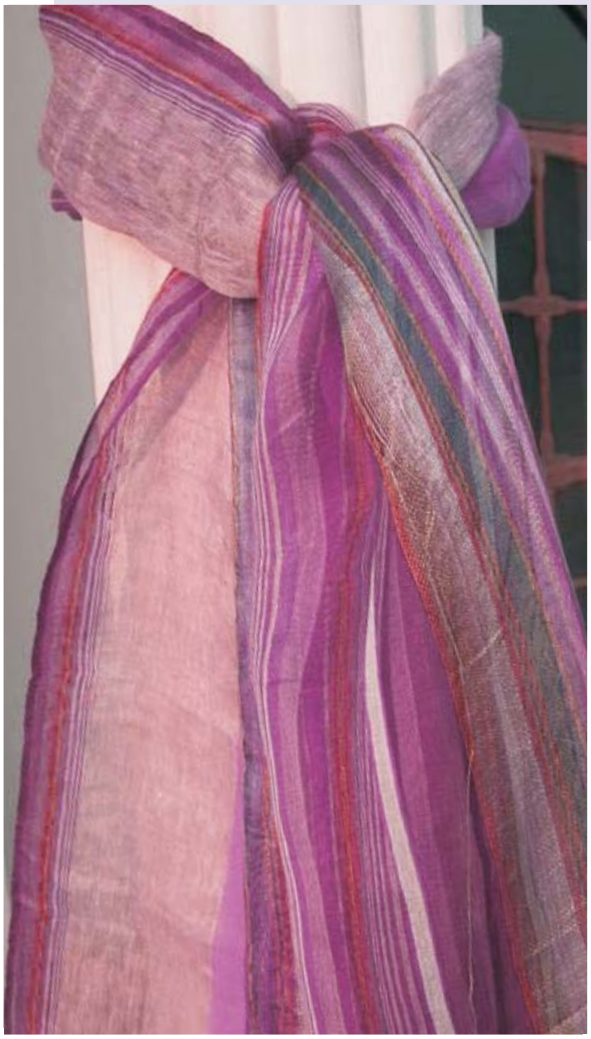
PRODUCT DEVELOPMENT - H1



FABRIC SPECIFICATION SHEET

BHAGALPUR

DRAFT NO.	H2

DRAFTING — REED 48 — WIDTH 44 In. — cms.

5	6		1	2	3	4		5	6		1	2	3	4		5	6				
D'	D'		A'	B'	A'	B'		D'	D'		B'	A'	B'	A'		D'	D'	X10			
X4			X5					X4			X10					X4					

5	6		1	2	3	4		5	6		1	2	3	4		5	6				
A'	A'		C'	D'	C'	D'		A'	A'		D'	C'	D'	C'		A'	A'	X5			
X10			X15					X10			X25					X10					

WARPING ORDER																					
D'	A'	B'	x10	D'	B'	A'	x20	D'	X12			A'	C'	D'	x30	A'	D'	C'	x30	A'	X5
8	1	1		8	1	1		8				20	1	1		20	1	1		20	

WARPING DETAILS & DENTING

WARP DETAILS				NO. OF ENDS
Color Code	Count	Content	Spinning	
A'	120/2	Silk	Mach.	660
B'	120/2	Silk	Mach.	360
C'	120/2	Silk	Mach.	300
D'	120/2	Silk	Mach.	588
		288		
TOTAL ENDS				1908

DENTING: 2 ENDS PER DENT

WIDTH - on the loom	44	In.	cms.
Length of Warp	20	m	ft
SHRINKAGE			

PEDDLING AND TIE-UP

FABRIC CODE		PEDDLING	WEFT DETAILS / REPEAT						
			Color Code	Count	Content	Ply	weft	In.	Spinning
H2	a	1, 6, 3, 5	A'	120/2	Silk	2	2 meters		mach.
H2	b	1, 6, 3, 5	F'	fine	viscose		2 meters		mach.
H2	c	1, 6, 3, 5	D'	120/2	Silk	2	2 meters		mach.
H2	d	1, 6, 3, 5	E'	33/37	Silk		2 meters		mach.
H2	e	1, 6, 3, 5	B'	120/2	Silk	2	20		mach.
		2, 7	F'	fine	viscose		6		mach.
H2	f	1, 6, 3, 5	A'	120/2	Silk	2		1.5	mach.
		2, 7	H'		viscose			0.5	mach.
H2	g	1, 6, 2 (acrylic), 5, 3, 4 (acrylic)	A'	120/2	Silk	2		1	mach.
		2, 7	F'	fine	viscose			0.5	mach.
H2	h	1, 6, 2 (acrylic), 5, 3, 4 (acrylic)	C'	120/2	Silk	2		1	mach.
		2, 7	H'	fine	viscose			0.5	mach.
H2	i	1, 6, 2 (acrylic), 5, 3, 4 (acrylic)	F'	fine	viscose		2 meters		mach.

TIE-UP

PEDAL	7	6	5	4	3	2	1	right
FRAME	2,4,6	3,6	1,3,4,6	1,3,6	1,2,3,5	1,3,5	1,5	front

YARN	Spun Silk	CODE
COUNT	120/2	A'
COLOR	873	

YARN	Spun Silk	CODE
COUNT	120/2	B'
COLOR	118	

YARN	Spun Silk	CODE
COUNT	120/2	C'
COLOR	871	

YARN	Spun Silk	CODE
COUNT	120/2	D'
COLOR	117	

YARN	Tussar	CODE
COUNT	33/37	E'
COLOR	117	

YARN	Lub-Lub	CODE
COUNT	fine	F'
COLOR	118	

YARN	Flag	CODE
COUNT		G'
COLOR	873	

YARN	Flag	CODE
COUNT		H'
COLOR	118	

YARN		CODE
COUNT		
COLOR		

YARN		CODE
COUNT		
COLOR		

YARN		CODE
COUNT		
COLOR		

FABRIC SPECIFICATION SHEET - H2

HRISHIKESH
Design Consultant, Delhi - 20 April 2009

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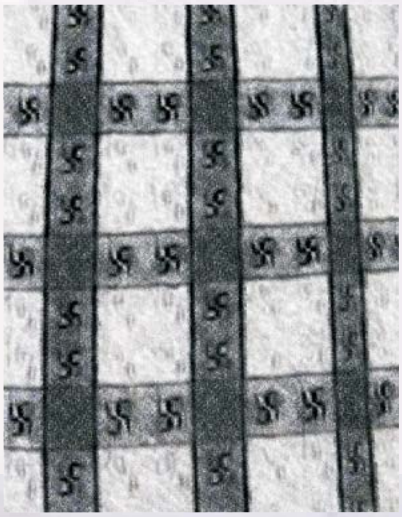
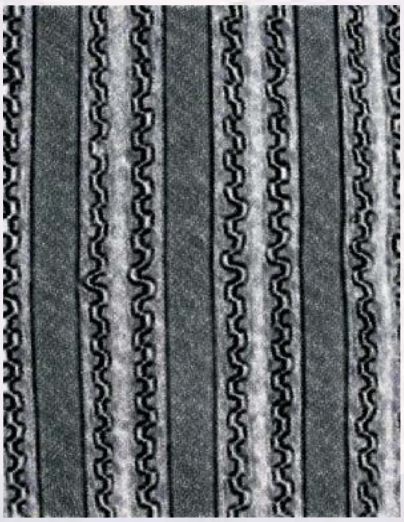
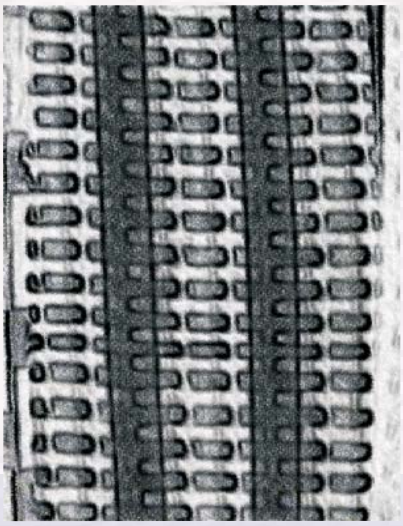
PRODUCT CONCEPTS - H2







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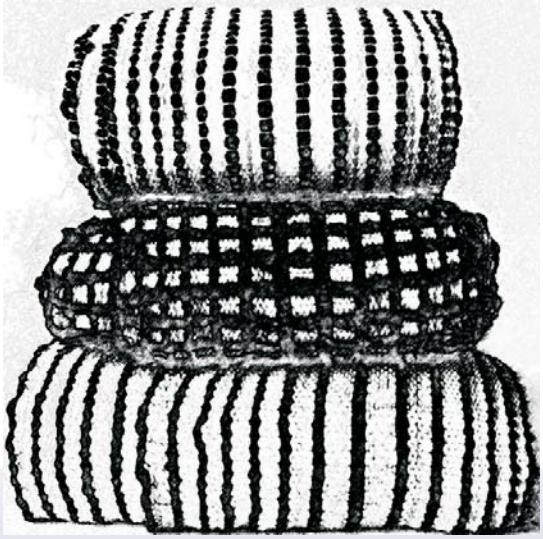
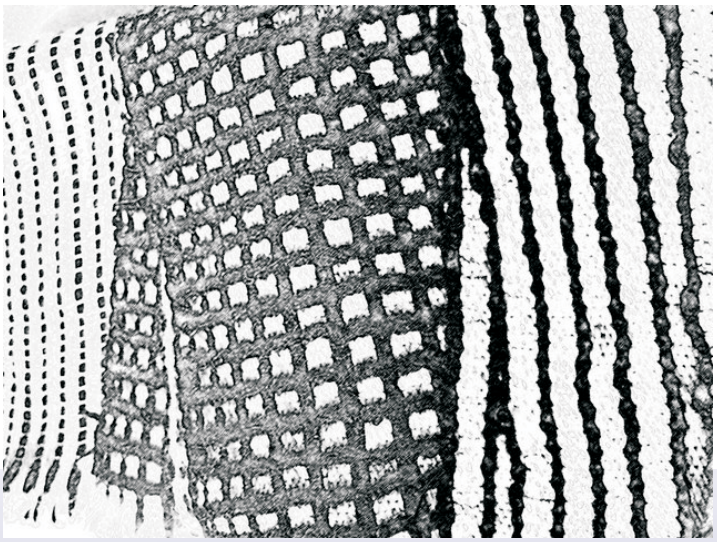
FABRIC CONCEPTS - H2





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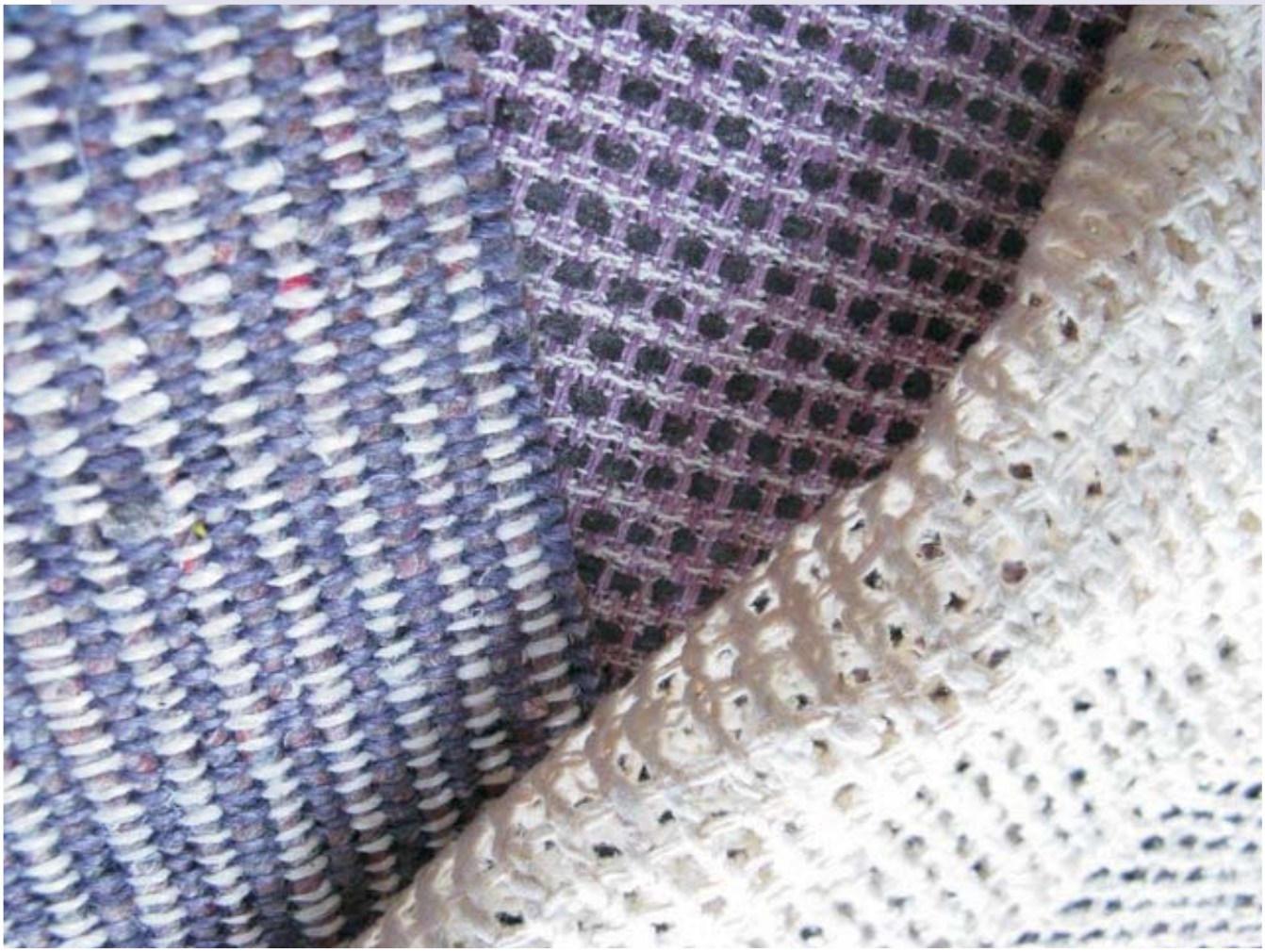
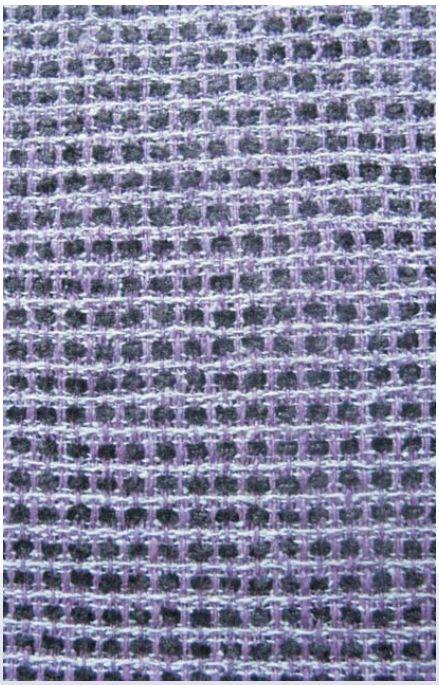
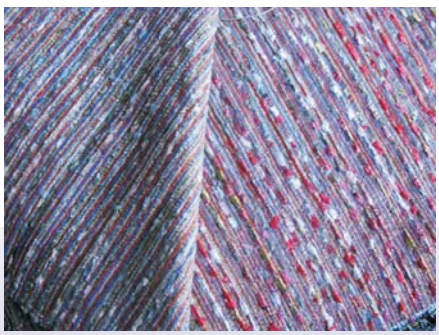
PRODUCT DEVELOPMENT - H2







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PRODUCT DEVELOPMENT - H2

14
PRODUCT DEVELOPMENT - H2

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ACKNOWLEDGEMENT

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