

Systematic Weave Drafting Handout – CW 2018

Sara von Tresckow – Fond du Lac, WI

www.woolgatherers.com

1. Introduction:

Weave drafting is ancient – the computer software we use today is the evolved representation of centuries of work.

Basics:

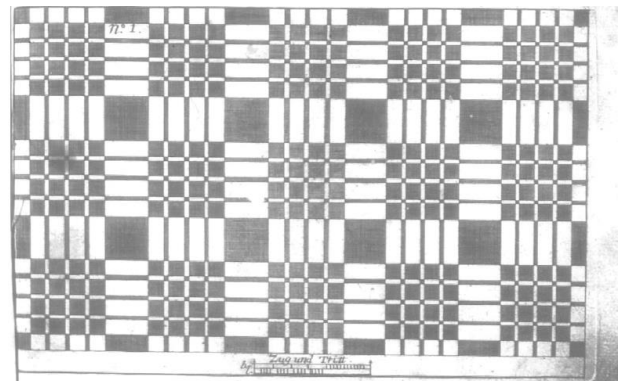
A weave draft is a mathematical or pictorial representation of fabric to be woven. **In this lecture we are covering only single layer weaves with a single warp and single weft, for handloom or dobbie loom.**

Conventions for creating drafts within this session are as follows:

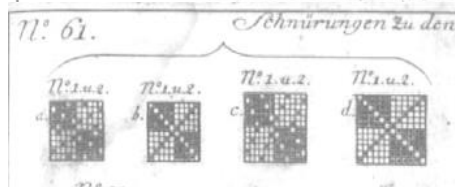
1. A woven textile is the result of binding 2 thread systems at right angles to one another. These systems are called warp and weft.
2. Bindungslehre is the methodical representation and creation of the various forms of intersection as they occur in weaving.
3. A binding refers to the rules governing intersecting warp and weft threads for a woven textile.
4. A binding point "Bindepunkt" is the actual intersection.
5. Floats are free floating warp or weft threads
6. A pattern or patrone (draft) is the graphed representation of binding of warp and weft .
- 7 The draft is represented on graph paper (or an electronic version).
8. Filled squares represent raised warp threads.
9. A rapport or repeat is the smallest number of warp and weft threads needed to duplicate the binding.

2.. Development of weave notations

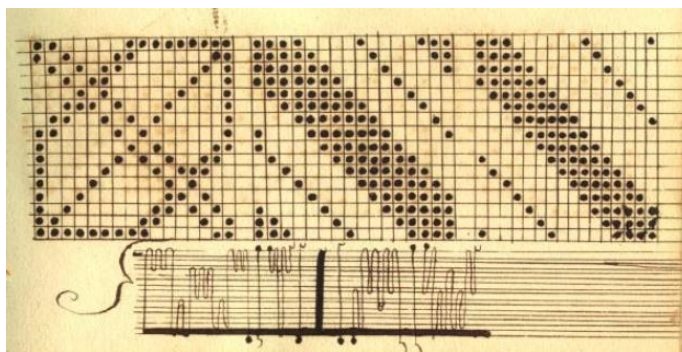
Early on, weavers designed systems of making their written directions easy to follow and using as little precious paper as possible.



John Hargrove



Johann Michael Kirschbaum



Cyrus Uhler

Fig. 262.
166bindg. $\frac{4 \ 2 \ 2}{4 \ 2 \ 2}$

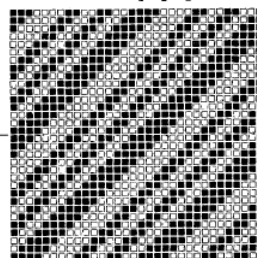
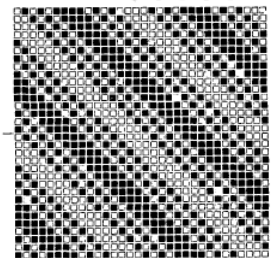


Fig. 263.
166bindg. $\frac{1 \ 1 \ 4 \ 1 \ 1}{1 \ 1 \ 1 \ 1 \ 4}$



G H Oelsner

Systematic Weave Drafting Handout – CW 2018

3. Systematically?

Weaving is not exact science, but it benefits from having commonality in terms and an ability to define a fabric in absolute terms

The material here is intended to create a structure for creating weave drafts. Using standardized terminology, symbols and basic elements, the weaver can combine, modify and recombine these elements to form a great variety of woven fabrics.

Fig. 1

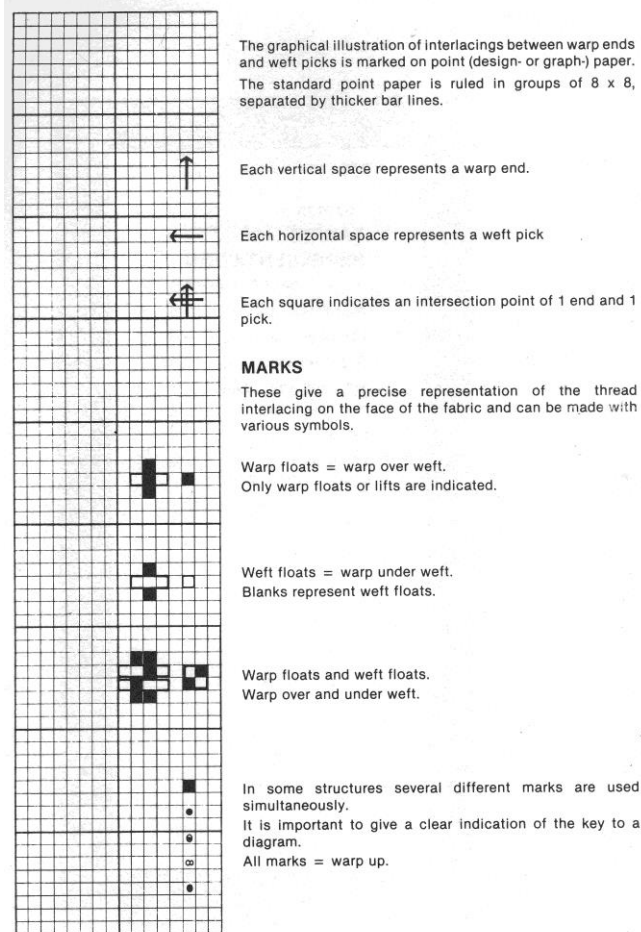


Fig. 2

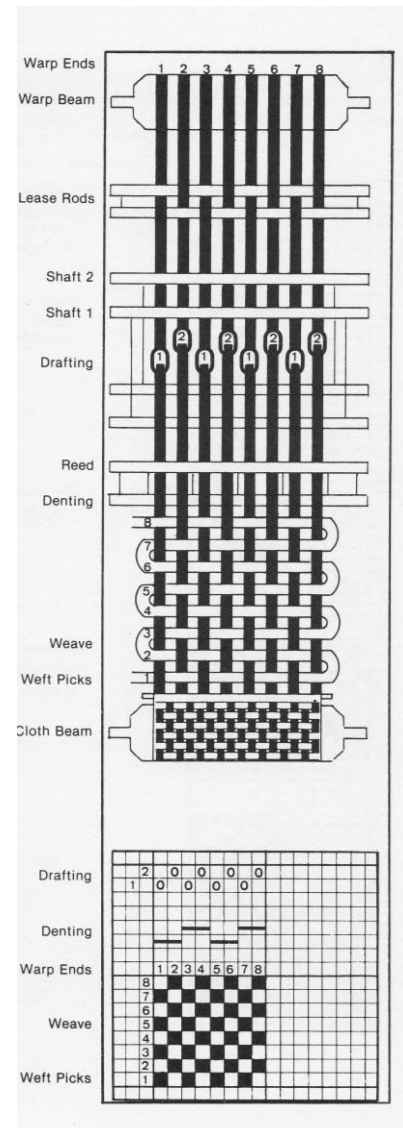


Fig. 1 and 2 reproduced with permission of WIRA Technology Group, Leeds, England
From "Woven Structure and Design Part 1" by Doris Goerner.

Fig. 1 shows various markings that can be utilized to represent not only the usual black square for a raised warp thread, but supplemental markings for supplemental warp or weft threads, separate warp or weft systems, etc.

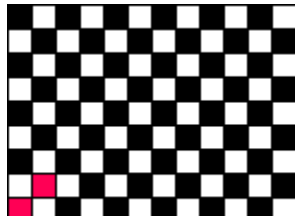
Fig. 2 shows the schematic of a loom set up with 8 threads in plain weave. The threads, numbered 1-8 are shown at top on the warp beam, passing through lease sticks, heddles, reed – and illustrating 8 picks – followed by the fabric on the cloth beam.

Below this schematic is the representation of this fabric in a production draft – threading, reed denting, liftplan.1

Systematic Weave Drafting Handout – CW 2018

4. The Three ground binding systems from which all weaves are derived.

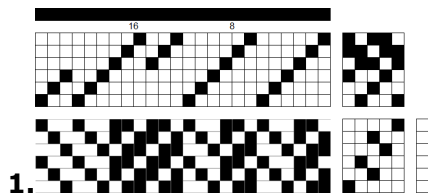
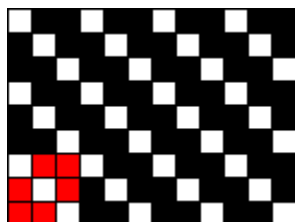
1. Plain weave - Weaving consists of interlacings of two thread systems – warp and weft. Plain weave in its simplest form is raising all even numbered warp ends followed by raising all odd numbered threads. A method for making two sheds is necessary – we'll use 2 shafts on a horizontal loom here.



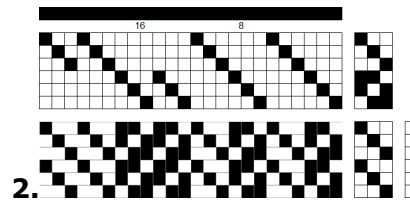
- 1. Hopsacking 1/3
- 2. Warp Rep 3/1
- 3. Weft Rep 3/3

Variations on the basic plain weave.

2. Twill weave- in twill weaves, the intersections are set over one thread and proceed in a diagonal fashion, min. 3 ends/3 picks.

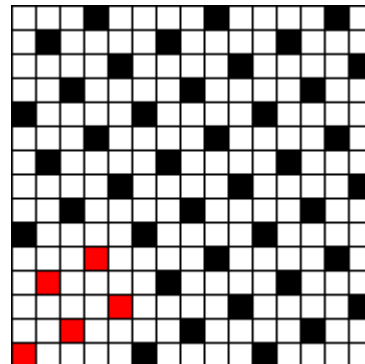


1. Dimity – John Hargrove 27



Dimity – John Hargrove 27, variant tieup and treadling

3. Satin weave – in satin weaves the intersections are not contiguous min. 5 ends/5 picks



There are a few popular structures that do not fit cleanly into this schematic.

The most prominent exceptions to ground bindings are barleycorn (lace spot weave) or huck, and rosepath (similar to twill but bends the rules). Curiously, exceptions seem to fall into the favorite weave structures of 4-shaft handloom weavers. Quite possibly the wide distribution of 4-shaft looms over hundreds of years led to creative interlacings.

Also, crepe and waffle weaves are non-conforming structures. In some books crepe is defined by challenging the weaver to add and subtract interlacings until the fabric looks suitable.

Systematic Weave Drafting Handout – CW 2018

5. Systematic descriptions of weaves

As time went on, the notations seen in the 19th century started containing numbers and form. The German L,K,S nomenclature for Leinwandbindung(plain weave), Koeper(twill) and Satin was worked into a designation for weave structures. Following the binding art came what appears to be a fraction. Numbers written above the line are raised warps and those below are lowered warps. The left to right sequence indicated the order of the raised and lowered warp threads. Additional information would be abbreviated behind this notation for raised/lowered warps.

This notation system then changed into a number representation – 4 groups of numbers separated by hyphens. This system became **DIN 61101** in 1979 (DIN = Deutsche Industrie Norm) and has now become the International standard designation for textile structures as **ISO 3572 (DIN61101-1)** and **ISO 9354(DIN61101-2)**. These standards can be purchased online either from the German source of DIN formulations or from the ISO document list.

The four groups are as follows:

1. **Kind of weave**, or binding art. A single, 2-digit number.
2. **Interlacing** – a description of the raised and lowered warp threads in numeric terms. Can be more than one 2-digit number separated by a space.
3. **Sequence of interlacing**. This shows the number of warp threads acting together – again with one or more 2-digit numbers separated by a space.
4. **Step or move number**, from the German the rise. Once more this is represented with one or more 2-digit numbers separated by a space. Each group is separated with a hyphen.

Number shown in first element	Type of weave, binding art	Designation of first warp thread shown in diagram
10	Plain(tabby) or derivative	First warp up
11	Plain(tabby) or derivative	First warp down
20	Twill or derivative	First warp up
21	Twill or derivative	First warp down
30	Satin/sateen or derivative	First warp up
31	Satin/sateen or derivative	First warp down

So, by the definition above, a simple plain weave for a bed sheet would be written thus: 10-01 01-01-00
 Plain weave, first warp raised in first pick, 1 up 1 down, each warp acting singly, no rise.
 Let's examine a simple 2-2 twill in this notation.



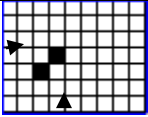
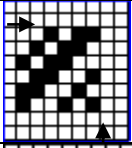
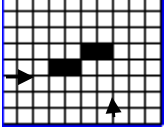
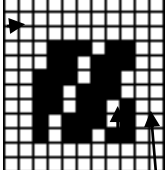
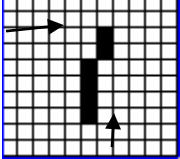
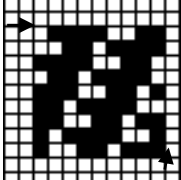
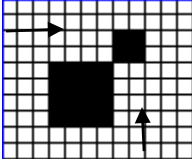
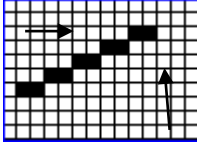
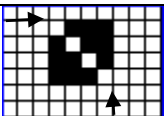
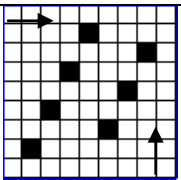
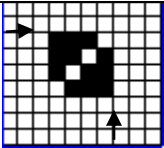
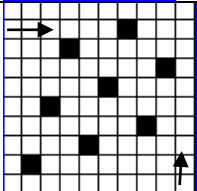
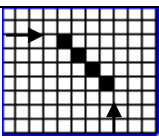
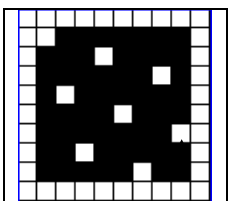
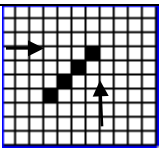
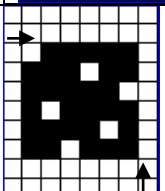
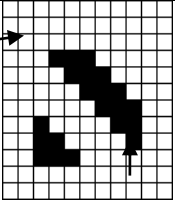
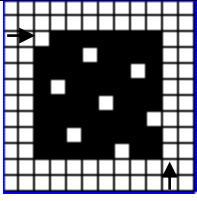
20-02 02-01-01

Kind of Weave Interlacing of Threads Sequence Step (move #)

Right leaning
 2/2 Twill
 4 shafts

Examples of this nomenclature are shown on the following page. ISO notation is the first code, the older L,K,S or A method underneath.

Systematic Weave Drafting Handout – CW 2018

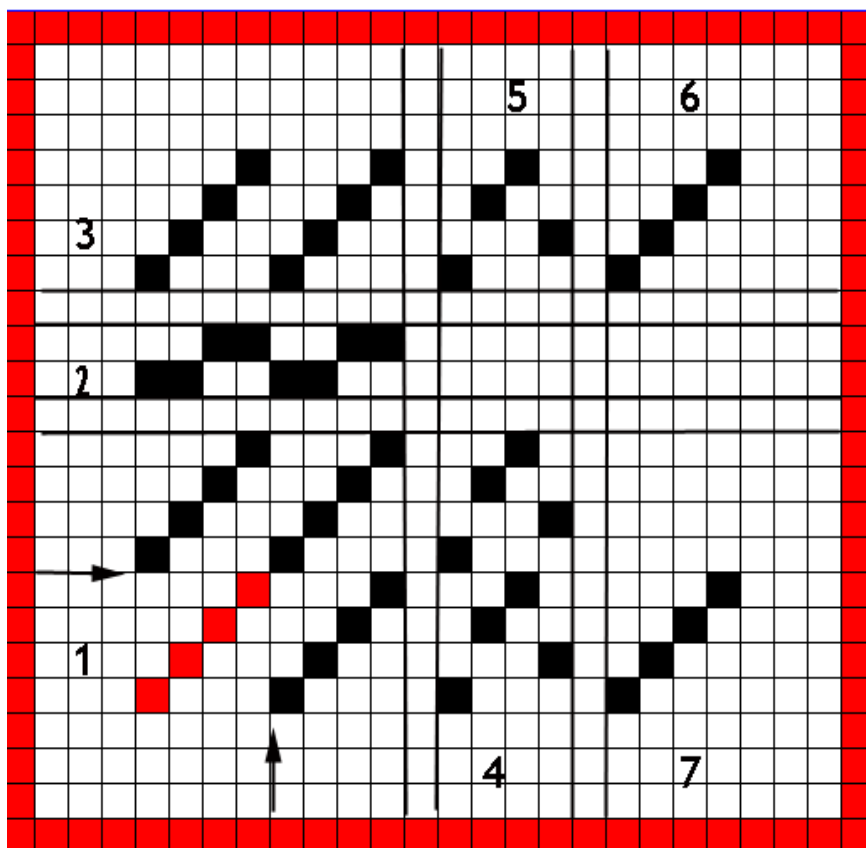
Weave	Name	Code	Weave	Name	Code
	Plain	10-01 01-01-00 L <u>1</u> 1		6-end Stitches Twill, "Z" direction	20-02 01 01 02-01-01 K <u>1 2</u> Z 2 1
	Oxford	10-01 01-02-00 RL <u>1</u> 2f. 1		5/2 steep Twill, "Z" Direction	20-05 02-01-02 K <u>5</u> Z 2
	Warp Rib (4 + 2)	10-04 02-01-00 RQ <u>4</u> 2		9-end stitches Twill, "Z" direction	20-05 01 01 02-01-02 K <u>5 1</u> Z 1 2
	Hopsack 4/4; 2/2	10-04 02-04 02-00 P <u>4</u> 4 + 2f. 2		1/4 flat Twill, "Z" direction	20-01 04-02-01 K <u>1</u> 2f. Z 4
	Twill 3/1 twill "S" direction	20-03 01-01-03 K <u>3</u> S 1		Satin 7-end weft sateen, step 2	30-01 06-01-02 S <u>1</u> (2) 6
	3/1 twill "Z" direction	21-01 03-01-01 K <u>3</u> Z 1		8-end weft Sateen, Step 3	30-01 -07-01-03 A <u>1</u> (3) 7
	1/3 twill, "S" direction	21-03 01-01-03 K <u>1</u> S 3		8-end warp Satin, Step 5	30-07 01-01-05 A <u>7</u> (5) 1
	1/3 twill "Z" direction	20-01 03-01-01 K <u>1</u> Z 3		6-end Cross warp Satin, steps 3, 4, 4, 3, 2	30-05 01-01-03 04 04 03 02 A <u>5</u> (3,4,4,3,2) 1
	3/4 twill "S" Direction	20-03 04-01-06 K <u>3</u> S 4		8-end warp Satin, Step 5	30-07 01-01-05 A <u>7</u> (5) 1

Systematic Weave Drafting Handout – CW 2018

6. Production Draft - The diagrams on the preceding page are just fabric repeats. Where are the "drafts"? There is no fixed draft for any of these bindings. The representation for setting up a loom depends on the loom and its configuration.

For many bindings, there can be several ways to represent the threading and treadling. Drafts are therefore derived from the sketch of the fabric repeat. Manually, the weaver would transfer a mark to the threading diagram for every raised warp in the binding and do the same for the treadling – leading to the tieup. Today we have the opportunity to use weaving software to generate this diagram. Using the design screen in Weavepoint or the sketchpad in PCW(or similar in other programs) saves us inordinate amounts of time. The following illustration shows a complete "Patrone" or the directions to weave fabric. It includes directions for a traditional handloom as well as a dobby.

Production Draft (Fertigungspatrone)



1. Binding (1/3 twill)
2. Reed denting
(2 per dent)
3. Threading on 4 shafts
4. Treadling order
5. Tieup
6. Card (lift) order
7. Liftplan, punching order

Source: IGH-Sindelfingen 4. And 5. Based on CM loom walking treadles 1, 4, 2, 3.

Creating the production draft in this manner the weaver can make allowances for the configuration and existing warps on the loom and possibly adjust this fabric binding to fit an existing warped loom without rewarping the loom.

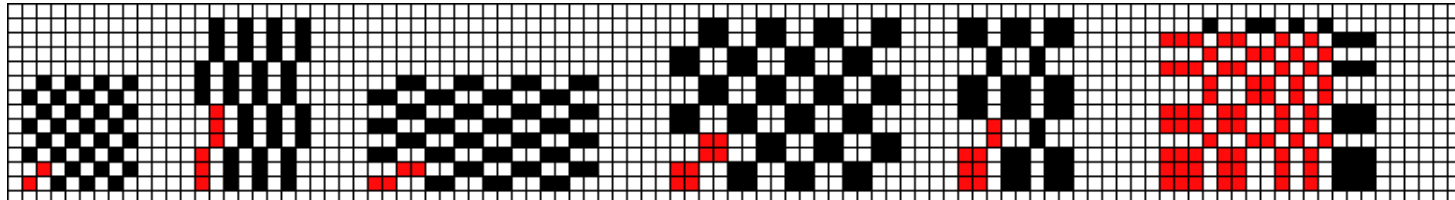
By showing only the binding in its minimum size, one saves time and space. Since a binding can have more than one representation, the actual production draft will be based on the configuration of the loom to be used rather than a set combination of threading, tieup and treadling.,
In this example, a simply graphed square – 4 x 4 pixels is enough to derive the information needed to actually weave the cloth.

Systematic Weave Drafting Handout – CW 2018

7. Deriving Weaves

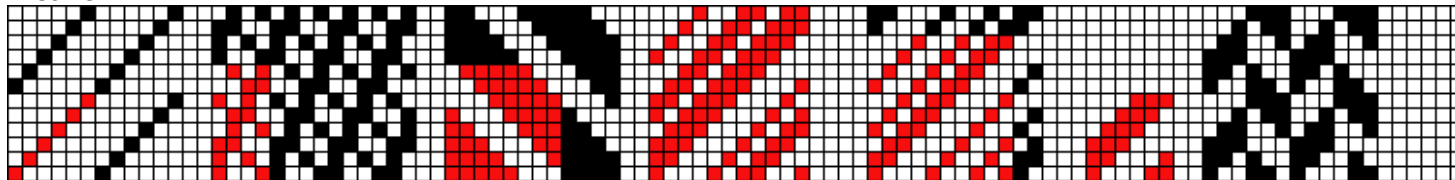
We can derive weaves using a blank graph paper.

Plain Weave: Standard threading/treading sequences R=Rib, Q =horizontal, L = vertical, P=Panama or basket



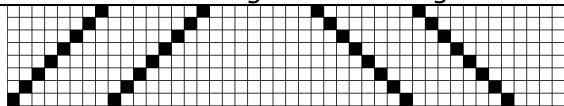
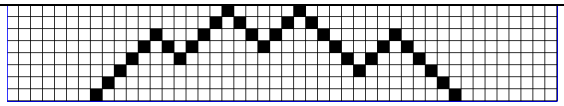
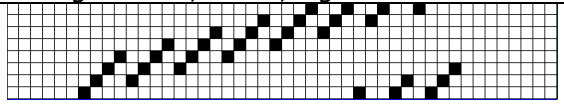
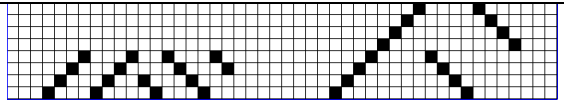
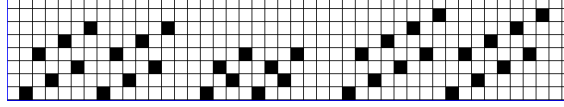
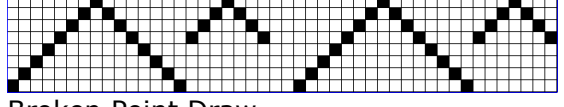
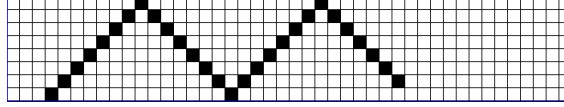
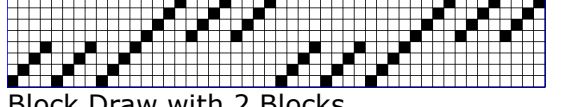

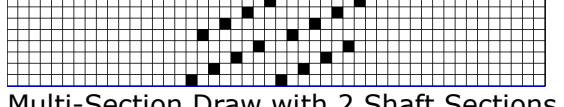
10-01 01-01-00 or L 1/1	10-03 03-01-00 or RQ 3/3	10-01 01-02-00 or RL 1/1 2t	10-02 02-02-00 or P2/2 2t	10-03 02-02 01-00 or P 3/2 2+1t	10-03 01 02 02 01 01 01 01-03 01 02 02 01 01 01 01-00 or P 3/1/2/2/1/1/1/1 3+1+2+2+1+1+1+1t
-----------------------------------	------------------------------------	---------------------------------------	-------------------------------------	---	---

Twill Weave



20-01 05-01-01 K <u>1</u> Z 5	20-03 02 01 02-01-02 K <u>3 1</u> Z 2 2 (Step 2)	20-05 -03-01-07 K <u>5</u> S 3	20-03 01 02 02 01 03-01-01 K <u>3 2 1</u> Z 1 2 3	20-02 01 01 02 01 03-01-01 K <u>2 1 1</u> Z 1 2 3	Ground: 20-03 03-01-01 K <u>3</u> Z 3 Cross twill, over 3 threads
-------------------------------------	---	--------------------------------------	--	---	--

8. Threading/Treading standards - In addition to DIN 61101, DIN 61110 describes a series of standard threading and treadings used to produce production drafts.

 Straight draw, left S, right Z	 Patterned Point Draw
 Intermittent Draw	 Broken Draw
 Scattered Draw	 Broken Point Draw
 Point Draw	 Block Draw with 2 Blocks
 Extended Point Draw	 Multi-Section Draw with 2 Shaft Sections

Systematic Weave Drafting Handout – CW 2018

9. Color and weave

Interesting effects can be achieved using the alternation of warp and weft colors in conjunction with these bindings.

Fig. 1 and Fig. 2 illustrate the use of the same binding (plain weave), substituting variations on color changes.

Figure 1

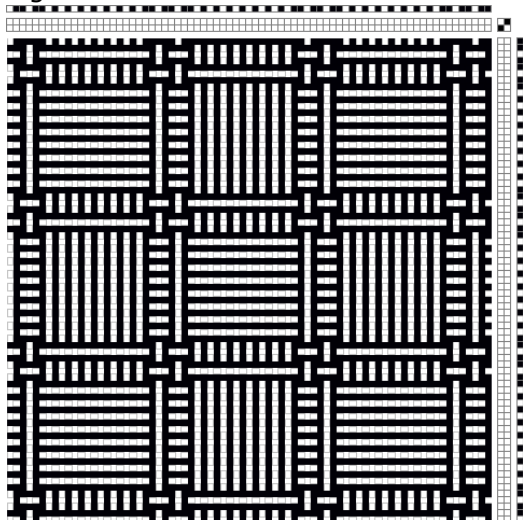
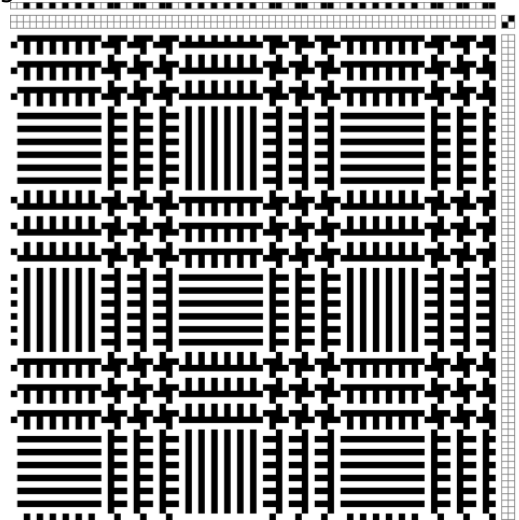
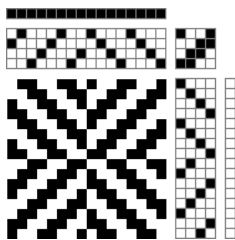


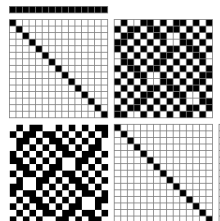
Figure 2



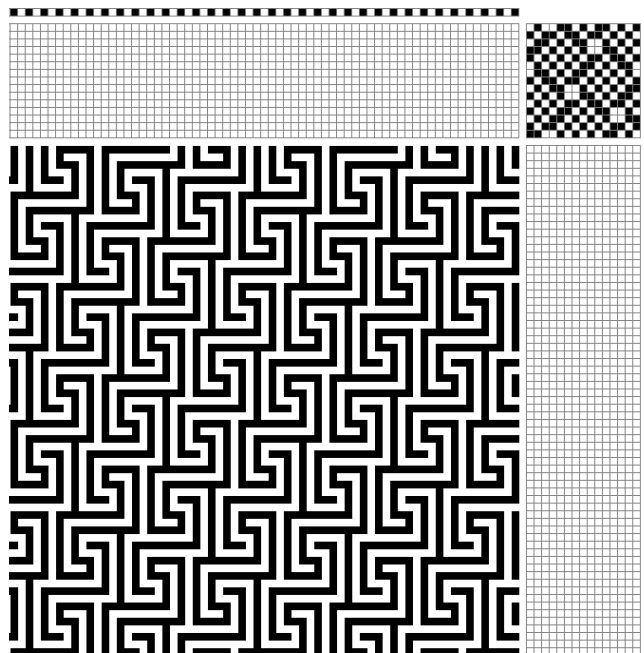
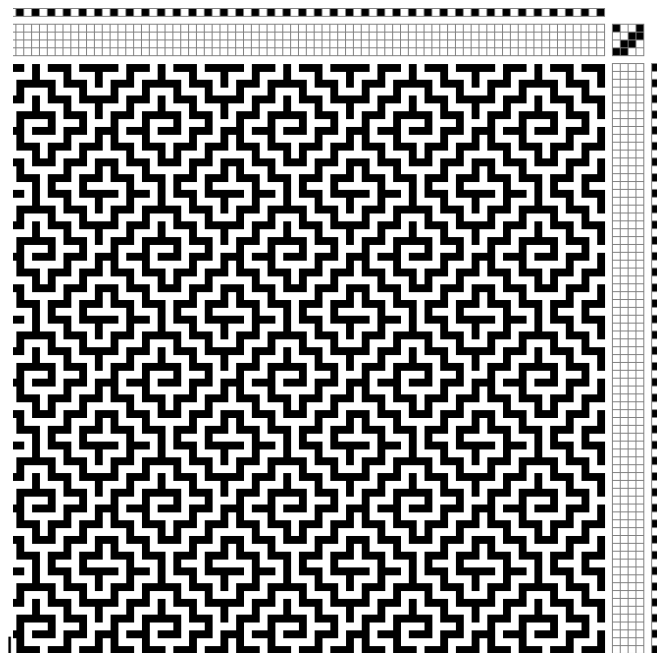
The following examples show the variation possible by alternating just 2 colors 1/1 and changing the structure.



16 thread pattern can be woven with just 4 shafts and 4 treadles. Expanding it to 8, 12, 16 or any multiple of 4 also works.



15 x 15 shafts/treadles
Fancy Twill



Systematic Weave Drafting Handout – CW 2018

Bibliography

Author	Title	Publisher	Date	Annotation
Arndt, Erika	"Handbuch Weben"	Haupt, Bern, CH	2006	In Print
Buff, Regula	"Bindungslehre – Ein Webmusterbuch"	Haupt, Bern, CH	1985	OOP
Donat, Fritz	„Methodik der Bindungslehre, Decomposition und Calculation für Schaftweberei“	Hartlebens, DE		Handweaving.net
Donat, Fritz	"DiE Farbige Gewebemusterung"	Hartlebens, DE	1907	Handweaving.net
Eriksson, Mariana	"Warp och Inslag– Bindnigslara 1"	LTs Forlag, Stockholm, SE	1999	OOP
Eriksson, Mariana	"Warp & Weft – Lessons in Drafting for Handweaving", revised ed. 2008	Trafalger Square, N. Pomfret, VT, US	2011	Translation of new edition of Warp och Inslag
Getzmann, Ulla	Weave Structures the Swedish Way – volume 1	Vavstuga Press	2006	In Print
Goerner, Doris	"Woven Structure and Design, Part1 – Single Cloth Construction"	WIRA Technology Group, Leeds, UK	1986	OOP
ISO 3572:1976	Textiles -- Weaves -- Definitions of general terms and basic			https://www.iso.org/standard/8977.html
ISO 9354:1989	Textiles -- Weaves -- Coding system and examples			https://www.iso.org/standard/17038.html
Kienbaum, Martin	"Binduntstec hnik der Gewebe – Konstruktion und Gestaltung mit warenkundlichyen Beispielen – Band 1: Einflächige Schaftgewebe"	Schiele & Schön Berlin, DE	1999	OOP but available
Neumann, Wolfgang	"Webschule 4 – Fachzeichnen/Bindungslehre", 7 th edition	Webe mit -, Winterbach, DE	1998	In Print
Oelsner, GH	"Handbook of Weaves"	Dover, NY, US	1952	OOP but available
Oelsner, GH	"Deutsche Webschule: Band 1(Text)"	Anton Send, DE	1869	Handweaving.net
Oelsner, GH	"Deutsche Webschule: Band 2(Illustrationen)"	Anton Send, DE	1869	Handweaving.net
Oelsnerk GH	„Die deutsche Webschule: Mechanische Technologie der Weberei“	Altona	1902	Handweaving.net

Contact:

Sara von Tresckow 124 Meadowbrook Blvd.

Fond du Lac, WI 54935

920-929-9203

info@woolgatherers.com

www.woolgatherers.com