INTERIOR DESIGN MATERIALS and SPECIFICATIONS

2ND EDITION

LISA GODSEY

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LEED AP, ASID, IDEC, IESNA, IIDA

Fairchild Books
New York

Fairchild Books
An imprint of Bloomsbury Publishing Inc

175 Fifth Avenue
New York
NY 10010
USA

50 Bedford Square
London
WC1B 3DP
UK

www.fairchildbooks.com

First published 2013

Library of Congress Cataloging-in-Publication Data
A catalog record for this book is available from the Library of Congress.
2012938422

ISBN: PB: 978-1-60901-229-8

Typeset by Tom Helleberg

Cover Design by Carly Grafstein

Cover Art: © Ocean Photography/Veer; © paulmaguire/Veer; © PiLens/Veer; © Ronen/Veer; © c/Veer; © Danilin/Veer; © Andrey Volokhatiuk/Veer; © c/Veer

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Printed and bound in the United States of America

TABLE OF CONTENTS

Preface xvii

Acknowledgments xviii

Chapter 1: Making Material Selections 1

Chapter 2: Paints, Coatings, and Wallcoverings 27

Chapter 3: Textiles, Window Treatments, and Soft Goods 63

Chapter 4: Carpeting and Area Rugs 113

Chapter 5: Wood 155

Chapter 6: Resilient Flooring 203

Chapter 7: Plastic Materials 219

Chapter 8: Glass 235

Chapter 9: Metals 251

Chapter 10: Tile and Brick 269

Chapter 11: Stone 301

Chapter 12: Terrazzo, Composites, and Concrete 325

Chapter 13: Laminated Materials 359

Chapter 14: Acoustics 377

Glossary 387

Metric Conversion Table 397

Index 399

EXTENDED TABLE OF CONTENTS

Preface xvii

Acknowledgments xviii

Chapter 1:
Making Material Selections 1

Key Terms 1
Objectives 1
Guidelines 2
    Building Code Structures 2
ADA Requirements 4
    Sustainability 4
    Nontoxic Materials 6
    Common Carcinogens 6
    Protection Against Toxins 7
    Environmental Costs 7
Third-Party Organizations 7
Budgets and Estimates 8
    Ballpark Estimates 12
    Cost Comparisons 12
    Actual Costs for Purchase 12
Programming Considerations 12
    Material Units and Estimating 13
Global Considerations 14
Managing the Specification 15
    The "Spec" 15
    Master Specification 16
Specifying 16
Process 16
    Sample Spec 1.1 17
Collaborating 19
The Supply Chain 19
Project Organization 20
Summary 23
Web Search Activities 23
Personal Activities 24
Summary Questions 24

Chapter 2:
Paints, Coatings, and Wallcoverings 27

Key Terms 27
Objectives 27
Paint Materials 28
    Primers 28
    Paint 28
    Paint for Special Surfaces 28
Characteristics 29
    Primers 29
    Paint 29
Related Work 32
Qualifying Installers 32
Installation 32
    Prepwork 32
    Typical Process 35
Special Finishes 36

Protection/Maintenance 38
Safety 39
Sustainability 39
Managing Budgets 39
Organization of the Industry 40
Selection Criteria 41
Specifying 41
Sample Spec 2.1 42
Inspection 43
Related Materials 43
Paints and Plasters 43
Top Coatings for Wood 45
Other Coatings 45
Wallcoverings 45
Wallcovering Materials 46
Paper 46
Facing Materials Other than Paper 47
Other Product Characteristics 49
Custom Colorways for Wallcovering 49
Backings 50
Ratings Applicable to Wallcoverings 50
Ratings for All Wallcoverings 51
Ratings for Commercial Vinyl Wallcoverings 51
Production 51
Sizes and Estimating 51
Estimating 52
Calculating Quantities for Cost Comparisons 52
Qualifying Installers 53
Obtaining an Estimate 54
Installation 54
Prepwork 54
Protection/Maintenance 55
Safety 55
Sustainability 55
Managing Budgets 55
Organization of the Industry 56
Selection Criteria 56
Specifying 56
Sample Spec 2.2 57
Inspection 58
Related Material 59
Summary 59
Web Search Activities 59
Personal Activities 60
Summary Questions 61

Chapter 3:
Textiles, Window Treatments, and Soft Goods 63

Key Terms 63
Objectives 63
Material 64
Components 67
Fiber 67
Yarn 69
Construction 71
Weave 71
Knits and Felted Fabrics 80
Finishing 80
Mercerizing 80
Bleaching 80
Dyeing 80
Printing 81
Embossing 84
Flocking 84
Calendering 84
Crushing 84
Glazing 85
Optical Brighteners 85
Soil Retardants 85
Heat Setting 85
Flame Retardants and Antimicrobial Finishes 85
Singed 85
Napping or Brushing 85
Quilting 85
Embroidery 86
Uses and Implications for Selections 86
Protection and Maintenance 87
Backings 87
Polymerization Treatments 88
Nanotechnology 88
Cleaning Codes 88
Safety 88
Safety Codes 89
Managing Budgets 89
Organization of the Industry 89
Selection Criteria 91
Related Material 92
Leather 92

Soft Goods 94
Window Treatments 95
Qualifying Installers and Fabricators 103
Upholstery 108
Bedding and Pillows 108
Cushions 108
Inspecting the Fabric Application 108
Sustainability of Fabrics and Leather 109
Summary 110
Web Search Activities 110
Personal Activities 110
Summary Questions 111

Chapter 4:
Carpeting and Area Rugs 113

Key Terms 113
Objectives 113
Carpet 114
Material and Characteristics 114
Natural Fibers 114
Synthetic Fibers 115
Yarn 117
Denier and Ply 118
Construction Methods 119
Tufting 119
Weaving 119
Flocking 120
Fusion Bonding 120
Knitting 120
Needle-Punched 120
Modular Tiles 120
Other Processes 121
Colors and Patterns 121
Predyed 121
Postdyed 121
Backing 122
Pads 122
Rebond 122
Waffle Rubber 123
Slab Rubber 123
Foam Padding 123
Fiber 124
Frothed Foam 124
Qualifying Installers 124
Installation 125
Checking the Seaming Diagram 125
Tackless Installation 126
Glue-Down Installation 126
Meeting Adjacent Flooring Materials 126
Installation on Stairs 126
Stair Rods 127
Installation Sequence 127
Installation of Carpet Tiles 128
Protection and Maintenance 129
Safety 129
Allergens and Carpet 129
Outgassing 129
Sustainability 130
Managing Client Budgets 130
Confirming the Estimate 130
Organization of the Industry 131
Selection Criteria 131
Specifying 133
Sample Spec 4.1 133
Inspection 134
Related Material 134
Area Rugs 134
Categorizing Area Rugs 135
Ready-Made Rugs 135
Semicustom Pile Rugs 135
Pieced Rugs 135
Floor Cloths 136
Rag Rugs 136
Hand-Tufted 136
Woven Rugs—Other Materials 136
Hooked Rugs 137
Braided Rugs 137
Felt Rugs 137
Tapestry Rugs 137
Needlepoint Rugs 138
Orientals 138
Assessing Products 139
Size 139
Material Quality 139
Determining Value 140
Age 140
Wear 141
Design Aspects 141
Construction Issues 142

Repairs 142
Knot Count 143
Fabrication 143
Finding a Rug 145
Care and Maintenance 146
Restoration 146
Safety 146
Sustainability 146
Managing Budgets 146
Organization of the Industry 148
Village Rugs 148
City Rugs 148
Vendors 148
Local Artisans 148
Dealer Services 148
Selection Criteria 148
Specifying 149
Sample Spec 4.2 150
Inspection 151
Related Products 151
Summary 151
Web Search Activities 151
Personal Activities 151
Summary Questions 152

Chapter 5: Wood 155

Key Terms 155
Objectives 155
Solid Wood 156
Material Makeup or Content 156
Characteristics 158
Products Commonly Made from Wood 160
New Flooring 160
Solid Wood Planks for Walls and Floors 160
Parquet Blocks 161
Existing Wood Flooring 161
Flooring Accessories 162
Architectural Trims 163
Doors 166
Staircases 167
Fabrication 167
Floors 168
Architectural Wood Trims 168
Doors 169
Stairs 169
Finishing Processes 170
Special Processes 170
Colorants 170
Qualifying Installers and Suppliers 171
Manufacturers 171
Custom Fabricators 172
Carpenters 172
Installation 172
Floors 172
Architectural Millwork Trims 173
Doors 174
Stairs 174
Protection and Maintenance 174
Floors 174
Safety 174
Doors 175
Stairs 175
Sustainability 175
Forest Stewardship Council 175
Reclaimed Wood 176
Managing Budgets 176
Organization of the Industry 176
Selection Criteria 178
Specifying 178
Sample Spec 5.1 179
Inspection 180
Floors 180
Inspection for Doors 180
Inspection for Trims 181
Inspection for Staircases 181
Related Material 181
Door Accessories 181
Stair Accessories 183
Wood Veneers 183
Material Makeup or Content 183
Characteristics 184
Grain 184
Figuring 184
Color 185
Veneer Grades 185
Parts and Accessories 186
Fabrication 186
Cuts 186
Patterns 186
Pattern Matching 188
Panel Matching 188

Finishing Veneered Pieces 190
Special Techniques 190
Qualifying Installers 191
Installation 191
Protection and Maintenance 192
Safety 192
Sustainability 193
Managing Budgets 193
Organization of the Industry 193
Working with Fabricators 194
Selection Criteria 195
Specifying 198
Inspection 198
Related Material 198
Summary 198
Sample Spec 5.2 199
Web Search Activities 200
Personal Activities 200
Summary Questions 200

Chapter 6:
Resilient Flooring 203

Key Terms 203
Objectives 203
Material 204
Characteristics 204
Linoleum 204
Cork 205
Leather 206
Vinyl 206
Rubber 208
Polyolefin 209
Parts and Accessories 210
Site Considerations 211
Moisture Control 211
Subflooring 211
Existing Floor as Substrate 212
Qualifying Installers 212
Installation 212
Protection and Maintenance 213
Safety 213
Sustainability 214
Managing Budgets 214
Organization of the Industry 214
Selection Criteria 215
Specifying 215
Sample Spec 6.1 216
Inspection 217
Related Material 217
Summary 217
Web Search Activities 217
Personal Activities 218
Summary Questions 218

Chapter 7:
Plastic Materials 219

Key Terms 219
Objectives 219
Plastic 220
Material Makeup or Content 220
Acrylic 220
Solid Surfacing and Engineered Stone 220
Plastic Laminates 222
Thermally Fused Foils 222
Decorative and 2D Foils 223
Rigid Thermofoils 223
Characteristics 223
Acrylic 223
Solid Surfacing 223
High-Pressure Laminate 224
Low-Pressure Laminate 225
Parts and Accessories 225
Substrates 225
Edging 226
Fabrication 226
Bonding 226
Material-Specific Considerations 227
High-Pressure Plastic Laminate 227
Thermofoil 227
Qualifying Installers 227
Acrylic 228
Solid Surfacing and Laminate 228
Installation 228
Protection and Maintenance 228
Safety 228
Sustainability 229
Managing Budgets 230
Organization of the Industry 230

Selection Criteria 231
Specifying 231
Sample Spec 7.1 231
Inspection 233
Related Material 233
Summary 233
Web Search Activities 233
Personal Activities 234
Summary Questions 234

Chapter 8: Glass 235

Key Terms 235
Objectives 235
Glass 236
Material 236
Characteristics 236
Properties 236
Parts and Accessories 239
Fabrication 240
Float Glass 240
Cast Glass 240
Laminated Glass 241
Tempered Glass 241
Chemically Strengthened Glass 241
Patterned Glass 243
Wire Glass 243
Glass Block 243
Surfaces 244
Edges 244
Qualifying Installers 245
Installation 245
Protection and Maintenance 246
Safety 246
Sustainability 246
Managing Budgets 246
Organization of the Industry 247
Selection Criteria 247
Specifying 247
Sample Spec 8.1 248
Inspection 249
Related Material 249
Summary 249
Web Search Activities 249
Personal Activities 249
Summary Questions 250

Chapter 9: Metals 251

Key Terms 251
Objectives 251
Material Makeup or Content 252
Characteristics of Various Metals 252
Ferrous Metal 252
Nonferrous Metal 253
Parts and Accessories 254
Forming Metal 254
Sheets 254
Plate 255
Cast Forms 255
Pipes and Tubes 255
Extruded 257
Spun 257
Welding and Soldering 257
Weaving 258
Finishes 258
Qualifying Custom Fabricators 259
Installation 259
Protection and Maintenance 259
Plating 260
Coatings 260
Problems with Coatings 261
Safety 262
Sustainability 262
Salvaged Metal 262
Managing Budgets 262
Organization of the Industry 263
Selection Criteria 263
Specifying 264
Inspecting for Quality 264
Related Material 264
Sample Spec 9.1 265
Summary 266
Web Search Activities 266
Personal Activities 266
Summary Questions 267

Chapter 10: Tile and Brick 269

Key Terms 269
Objectives 269
Tile 270
Material Makeup or Content 270

Clay 270
Glass 272
Stone 273
Concrete 273
Metal 274
Composite 274
Characteristics 274
Unglazed Tiles 276
Glazed Tiles 276
Visual Character 277
Spacing 277
Parts and Accessories 277
Fabrication 278
Layout 278
Qualifying Installers 279
Installation 279
Prior to Setting 279
Setting the Tile 280
Protection and Maintenance 282
Safety 282
Sustainability 283
Managing Budgets 283
Organization of the Industry 284
Selection Criteria 285
Specifying 285
Sample Spec 10.1 286
Inspection 287
Related Material 287
Brick 287
Composition 287
Characteristics 288
Dimensional Brick 288
Brick Pavers 289
Brick Veneers 289
Parts and Accessories 289
Fabrication 290
Finishes 290
Qualifying Installers 291
Installation 291
Mortar Joints 291
Horizontal Installations 292
Brick Orientations 292
Protection and Maintenance 294
Safety 294
Sustainability 295
Managing Budgets 295
Organization of the Industry 296
Selection Criteria 296
Specifying 296
Sample Spec 10.2 297
Related Material 298
Summary 298
Web Search Activities 298
Personal Activities 299
Summary Questions 299

Chapter 11: Stone 301

Key Terms 301
Objectives 301
Characteristics 302
Identifying Stone Characteristics 303
Tests of Physical Characteristics 304
Stone Species 304
Granite 304
Soapstone 305
Marble 305
Serpentine 306
Travertine 306
Slate 307
Limestone 307
Quartzite 308
Onyx 308
Options to Specify 310
Surface Textures 310
Profiles 311
Match 312
Grade 313
Sealants 313
Penetrating Sealant 313
Topdressings 313
Managing Budgets 314
Protection and Maintenance 315
Qualifying Tradespeople 315
Safety 316
Sustainability 316
Organization of the Industry 316
Selection Criteria 318
Specifying 319
Sample Spec 11.1 320
Inspection 321
Working with Resources 321

Summary 321
Web Search Activities 321
Personal Activities 322
Summary Questions 322

Chapter 12: Terrazzo, Composites, and Concrete 325

Key Terms 325
Objectives 325
Terrazzo and Similar Composites 326
Material 326
    Aggregate 326
    Matrix/Binder 328
Characteristics 328
Parts and Accessories 330
    Precast Items 330
    Divider Strips 330
Fabrication Considerations 332
    Substrates 332
    Curing and Finishing 332
Qualifying Installers 332
    Experience 332
    Credentials and Training 332
    References 333
Installation 333
Protection and Maintenance 333
Safety 334
Sustainability 334
Managing Budgets 335
Organization of the Industry 335
Selection Criteria 335
Specifying 336
Related Material 336
    Artificial Stone 336
    Sample Spec 12.1 337
Concrete 338
Material 338
Characteristics 339
Forms 339
    Precast 339
    Surfaces 340
    Stock or Custom 341
    Toppings 342
Finishes 343
    Textures 343
    Pigment 344
    Sealants 344
Installation 348
Managing Budgets 349
Qualifying Installers 349
Safety 350
Sustainability 350
Organization of the Industry 350
Selection Criteria 350
Specifying 351
    Sample Spec 12.2 352
Inspection 353
Related Material 353
    Grouts and Mortars 353
Summary 355
Web Search Activities 355
Personal Activities 356
Summary Questions 357

Chapter 13: Laminated Materials 359

Key Terms 359
Objectives 359
Laminated Materials 360
Material Makeup or Content 360
    Substrates for Laminated Products 360
    Facing Materials 362
Products 362
    Laminate and Engineered Flooring 362
    Laminated Stone 363
Characteristics 365
    Wood Products 365
    Stone Veneer 366
    Resilient Products 367
    Other Surfaces 367
Accessories 367
Fabrication 367

Qualifying Installers 368
Installation 368
Laminated Floor Products 368
Stone Veneer Products 369
Modular Systems 370
Custom Installations 370
Protection and Maintenance 370
Safety 370
Sustainability 371
Managing Budgets 371
Organization of the Industry 372
Selection Criteria 372
Specifying 372
Sample Spec 13.1 373
Inspection 374
Related Material 375
Summary 375
Web Search Activities 375
Personal Activities 375
Summary Questions 376

Chapter 14: Acoustics 377

Key Terms 377
Objectives 377
Acoustic Concepts 378
Characteristics of Sound 378
Echo 378
Flutter Echo 378
Frequency of Airborne Sound 378
Reverberation 379
Focused Sound 379
Rating and Measuring Sound 379
Privacy Index 379
Sound Transmission Class 379
Impact Isolation Class 380
Noise Reduction Coefficient 380
Speech Range Absorption 380
Ceiling Attenuation Class 380
Sound Absorption Coefficient 380
Managing Sound 380
Live and Dead 381
Decibel Reduction 381
Attenuation 381
Products 383
Ceiling Systems 383
Wall Systems 384
Sound Abatement Mats 384
Other Material Solutions 384
Specifying 385
Sample Spec 14.1 385
Installation 386
Inspection 386
Summary 386
Web Search Activities 386
Personal Activities 386
Summary Questions 386

Glossary 387

Basic Metric Conversion Table 397

Index 399

PREFACE

Interior design students are required to understand many more issues in their work than ever before—methods for best practice, software platforms for developing and communicating design, strategies for researching and incorporating new ideas and approaches, and new materials. To best serve the needs of students who must assimilate a lot of content, this second edition has undergone tremendous changes relative to the first.

The format of the information has been somewhat compartmentalized, allowing students to revisit portions of the various materials chapters and find the information there complete for that issue of that material. Much information has been streamlined—converted to tables and charts for fast assimilation—and topics edited to address the materials more concisely and comprehensively.

New pedagogical features allow for quick introduction to concepts and information that can be presented in smaller chunks, and do not require lengthy background information to comprehend. These features appear as *Helpful Hints*, *Points of Emphasis*, *What Would You Do?*, *For the Connoisseur*, and *Cautionary Tales*. *Helpful Hints* are quick tips for managing a portion of the process. They are related to, but distinct within, the materials presented. *Points of Emphasis* further explain some nuance or expand on a specific instance within the topic. *For the Connoisseur* tidbits share some popularly held valuations or preferences. *Cautionary Tales* are just that, stories of what has gone wrong with an installation and why. These tales are an opportunity to see the often hidden implications for material characteristics. *Web Search Activities* and *Personal Activities* for each chapter encourage students to apply newly gained knowledge and ending *Summary Questions* test comprehension of topics discussed in the chapter. This new edition also introduces a glossary of definitions for important *Key Terms* that are listed at the beginning of each chapter and bolded at first mention within the text.

A textiles section has been added to address the needs of students in programs where textiles is not a separate course or an elective. It gives students a working knowledge of fiber chemistry and the various characteristics of fabrics that affect performance. This chapter will also be a good overview for students who intend to study fabrics in more depth in a class devoted to fabrics alone.

Other new features engage students' curiosity by suggesting consideration of possible outcomes of selections and requesting that the student form an educated opinion about an issue, or think of a resolution to a possible problem, in the *What Would You Do?* feature. *Shop Visits* have been moved out of the CD and into the book proper so students are not required to switch media to access the material. Each of these features, *Helpful Hints*, *Points of Emphasis*, *Cautionary Tales*, *Shop Visits*, and *What Would You Do?,* contain important and specific information, succinctly put forth with little extraneous explication. Streamlining the materials will help busy students get the gist of these topics quickly and, at times, even visually.

This is a nuts-and-bolts subject that deserves the most straightforward presentation. The idea behind the book is to give the new designer a working knowledge of surfacing materials and the basis for a logical investigation when selecting and specifying. Globalization, sustainability, and toxicity are important conversations within the material topics and are integrated into the materials chapters to help students make direct connections between the material and these issues.

The specification format that has been adopted by the industry is used in every materials chapter so students can comprehend the universality of the format and how it is adapted to every material that they read about. The chapters have been rearranged so that they ease students into the topics with materials that are familiar to most people, such as wallcoverings and carpeting, to expand on the understanding that they have likely acquired before starting their interior design studies.

The book provides a background that will be the basis of material selections from a performance standpoint, making this valuable information to have acquired prior to studio classes.

ACKNOWLEDGMENTS

I am very grateful to the reviewers for their critique of the first edition: Bill Beitz, Oklahoma State University; LuAnn Nissen, University of Nevada, Reno; Linda Nussbaumer, South Dakota State University; Petra Probstner, Columbia College Chicago; Erin Speck, George Washington University; Elizabeth Stokes, The Art Institute of Portland; Maruja Torres-Antonini, University of Florida; Meghan Woodcock, Savannah College of Art and Design. Their comments became the basis for many of the improvements that we made to meet the changes in student needs for simplicity and streamlined focus. Thank you, Olga Kontzias, for all of your suggestions for organization, especially regarding the new format of the chapters. Maureen Grealish, development editor, and Joe Miranda, senior development editor, contributed mightily to the organization and guided the process through a couple of iterations as we arranged and rearranged for ever more logical presentation. The beautiful new cover was designed by Carly Grafstein. Last, but not least, thank you to Gale, still my best sounding board and friend.

Chapter 3

TEXTILES, WINDOW TREATMENTS, AND SOFT GOODS

Key Terms

Biodiversity
Calendering
Cellulosic
Chintz
Crimped
Denier
Economies of scale
Felted
Filaments
Floats
Greige goods
Hand
Inside mount
Memo sample
Mercerizing
Monoculture
Nap
Off-grain
Pile
Protein
Seam slippage
Stackback
Synthetic
Twill
Worsted

Objectives

After completing this chapter, you should be able to:

- Specify how yarn, weave, and finish processes define the characteristics of a textile.
- Understand how the chemistry of the fiber affects performance.
- Know what to consider when selecting and specifying a textile for a specific use.
- Explain how leather is used in place of textiles and how to evaluate leather for your client's job.
- Understand soft goods, their uses and design considerations, and installation.
- Understand upholstery production and evaluation.
- Relate to sustainability issues associated with fabric and leather.
- Select from related materials, such as manufactured window coverings.
- Understand working with other materials used for window coverings and upholstery.

Your clients may respond to fabrics and wallcoverings with more enthusiasm than they do for any other material you present to them. This is because we come into physical contact with them, so they are especially personal. They must be visually appealing (and appropriate) and tactilely pleasant. You may even find that your client is more involved in the evaluation of the fabrics that you present than they are in the furniture they go on!

Your evaluation of fabrics will address your program goals for cleanability, acoustical control, flame resistance, durability, fade resistance, sustainability, global markets, and other factors that will make the fabric serviceable and long lived in the environment. You don't need a textbook to tell you that a huge variety of fabric types has been developed to provide performance and aesthetic characteristics to interior design. Your client is likely to have a personal reaction to the fabrics you suggest, even though you are suggesting a fabric not only to please them, but to create a look that is congruent with their brand or their project's concept. These visceral responses also play part in your selection.

As you select and evaluate fabric, keep in mind that characteristics are influenced by several factors. For example: a crisp hand may be due to the fiber type, like linen. Linen fiber is described as crisp; it comes from the stem of the plant (called bast fiber). Knowing its function on the plant makes it easy to understand why it is stiff. A high twist can also make a fabric feel more crisp, so a fiber that is not characterized as crisp can still be used to make a crisp fabric. A tight weave can also affect the hand of the fabric and make it feel crisper. A **twill** weave can have more body than a plain weave. Finishing processes such as starching or glazing (part of the finishing process for cotton **chintz**) lend crispness to fabric. The versatility that is created by the great number of materials and processes used to make fabrics results in myriad fabric choices that you must evaluate when you select fabrics for your jobs. The characteristics of a fabric cannot ever be attributed to a single element of its fiber, construction, or finishing, as they all work together to define the nature of a particular fabric.

MATERIAL

Fabrics are woven from yarns and yarns are constructed of fiber. Fiber sources can either be natural or **synthetic**. Some natural fiber sources provide fiber directly. Cotton and wool are such natural sources, so these fibers are referred to as natural fibers. Cotton is a natural **cellulosic** fiber and wool is a **protein** fiber. Other natural sources for cellulosic fiber are wood or bamboo. Wood and bamboo are often deconstructed into their chemical constituents and the chemicals are then recombined in forms that are more appropriate for textile production. You could imagine that the cellulosic material is chemically "melted" with other chemicals, the molecules rearranged and then extruded into **filaments**. These fibers have natural sources but they are still man-made, since they are extruded into fibers. These fibers are called man-made fibers.

Wool is one of two protein fibers, the other being silk. Wool is a category encompassing the hair from any animal. When we think "wool," we immediately think of sheep. There are many kinds of sheep with varying wool characteristics: some sheep have heavy lanolin production that makes their hair good for carpeting. Some sheep have long, fine hair and their wool is used to make **worsted** wool, which has a smooth, fine surface and good drape. Some sheep have short, curly hair, which is good for fabrics that are woven to produce hefty fabrics with a "warm" hand.

The hair of any animal can be made into wool textiles. The luxury fibers from alpaca, camels, or cashmere and Angora goats can be found in blends for the furnishings industry, but because of the larger quantities required for furnishings versus clothing, it is not as common to see these fibers used in fabrics for furniture and drapes as it is to find them in apparel.

Although there are a few different species of silkworms, most of the silk that you will specify comes from one kind of caterpillar that eats mulberry leaves. Since this silk represents over 90 percent of the commercial silk industry, it is usually not distinguished from other kinds of silk and will be simply known as silk. Only when needing to distinguish from other kinds of silk will anyone refer to this silk as mulberry silk. The other kind of silk that you are likely to specify is called tussah (or less commonly, tassar) silk. It is not as lustrous as mulberry silk and has a crisper hand. Silk from silkworm cocoons will be in longer strands if the insects are not permitted to chew their way out of the cocoon.

Other fibers are derived from constituents that do not come from plants. These fibers are synthesized from chemicals and extruded into fiber the way the man-made fibers are extruded, but since they are composed of chemicals that were not grown in nature they are called synthetic fiber. Table 3.1 categorizes these fiber origins.

Table 3.1
Fiber characteristics.

Natural Fiber			
Protein Fiber	**Properties**	**Hand and Appearance**	**Uses and Implications**
Silk	Good tensile strength, may water spot, yellows with age, degraded by UV rays	Smooth or slubby, lustrous, crisp drapability	Drapery, light upholstery, used in blends
Wool	Resists wrinkling, absorbent, resilient, burns slowly in direct flame, self-extinguishes	Worsted, smooth, drapable, short, staple, springy; varies by animal	Carpeting, upholstery, and drapery
Cellulosic Fiber	**Properties**	**Hand and Appearance**	**Uses and Implications**
Cotton	Absorbent, dyes well, flammable unless treated with chemicals; hydrophilic	Soft and drapable, tends to wrinkle and soil	Drapery and multipurpose in blends; difficult to keep clean without treatments or use in blends
Linen	Absorbent, dyes well, resists piling and degradation from UV, wrinkles, reacts to moisture in air	Crisp, smooth	Upholstery wrinkles, drapery elongates and shrinks with changes in humidity, some use in carpeting, dry-clean only
Jute	Absorbent, dyes well	Crisp, coarse	Floor covering, novelty
Hemp	Absorbent, dyes well	Crisp, coarse	Floor covering, novelty
Bamboo	Very absorbent, antibacterial	Crisp, coarse	Multipurpose
Man-made Fiber			
Cellulosic	**Properties**	**Hand and Appearance**	**Uses and Implications**
Rayon and lyocell	Absorbent, easy to dye; from wood pulp	Artificial silk; drapes well	Multipurpose and light upholstery
Acetate	Resists shrinking, moths, from wood pulp; cross-dyed with cotton or rayon	Soft and drapable, variety of lusters possible	Multipurpose and light upholstery use
Lyocell	Dyeability, wrinkle resistance, biodegradable	Good drapability, varying construction simulates silk or leather	Multipurpose fabrics
PLA	Good wicking, low absorption, light fiber, low smoke and flame; renewable from sugar crops, corn, and beets		Multipurpose fabrics
Bamboo	Very absorbent, antibacterial	Soft and drapable	Multipurpose, novelty
Noncellulosic	**Properties**	**Hand and Appearance**	**Uses and Implications**
Polyester	Springy hand, resists wrinkling, shrinkage, mildew; melts, self-extinguishes; oleophillic	Pleats and creases must be heat set; crisp hand	Carpet, multipurpose, used in blends for upholstery
Nylon	Strong, elastic, abrasion resistant, resists damage by many chemicals, low absorbency; hydrophobic	Lustrous, can be fine or coarse depending on fiber cross section and size	Carpet, upholstery, drapery, blends may pill
Acrylic	Low absorbency, dyeable, resists winkling, soiling, and damage from UV	Can resemble cotton or wool	Carpeting, upholstery, novelty; may pill unless continuous fiber
Polypropylene	High bulk, resists abrasion, moisture, UV, chemicals; low melting temperature, oleophilic	Springy, waxy feel	Carpeting, upholstery, used in blends
Glass	Fiberglass is nonabsorbent, flame resistant	Heavy, can cause skin irritation if handled excessively; the term *glass curtains* is also used in place of the term *sheers*, which may be made of another fiber	Window covering

Selection of the correct fabric for your job begins with your design program. You will determine the characteristics that the textile must have for each location on your client's job. During your evaluation, and throughout this chapter, you should keep in mind that a fabric's characteristics are created by manipulating a number of elements in the construction and each of these elements is independent of the others. These characteristics are independent of one another. For instance if you had two fabrics that were identical in every way except for the density of the weave, the looser weave would have superior drape to a denser weave. If two fabrics were identical in every way except the degree of twist given to the yarn, the fabric woven from the high-twist yarn would have more body. Designers must make evaluations of each fabric selected by noticing its characteristics. Some of these characteristics can be seen and felt, others are measurable and you will review the test results when selecting textiles for commercial use. Table 3.2 lists these measurable characteristics for which you will be able to locate testing data.

Point of Emphasis 3.1

To really comprehend some of the subtle distinctions between the characteristics that you read about in this chapter, you will need to have access to different kinds of fabric for interior design. Options here would be to purchase a swatch kit intended for interior design studies. You can find such a swatch kit online—make sure it clearly states that it is for interior design because there are fashion studies kits as well and they will not serve your purposes. Another option is to keep a list of characteristics that you read about and then go to a fabric shop or an upholstery shop that has sample books and locate physical examples of those characteristics that you can cement in your brain with direct contact. If you identify yourself as a student, shops will sometimes save their discontinued books for your projects.

The goal is to have direct contact with fabric so that you become actively aware of the implication of the various characteristics on performance. You can tell a lot about how a fabric will be likely to perform *just by touching it*.

Table 3.2
Characteristics to evaluate for your textile selections.

Resistance To	Important Because
Flame	Textiles in commercial interiors especially should not support flame
Smoke generation	Even if a textile does not flame up it can obscure an exit route with smoke or release toxic chemicals
Abrasion	Fabric that abrades will wear through from friction, limiting its useful life
Stains	Fabrics that look soiled will be discarded even if they are still serviceable otherwise
Static	Sensitive equipment such as hospital monitors can be disrupted, moving drapery can transfer electrons and develop static cling
Crushing	Fiber can flatten out where weight is applied (from people sitting) and appear worn out even if it is still structurally sound
Moisture	Absorbent fibers may change with humidity, shrinking and growing in length; fiber with high moisture-regain properties are more comfortable
Chemicals	Affects cleanability
Tear strength and burst strength	If fibers break, fabric will be likely to pill or even tear; upholstery endures "foot sitters" and sharp objects
Seam slippage	Stressed seams, like on upholstered seats, will split open if the fabric unravels at the seams

Fabric intended for the residential market will not always have testing data immediately available. This means that you will be expected to make a determination of the suitability of the fabric with only the barest information about it. Often you have only the fiber content and width of the bolt provided and the rest you must evaluate by looking and handling the fabric. Luckily many of the characteristics in the list above can be discerned by a physical inspection of a **memo sample**. Table 3.3 lists some of the characteristics inherent in the fiber chemistry, so you can see that this information is very important as many properties vary with chemical makeup. These are properties that you could not be expected to discern by looking at and handling the fabric, so this is information that you will have to remember or look up when you are a working designer evaluating fabric for your client's jobs.

COMPONENTS

Fabric characteristics depend on the entire fabric construction with each component interacting with the others, creating the way each fabric feels, looks, and performs. The components that you will evaluate, not just individually, but as parts of the whole structure, include fibers, yarn, and weaves.

Fiber

Fibers have their own inherent properties created by their chemistry and their form. For instance, the chemistry of nylon makes it resist abrasion and when spun into a trilobal, meaning it has three lobes in cross section (Figure 3.1), it also conceals soiling.

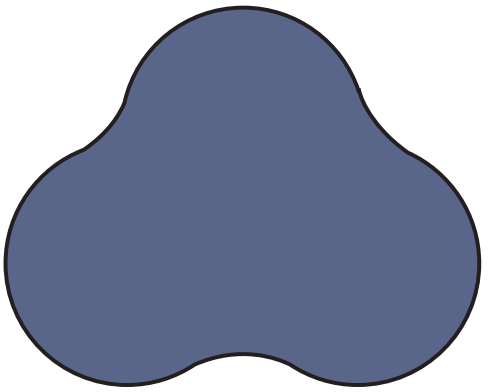


FIGURE 3.1 *Trilobal* simply means "three lobes" and that describes the cross section of the fiber.

Table 3.3
Characteristics of fiber chemistry compared. (L = Low, M = Medium, H = High)

	Wool	Silk	Cotton	Linen	Jute	Hemp	Bamboo	Rayon	Acetate	Lyocell	PLA	Polyester	Nylon	Acrylic	Polypropylene	Glass
Flame resistance	H	H	L	L	L	L	L	L	M	L	L	H	M	M	L	H
Moisture regain—comfort	H	M	M	M	M	M	M-L	M-H	L	M-H	L	L	M-L	M-L	L	L
Abrasion resistance—durability	H	M	M	M	M	M	M	M	L	M	L	H	H	M	H	L
Tensile strength—breakage	L	H	H	H	H	H	M	L	L	H	M-H	M-H	M-H	M	H	H
Elasticity—recovery after stress	H	H	L	L	L	L	M	H	L	M	H	L	H	H	H	L
UV resistance	L	L	M	M	H	H	H	M	M	M	H	H	L	H	M	H
Resiliency—wrinkle resistance	H	H	L	L	L	L	M	L	M-L	M-L	H	H	M-H	M-H	M-H	H
Density (low density = coverage)	M	M-L	H	M-H	M-H	M	H	M-H	M	M-H	L	M	L	L	L	H

Fibers that are long and fine will produce smooth fabrics; worsted wool made from longer hair with a high twist to the yarn is smooth and fine but wool that is spun and woven from shorter hair is fuzzy and warm. Fibers that are kinked or **crimped** will produce fabric that has a little "give"; conversely, fiber that has no elongation can produce a more stable fabric, provided the weave is tight. Fiber characteristics are a very critical consideration when evaluating a fabric for your job. Table 3.4 has a quick comparison of some characteristics of different fibers.

What Would You Do? 3.1

If you wanted a fiber for a senator's waiting area in a government building that was flame resistant and comfortable to sit on, what fiber would you pick? Why?

If you wanted a fiber that was UV and wrinkle resistant, what would you pick? Why?

If you wanted a fiber that dried quickly and resisted breaking, what would you pick? Why?

Reasons for selecting textiles include functional and aesthetic considerations. There are many highly subjective reasons for choosing aesthetic characteristics but some considerations that seem to be aesthetic are also functional. Table 3.5 illustrates some seemingly aesthetic choices that have functional outcomes.

Fibers are used alone and in blends. The reasons for blending two fibers together include:

1. Properties of two fibers will contribute to the characteristics of the finished textile. Sometimes these blends are motivated by price, as when acrylic is blended with wool to reduce the price of wool fabric while changing the hand and appearance as little as possible. Sometimes it is motivated by performance, as when nylon and polyester are combined to lend nylon's improved elasticity or polyester's superior fade resistance to the blended fabric.
2. Different dying methods are possible with multiple fibers because different fibers react to dyestuffs in different ways creating an ombre effect.

Table 3.4
Functional outcomes of various properties.

Fabric Component	Characteristic
What the fiber is made of will affect many properties	Some fibers are naturally slippery, stiff, springy, flammable, or flame resistant, etc. Different fibers have different characteristics.
Fiber characteristic—length	Fibers that are long may feel smoother whereas short fibers will have the ends "poke out" of the yarn, possibly imparting a warmer hand.
Fiber characteristic—kink	Fiber that has some kink or curl has some potential to elongate just due to the fact that the kink makes extra material available to stretch out.
Yarn characteristic—thickness	A thick denier puts more fiber into the construction so even if some wears away, there is still fiber holding the structure of the cloth together. The hand will be more "plump." The opposite is true for a fine yarn.
Yarn characteristic—twist	A high-twist yarn will produce more "body."
Density of the weave	The more tightly the yarns are packed together the firmer and more stable the fabric will be.
Weave construction	Some weaves are more durable and stable than others.
Processes	Treatments and chemicals applied to fibers or to fabrics alter the characteristics and performance of the fabric.

Table 3.5
Functional outcomes of aesthetic choices.

Characteristic	Functional Outcome
Fabric weight	Serviceability is affected; heavy fabrics with more fiber in them will last longer
Texture	Coarse textures will attract more soiling; smooth textures may be finer and therefore less durable yarns
Color	Light and dark fabrics show different kinds of soiling; medium tone fabrics are most successful at concealing soiling
Luster	Reflect more light, show more surface dirt
Pattern	Some patterns conceal soiling

For the Connoisseur 3.1

Even though synthetic fiber has been developed to solve a lot of problems that cannot be overcome by natural fiber, natural fiber is still preferred by the connoisseurs. Fabric constructions that feature long staple, high-twist, small denier yarns in natural fiber are likely to meet with approval among the connoisseur crowd.

Yarn

The character of the yarn comes from the fiber properties (see Table 3.5, opposite) and processes that have been used on the fiber. Natural fibers like cotton and wool are shorter in length than long fibers unwound from the cocoon of a silkworm. The long length of silk fiber is partly responsible for the smooth surface and luster of silk fabric. Man-made fibers are spun into similarly long filaments. These filaments are typically given a crimp or texture so that they mat together, creating a more stable and resilient yarn. When long filaments are texturized they are referred to as bulked continuous filament (BCF). The yarn made from these filaments is smoother because it does not have the ends of short fibers projecting out of the yarn that would make it "fuzzy." Short staple yarns like wool (Figure 3.2) and cotton have their short ends poking out so they are fuzzier than silk and BCF yarns. Figure 3.3 shows the silhouettes of two fabric yarns. The top one is made from fiber cut to staple length and crimped before being spun into yarn and the bottom one is only crimped. Both will have a slightly warmer hand and have more resilience and elasticity than BCF left uncrimped, but the fabric woven from staple length will have a warmer hand than the fabric woven from long fiber.

The degree of twist as the fibers are spun into yarn also contributes to the characteristics of the fabric. Tightly twisted yarn, called high-twist yarns, have more body, and are more stable than low-twist, "blown" yarns. More than one yarn may be twisted together to make the complete yarn used to weave a fabric. Each strand of yarn is called a ply and a single-ply yarn is only one yarn twisted into a strand to be woven while a two-ply yarn has two yarn strands twisted together and so on. Figure 3.4 diagrams a two-ply yarn: two yarns twisted around each other after they were spun.

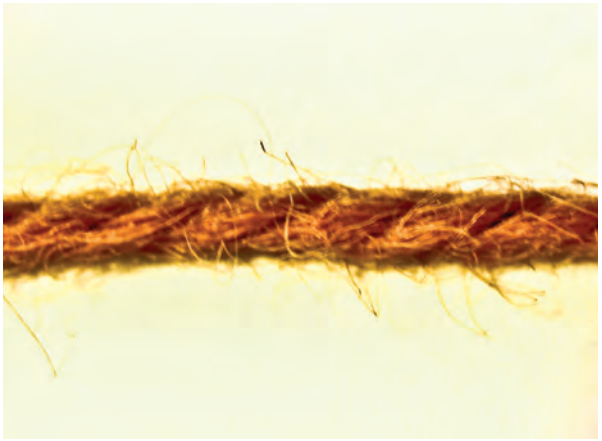


FIGURE 3.2 Most natural fiber is staple fiber, meaning shorter pieces like the length of a sheep's hair or the height of the stalk that linen comes from. One of the yarn characteristics that comes from this staple length is that fuzzy ends protrude from the spun yarn.

FIGURE 3.3 Man-made fiber can be much longer than staple length. Long fiber is called filament, as in staple yarn versus filament yarn. When man-made fiber is modified to make a fabric that resembles natural fiber it will be cut to staple length and crimped to give it texture, as in the silhouette at the top of the image. The filament yarn at the bottom of the image does not have the small ends poking out of the yarn.

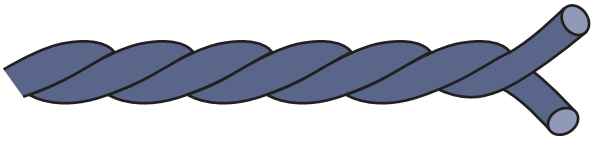


FIGURE 3.4 *Ply* means the number of yarns twisted together. This two-ply yarn illustrates the concept but many more plies are possible.

The thickness of the yarn makes a difference too. The thickness of the yarn is described as a measurement of its **denier**. A high-denier yarn is a thick yarn. Thick yarn may be more durable because it has more fiber to wear away before it wears through. All else being equal, fabrics woven of heavy-denier (thick) yarn will have more fiber in them so they will not wear out as fast as those made from the same fiber but spun into a finer yarn. The fine denier of a yarn used to weave a batiste and the heavy yarn used to weave a commercial-grade hopsacking demonstrate this distinction (Figure 3.5).

There are novelty yarns that are an inconsistent diameter with some portions tight, smooth, and fine and other parts along the length of the same yarn being thicker and less tightly spun. These yarns are called slub yarns. There are special yarn constructions, called bouclé yarns that are two-ply or more, with one yarn for stability and the other for texture. Figure 3.6 shows a bouclé and Figure 3.7 shows a fabric woven with a bouclé yarn. If you look closely at the bouclé yarn shown in Figure 3.7 you can easily imagine that a looped bouclé yarn could be vulnerable to catching and pulling if not woven in tightly or adhered to a backing. The slub yarn in Figure 3.6 has, alternately, a loose, "blown" structure and a more tightly twisted structure. You can imagine that these special yarn constructions affect the appearance and performance of the fabric.

Simply varying the denier of the yarn used throughout the weave can introduce subtle textural changes. Figure 3.8 shows a series of weaves called filling rib weaves because they have weft yarns that are of a heavier denier than the warp yarns. The fine denier of the faille fabric on the left of Figure 3.8 is different from the wide denier of the ottoman fabric on the right. Bengaline and rep in the center of Figure 3.8

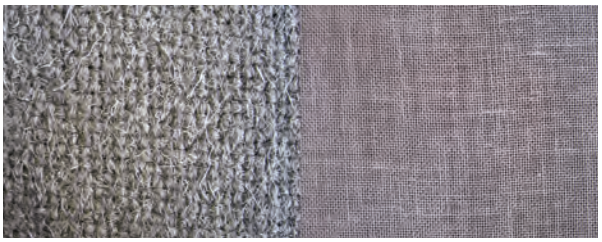


FIGURE 3.5 The denier of the yarn, its thickness, has a significant effect on the characteristics of the fabric woven from it. This wool hopsacking cloth on the left and the batiste on the right utilize the same weave pattern but anyone would guess that their performance and hand will be quite different.

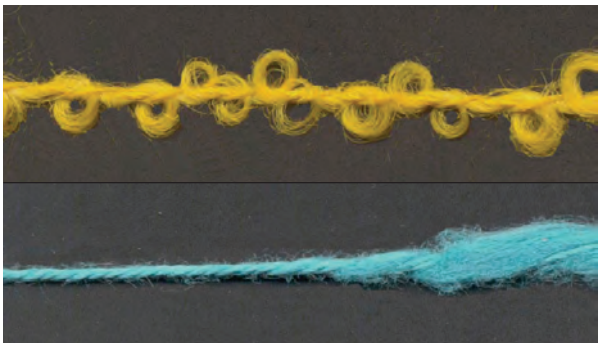


FIGURE 3.6 Specialty yarns lend additional texture to fabric weaves. This bouclé yarn at the top is a multiple-ply yarn that retains a little loop in its construction. The slub yarn at the bottom has more fiber, or more loosely spun fiber at isolated sections of its length.

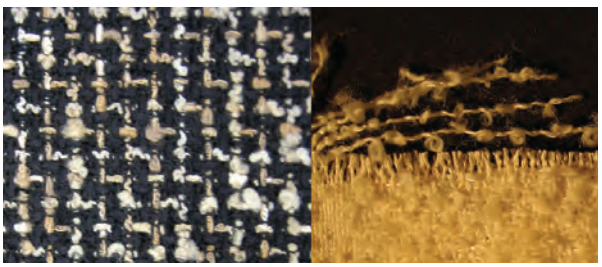


FIGURE 3.7 The loops of bouclé yarn lend texture to the surface. Be sure to specify a bouclé only for areas where the fabric is not likely to be snagged or pulled.

FIGURE 3.8 The filling-rib weave produces a horizontal (selvage to selvage) rib. The size of the rib is variable and, depending on the size, would be categorized as a faille, bengaline, rep, or ottoman weave.

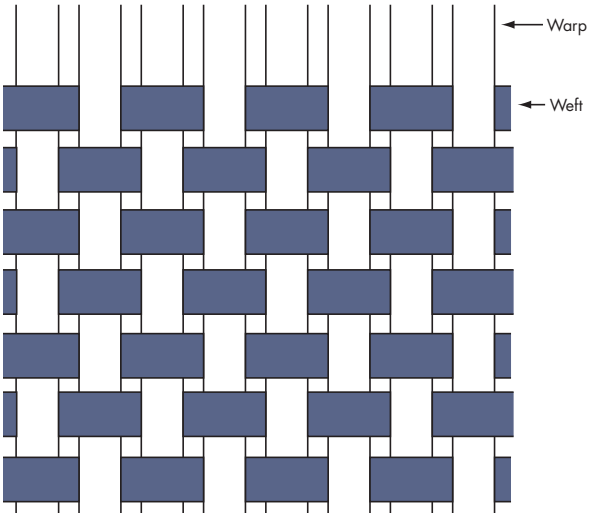
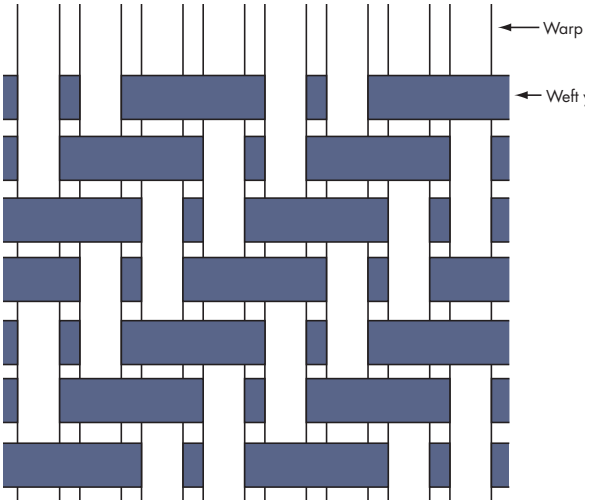


FIGURE 3.9 Hopsacking versus batiste comparison in Figure 3.5 shows a plain weave with a simple over-under structure.



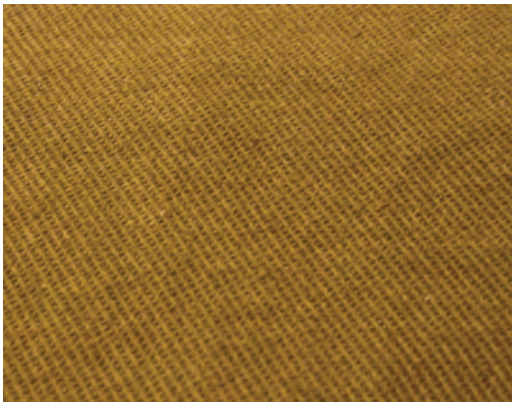


FIGURE 3.11A–B The twill weave is a durable weave that appears to have a diagonal construction although the warp and weft are still perpendicular to each other.

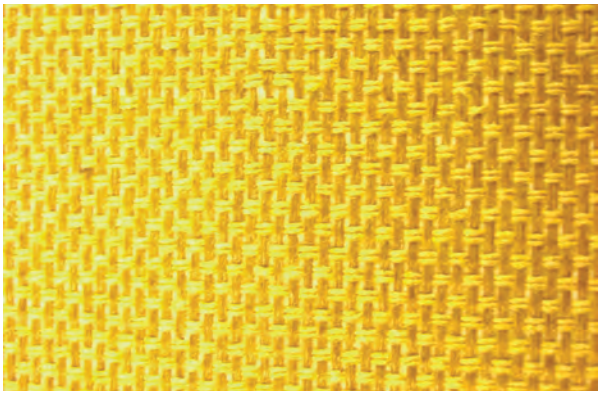


FIGURE 3.10 The basketweave utilizes an over-over-under-under construction. This structure can be durable if densely woven but does not lock the structure in as surely as the plain weave.

also have the pronounced horizontal filling ribs from having heavier yarns used in a horizontal direction. You will notice (if you look very close) the yarns that are horizontal filling ribs are not visible; they are entirely encased in the warp yarns.

CONSTRUCTION

No single attribute is responsible for the characteristics of a fabric, so if the yarns are tightly packed in the weave it will be more durable than a loosely woven fabric (it may also have more body and less drape). Fabrics may be woven, felted, knitted or knotted, or created from a film.

Weave

The simplest weave is a plain weave (Figure 3.9). The woven pattern is not just about the texture and aesthetics of your fabric. Some woven patterns are more durable and stable than others. For example, a basketweave (Figure 3.10) is a simple variation on a plain weave. Instead of an over-under pattern it is over-over-under-under. It is not as durable or stable as a plain weave because yarns will "float" across the face before interlacing, so if your fabric must endure hard wear, a plain weave that locks the yarns down in the weave is a better choice than a basketweave.

A twill weave (Figure 3.11a and b) is more durable than a basketweave or a satin weave (Figure 3.12a and b); the satin weave is more luxurious and delicate than a plain weave, among other subtle performance differ-

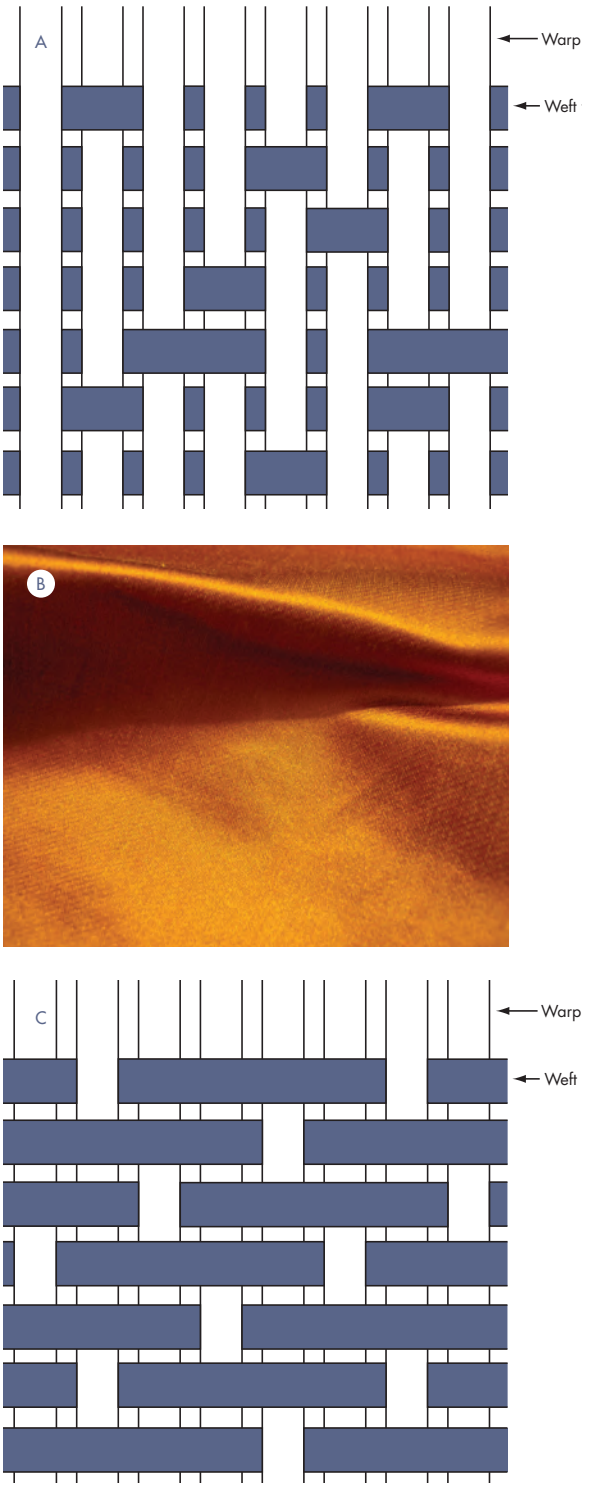


FIGURE 3.12A–C Satin weave (a) "floats" the warp yarn over several weft yarns before diving under and locking itself down. This makes it vulnerable to snagging but creates a fabric that has a high luster (b). Sateen weave (c) is similar except the weft yarns float over several warp yarns before diving under.

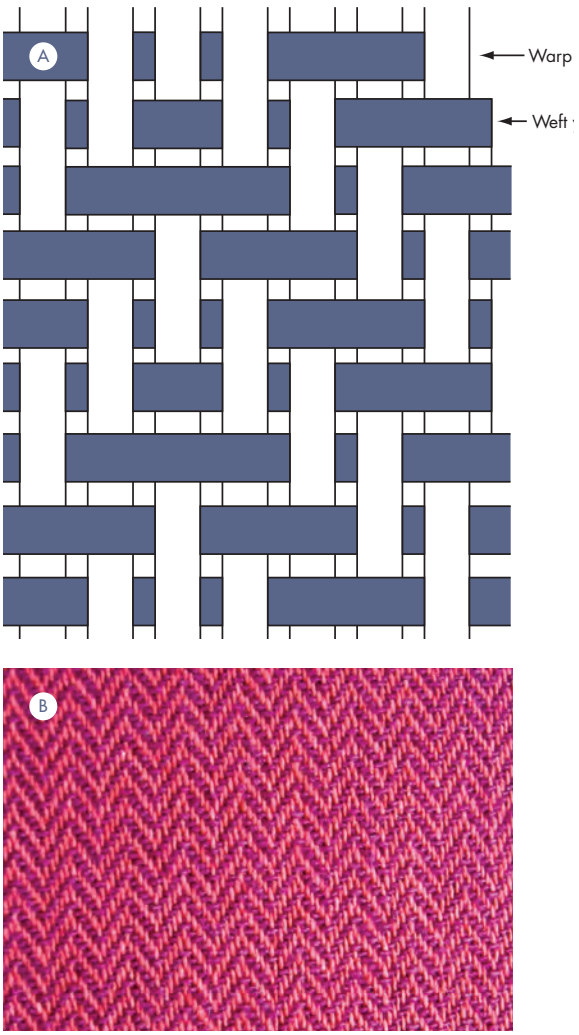


FIGURE 3.13A–B Herringbone is an example of a modified weave; it is a twill that changes direction creating a repeating chevron.

ences. The long **floats** on a satin weave are vulnerable to catching and snagging to a greater extent than a weave that secures the yarns in more closely. Satin fabrics will be lustrous (have a sheen) but are not as abrasion resistant because vulnerable threads are traveling unsupported along the face. A sateen weave also has long floats for a lustrous appearance. Sateen has floats in the horizontal weft direction (Figure 3.12c) and most of the sateen that you find will be cotton or a cotton blend.

These basic constructions are subject to yet further modifications. Herringbone is a modification of twill (Figure 3.13a and b) and has properties similar to twill but if you look closely, you will see that the

twill weave here reverses and creates a zigzag rather than a diagonal that runs across the full width. The twill and herringbone weaves are composed of perpendicular warp and weft yarns and the diagonal is visual only.

These weave modifications are not just decorative. As mentioned above, the basketweave is not as stable as a plain weave, but a modification of the basketweave shown in Figure 3.14 has the coarse, loose appearance of a traditional basketweave but is much more stable than a typical basketweave. If you look very closely, you can see the brown yarns that form the background occasionally loop over the yarns that form the basketweave pattern on the face. These yarns stabilize the weave and improve its performance.

As you learn more about how all the materials and constructions work together, you could randomly draw a fiber composition, a yarn construction, and weave characteristics "out of a hat" and predict how that fabric would perform, what it would look like, and how it would feel to touch it.

FIGURE 3.14 This modification of a basketweave is more stable than its initial appearance would suggest. If you look closely at the construction you will notice that there is a sturdy ground (brown yarns at back) and every so often they come forward and grasp what appear to be long floats, but locking them down to make a more stable fabric.

Point of Emphasis 3.2

Upholstery weight, drapery weight, and multipurpose weight are three general designators implying appropriate use of the fabric and their names make it pretty obvious what you might use them for. The multipurpose weight is often used for soft goods such as bedding, drapery, and tight, light-use upholstered pieces; think dining chair or bench at the foot of the bed. Drapery weight may also be used for bedding but not for light upholstery. Even if it seems heavy enough, it may not have a tight enough weave to withstand the stress of taut upholstery details. Upholstery weight can be used for drapery but often has too much body to stack neatly and may have a fiber content, perfect for upholstery, that resists wrinkling, but the flip side of this characteristic is that the fabric is unlikely to hold a pleat. Pleating is what makes drapery hang, move, and stack neatly.

There are a great number of woven constructions—so many that there is little point in naming all of them—but the above are basic woven constructions that are common and the basis for other, elaborated and modified weaves. No matter what the weave pattern is, the warp and the weft must be perpendicular to each other. Twill looks like the construction is a diagonal but this is an illusion created by the pattern; all the warp and weft yarns are still perpendicular, as they must be for the fabric to be on-grain. Fabric that is **off-grain** will not hang correctly and will pucker on upholstery.

Complex Weaves

Looms are modified to create these different patterns. Computer-driven looms that have an intricate system for manipulating the warp yarns can create patterns that have even more complexity. The leno weave (Figure 3.15a) is produced on a loom that has an extra piece of equipment attached. Notice that the warp yarns are twisted back and forth, locking the weft yarns into position. The next time you come across a very open weave that you can see through, look closely and see if it is a leno weave that prohibits yarn slippage because the weft is caught tightly in a twisted warp. If you look very closely at a chenille fabric you will notice that that the "yarns" forming the weft are not spun yarns but are leno-woven strips with small fibers caught in the twisted pair

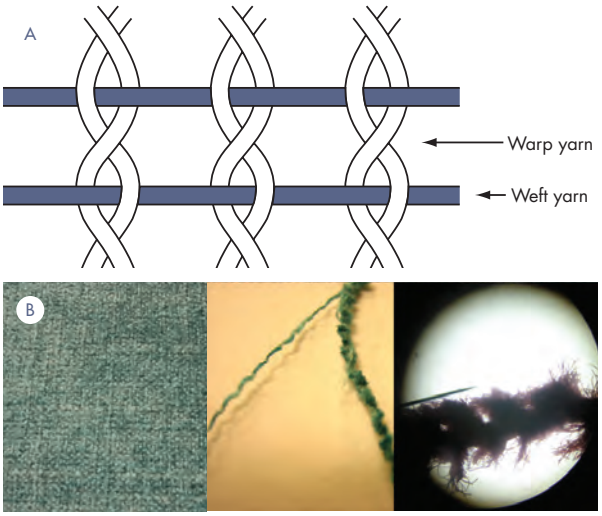


FIGURE 3.15A–B A leno weave (a) can create a stable netting or mesh because pairs of warp yarns grasp the weft yarns, holding them in position. Chenille fabric (b) is called that because it is woven from chenille yarns which are not spun but are made by slicing a leno weave into strips. When you look closely at the silhouette of the yarn you can see that small fibers are wound into crisscrossing warp threads.

of warp yarns. The leno fabric was woven, then sliced into "yarns" and these yarns were again woven into fabric. Figure 3.15b shows the face of a chenille fabric; this fabric was woven with alternating leno and spun yarn and if you zoomed in with a microscope, you would see in the silhouette of a single chenille yarn small tufts caught in the twisted leno warp pairs.

Some weaves must be produced on Jacquard looms because they require especially complex computer commands and more manipulation of the warp yarns, raising and lowering them in intricate sequences to create elaborate woven patterns. The word *tapestry* refers most strictly to a plain weave that is based on hand-loomed techniques that have a long history. The weave was common for flat-weave rugs and wall hangings (Figure 3.16). Modern, machine-made tapestries undergo numerous color changes like their hand-woven ancestors to create intricate patterns based not on the complexity of the weave patterns but on the numerous color changes (Figure 3.17). But you may find that people casually refer to any multicolored pattern with a complex, motif presentation as a tapestry or they may lump all such patterns together and call them Jacquard, even though that is technically a loom and not a weave.

Brocades (Figure 3.18) and damask weaves (Figure 3.19a) are also woven on Jacquard looms. Damask has been defined as having only one or two colors and is

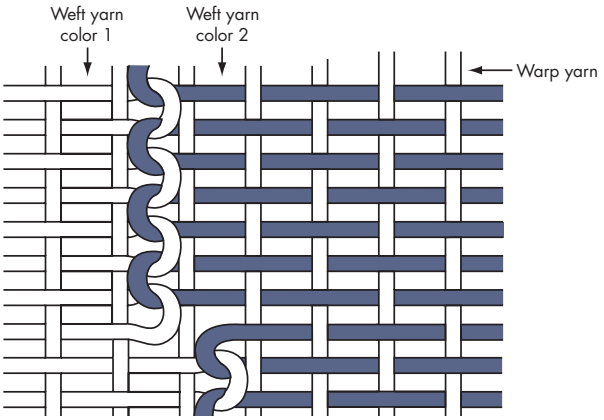


FIGURE 3.16 A tapestry has traditionally been a pictorial fabric with a plain weave, usually exhibiting numerous color changes. The hand-woven tapestry interlocked the colors as they changed or left a slit between. Many flat-woven rugs utilizing the technique are called slit tapestry.

FIGURE 3.17 Machine-woven tapestry is plain weave like hand-woven tapestries were. Their color changes produce a pattern that is intended to be seen from one side, meaning, even though they are a plain weave and the weave has no front and back, the tapestry does.

FIGURE 3.18 Brocade fabric utilizes a complex weave. When you look closely at this fabric you can notice several different woven patterns.

FIGURE 3.19A–B Damask relies on a variety of weaves; in the case of the fabric in (a), the changing play of light off the different woven textures is responsible for making the pattern visible.

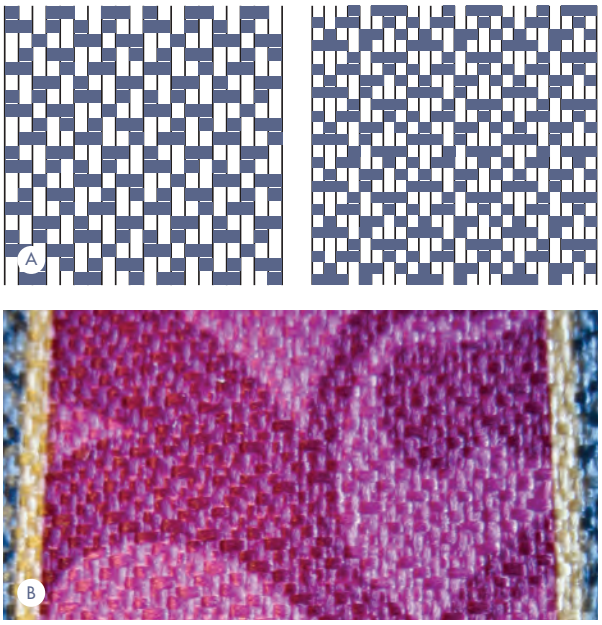


FIGURE 3.20A–B Crepe weave is intended to appear random, without pattern. There are many patterns that produce a random look. Figure (a) shows different crepe weaves. The result is a fine, pebbled appearance rather than a repeating pattern as shown in (b). This crepe fabric has a printed pattern as well.

FIGURE 3.21 The dot-spot weave floats yarn across the back until required on the face for a surface motif.

most typically a one- or two-color pattern, but Figure 3.19b illustrates yet another variation on a theme with a variety of damask weaves having four colors. Even though its back is like a negative of the front (as is typical of tapestry), it is not a tapestry weave and neither is it typical damask (too many colors) but is something in between the two. Look closely at the photo of this "in-between" fabric and notice that these looms are capable of incorporating more than one woven pattern in a single fabric. You can see plain weaves (flat, straightforward, in-and-out), modified twill (diagonal appearance) and sateen weaves (long floats) in a single fabric.

Another complex weave requiring a sophisticated loom appears to be quite simple until you look very closely at the crepe weave and see how randomized the pattern is. The goal of a crepe weave is to appear to have no pattern or directionality. Figure 3.20a diagrams a couple of different crepe weaves (there are many). Figure 3.20b zooms in on a crepe weave so you can see the pattern of the weave, which is nicely random so it doesn't look like a pattern at all, just a pebbled surface. You will also encounter the word *crepe* applied to yarn. Crepe yarn has a very high twist so that it has a highly textured, kinked appearance.

Notice the long floats on the back of the fabric in Figure 3.21. These yarns are only visible on the face in the motif but see that the yarns travel along the back. It is not the intention of the textile designer that these yarns, traveling across the back, should be visible from the front, but if you use this fabric for drapery, the backlighting of sunlight will cause these yarns to "shadow" on the face. If you intend to use this fabric for tight upholstery, pull it

FIGURE 3.22 This clipped dot-spot weave has small fringed ends sticking out where the long floats were trimmed away.

FIGURE 3.23 Matelassé is woven to be reversible with a back that is a perfect negative of the front.

taut and confirm that theses long floats on the back do not ghost through to the face. Sometimes even yarns that do not show when the fabric lays loose as a memo will show up if the fabric is pressed flat as when it is tightly upholstered on the frame of a piece of furniture. This is especially true if the fabric ground is a paler color than the floats on the back. Hold your memo up to the light if you intend to use the fabric for drapery or pull it taut against a white surface (like the muslin or Dacron in upholstery) to make sure these floats do not show through the ground. The dot-spot weave shown in Figure 3.22 has been clipped so the long loose floats have been removed and only the slightest fringe along the edges of the champagne dots indicates they were once there.

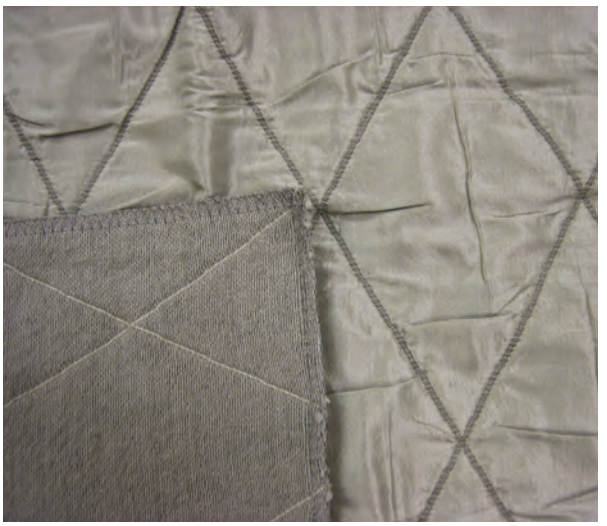


FIGURE 3.24 A cloque has a pillowed appearance like a matelassé but it is not reversible. It appears to be a quilted fabric but if you look closely where the front and back are joined you can see that it is a weave that interlaces the two faces together, not quilting.

You will often have to look at the back of fabrics to really understand their construction. Figure 3.23 shows a matelassé. It is a pocket cloth construction, meaning that if you grasped the large rose section on the face and the corresponding large ivory section on the back you would find they pull apart from each other, completely independent, flat-weave faces. Matelassé fabrics are the only fabrics that are guaranteed to be reversible, with both faces free of defects. Recall that the tapestry is also a negative, front to back, but it has a designated face and any broken yarns that occur during weaving are pulled through to the back and allowed to remain there like little "tails." A matelassé is a pocket cloth that is intended to be used on either side, so it will not have defects in the weave showing up on the "wrong" side because there is no wrong side. The corner turned over in the photo reveals a usable side as perfect as the face. This is not true of all pocket cloths. A cloque is also a pocket weave, but if you examine the back of Figure 3.24 you will see that this fabric has a definite wrong side. The turned-up corner shows the back to be a loose, coarse weave that would not be durable for the face of the fabric. Both the matelassé and cloque are pocket cloths but their construction is not

exactly the same. Figure 3.25 shows yet another pocket cloth showing the pocket construction. The two faces of a pocket cloth are only attached into a single cloth at the pattern junctions, as the matelassé, but a cloque is not designed to be used front and back. One consideration that they share is that, even though they may be thick fabrics and you might presume they are very durable, remember that the thickness of one layer will determine the durability of the fabric. When the face layer wears away, the fabric will be ruined, so it is only serviceable to the thickness of the top layer. Matelassé and cloque are weaves that are somewhat dimensional, meaning that they have varying thickness; you can see the slightly "pillowed" face of these double-layer constructions. They resemble quilted fabric (more later, under Finishing) but, unlike quilting, the pillowed surface is the result of the weave.

The dobby weave is also subtly dimensional (Figure 3.26a and b). These small geometric patterns are quite complex and the construction and tension of the yarn used in the pattern can create a 3D effect, as shown in 3.26a, or a repeated geometric pattern, as shown in the multicolored example in 3.26b.

FIGURE 3.25 Pocket cloths have two layers that are occasionally interlaced in the weaving. *Photo courtesy of Amy Willbanks, Textile Fabric Consultants, Inc.*

You are likely familiar with **pile** fabrics like velvet, velveteen, and corduroy. Many pile fabrics are directional. When you run your hand in one direction the fabric feels smooth but when you rub it in the opposite direction it feels rough. The short fibers that create the pile are "leaning" in one direction. Figure 3.27 shows a directional corduroy with an area of the fabric brushed

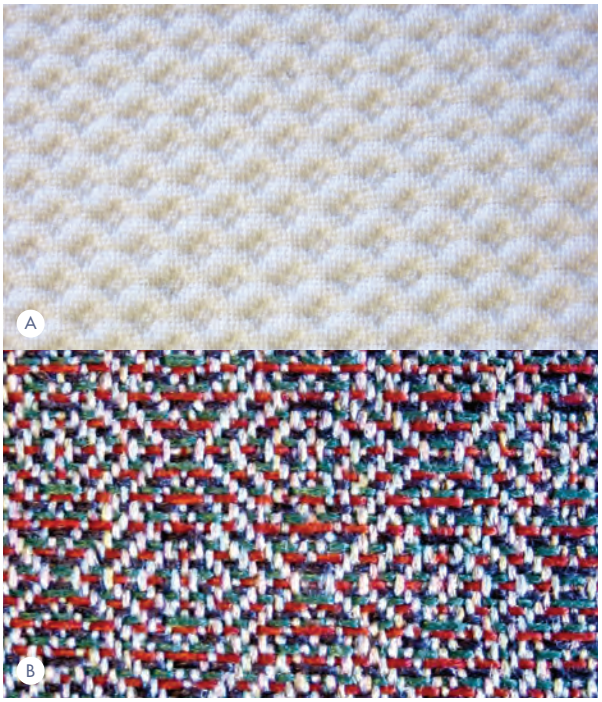


FIGURE 3.26A–B Dobby weaves are complex little geometrics that are often somewhat dimensional.

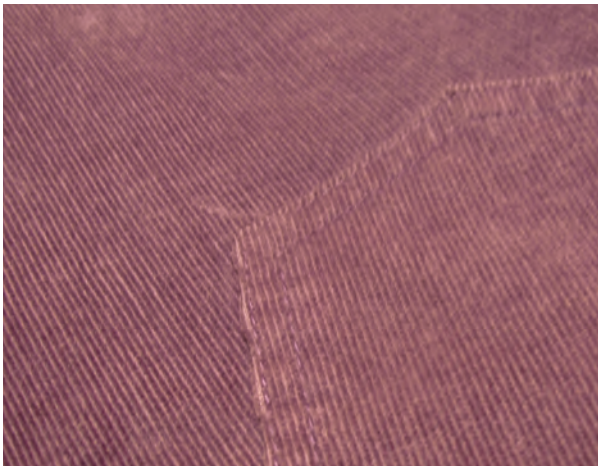
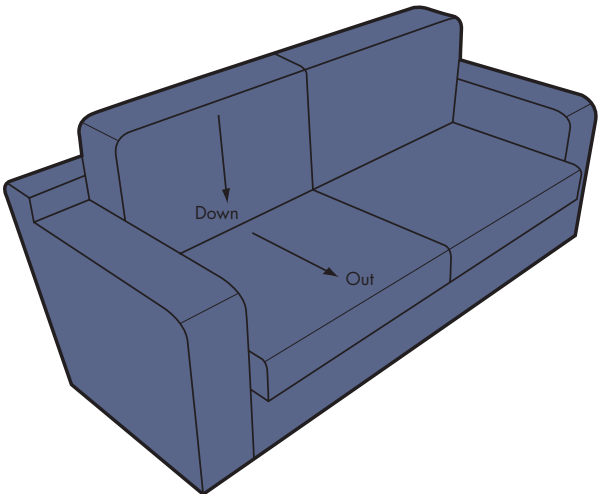


FIGURE 3.27 Pile fabrics may be directional. The pile of this corduroy leans in one direction and looks scruffy when brushed in the opposite direction.

in the "wrong" direction. If you use a directional pile for upholstery remember the phrase *down and out*. When a directional fabric is applied to a sofa, as shown in Figure 3.28, the smooth direction should be in the *down* direction on the vertical parts and the *out* direction on the horizontal parts or the scruffy appearance of the area of corduroy that was brushed the wrong way will show up on the furniture when it is in use. When we exit a piece of furniture we tend to slide forward, and if the pile goes in the direction that we slide, we will smooth the fabric as we leave the furniture. If the **nap** goes in the opposite direction, people leaving the furniture will raise the pile. Not only will the furniture be harder to get out of (as you have to "fight" your way out against the direction of the pile) but it will always look scruffy where people were sitting. Some pile fabrics are woven without a direction so they do not scuff this way or shade (the pile looks darker in one direction than another). Many velvet pile fabrics are woven to be nondirectional.

This directionality of some pile fabrics means not all of these fabrics can be railroaded. When your upholstered item is wider than the fabric, you may want to run the fabric along the length of the item; this is known as railroading the fabric. Figure 3.29 shows the difference between running the fabric off the bolt so you can apply the pile down and out, but you can imagine there will have to be seams on the frame because it is wider than the fabric. Your nondirectional pile selection can be railroaded to avoid these seams.



FIGURER 3.28 When applying a directional pile to a piece of furniture the smooth pile should lay down and out.

Not all pile fabrics have cut pile. A loop pile fabric that you may be familiar with is terry cloth; bath towels often have looped construction for their faces. You may not specify much terry cloth for your interior design clients but frieze fabrics have looped faces, or combine loops with other surfaces as shown in Figure 3.30. Frieze yarn is tightly twisted and is often woven into very tight, durable fabrics. Another looped pile construction is called gros point (Figure 3.31). This fabric has a very consistent loop.

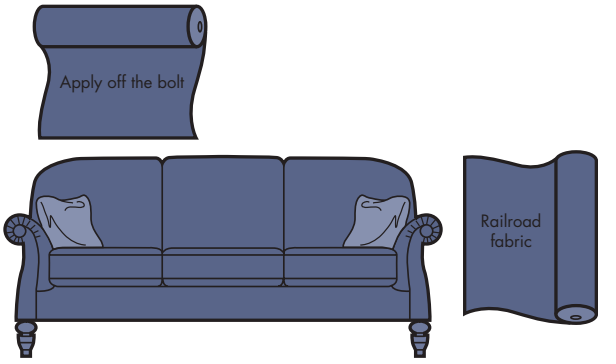


FIGURE 3.29 If your fabric has no direction, you may choose to railroad it to eliminate seams.

FIGURE 3.30 The frieze has a small, regular looped pile face.

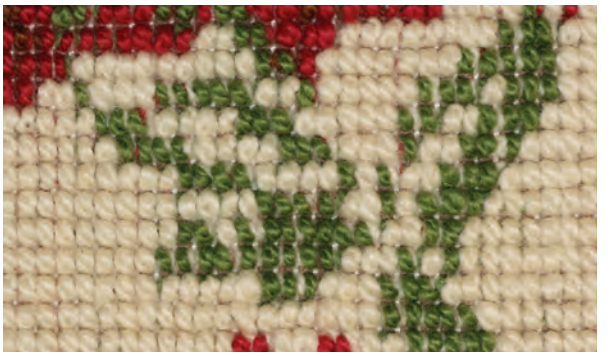
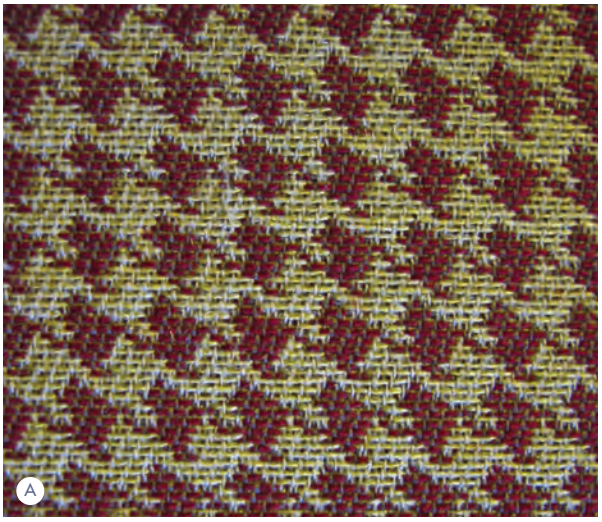


FIGURE 3.31 The gros point has larger loops than the frieze. *Photo courtesy of Amy Willbanks, Textile Fabric Consultants, Inc.*

FIGURE 3.32 This plain weave fabric is similar to a tapestry in its woven construction, but is a classic pattern, so is referred to by its unique pattern name, flame stitch.

FIGURE 3.33 Another classic pattern, the plaid, may be constructed from a variety of weaves. If you look closely at this plaid you can see the diagonal pattern of a twill.



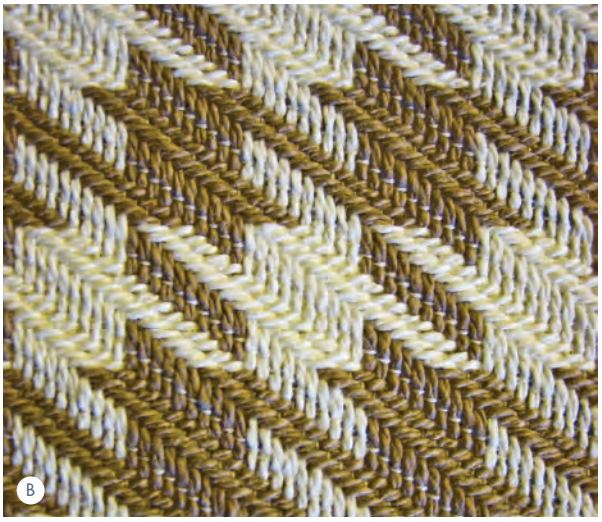


FIGURE 3.34A–B Patterns created from color changes are not dependent on a particular woven pattern. The houndstooth pattern shown in (a) and (b) is at different scales and is produced by different woven structures.

Some woven patterns are identified by the arrangement of colored yarns used in the weave, whatever the weave pattern may be. A classic woven flame stitch (Figure 3.32) has a lot in common with tapestry but the pattern name is more important than the kind of weave. This happens with many classic woven patterns. If you look closely at the plaid in Figure 3.33 you will notice that it is a twill weave, but if you asked any designer what this fabric is called, they will say it is a plaid. They will call the fabrics in Figure 3.34a and b houndstooth, even though they are clearly different weaves.

The compactness of the weave will also affect the fabric. A more compact, tighter weave will be stiffer and more stable. So the weave construction and the density or compactness of the construction affects the hand and durability.

Point of Emphasis 3.3

Drape means the way a fabric falls when held loosely. Fabrics that are densely woven will not fall in graceful folds and fabrics that are woven too loosely will be limp. A fabric that falls in between will have acceptable drape.

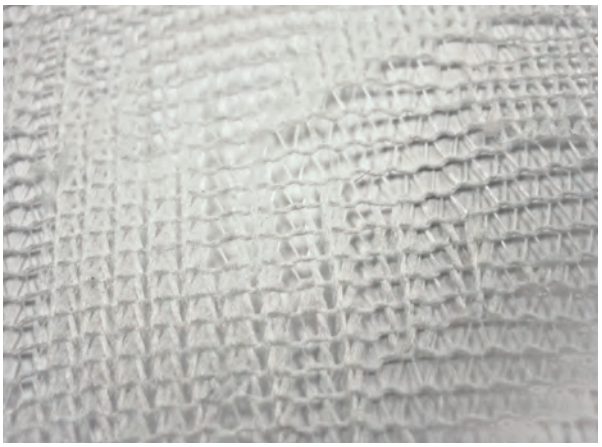


FIGURE 3.35 This fabric is knitted, not woven.

Knits and Felted Fabrics

Not all fabrics are woven; Figure 3.35 shows a knitted fabric used for window covering. Knitted fabrics rely on looping yarn together rather than weaving. Other fabric constructions are produced by flocking wherein small fibers are glued onto the surface of a woven backing. **Felted** fabrics are nonwoven and are made of loose fiber rather than spun yarn. Felted fabrics are made of fibers that are matted or tangled together.

These are just a few examples to illustrate the way the fibers, yarns, and weaves all contribute to the characteristics of the fabrics. This is not to be mistaken for an all-inclusive list of fabric constructions, just the basics of what you will be expected to know and understand.

FINISHING

In addition to the construction of the fabric, textiles may undergo additional processes called finishing. Finishing includes printing, dyeing, applying optical brighteners, mercerizing, soil guard, fire-resistance treatments, and other treatments. Finishing will affect the performance and appearance of the textile.

Mercerizing

Mercerizing is performed on cotton. It increases the luster. Usually yarns that are intended for mercerizing are made of longer cotton fibers, so they are already more lustrous than yarn made form shorter fibers. A caustic soda is used to treat the cotton, and it may also be singed to remove any fiber ends projecting beyond the yarn face.

Helpful Hint 3.1

The most immediate judgment of the characteristics of a fabric is always close at hand because it is, literally, your hand. Many important judgments that you make about a fabric are things that you can feel (and then verify through examination of the specs). The compactness of the weave and the density of the yarn will be apparent when you hold a fabric. With some practice you will not be surprised to learn that the fabric you thought would be serviceable when you picked it up does indeed meet the abrasion-resistance criteria required for your job. The smoothness of the yarn that will shed soiling will be apparent to the touch. The stiffness will affect drapeability and comfort. Squeeze the fabric for 10 seconds and notice the hardness of the wrinkles in the crumpled area, indicating resilience; this will give you clues about its appearance retention. Understanding the connection between hand and performance will save you time as you make selections. You will know instinctively which fabrics warrant closer inspection and which ones do not warrant reading the spec data as you move quickly through fabric displays as you shop for your clients.

Bleaching

Bleaching removes color from the fiber. It is applied throughout or selectively in discharge printing. Discharge printing "prints" with bleach by forcing bleach through a fabric that was previously dyed a color, removing the color only where the bleach was forced through. More often, fabrics are bleached in order to control the final color for white or dyed fabrics. The faille fabric in Figure 3.8 was discharge printed.

Dyeing

Dyeing fabric imparts color to the piece. In the case of a single fiber, the color may be evenly distributed. Sometimes blends are used because the two different fibers will react differently to the same dye bath and create a heathery or varied appearance. Dyes can be used at several stages of production. Man-made fiber can be solution dyed, when dye is dumped into the vat before the fiber is extruded. Solution-dyed fabrics are very fade resistant because color is part of the very fiber. They can usually be bleached and left out in the

sun. After the fiber is spun, or removed from the plant or animal and cleaned, it may be stock dyed or staple dyed. In this case the loose fibers are soaked in a dye bath before being spun into yarns. Dye can be used after fiber is spun into yarn. This process is called skein dyeing or yarn dyeing. After the yarns have been woven into fabric, the cloth can be piece dyed. See Table 3.6 for a quick comparison.

Printing

Printing creates an applied pattern rather than an integral pattern that is woven in (like a plaid). The typical methods are rotary or cylinder printing, block printing, and screen printing. Registration is important for clear patterns; multiple colors should meet up precisely without overlapping or leaving unprinted areas of the ground fabric showing through. The more colors involved, the more precise the process must be, so patterns with lots of different color in the print will cost more. Figure 3.36 shows how the number of screens are documented on the selvage of the fabric. Printing sits on the surface of the fabric and may wear off, unlike dyeing that is integrated into the fiber so it will last (except for possible fading) until the fiber itself wears out. The more saturated the dyed area is, the more durable the color retention. The amount of color forced through to the back of the fabric is an indication of the saturation of the dye through the fabric. See Table 3.7.

FIGURE 3.36 Printed fabric will identify the number and color content of each screen used to create the pattern.

Table 3.6
Dyeing methods.

Phase of Production	What Occurs	What This Means for Your Selection
Solution dyeing	Pigment is added to solution before fibers are spun	These fabrics will resist fading; they are likely to be hydrophobic as well, so will resist waterborne stains
Fiber or stock dyeing	Fibers are dyed	Color goes throughout fiber structure, not just on surface; different colors can be spun together in heathered or ombre effects
Yarn dyeing	After fiber is spun into yarn	A single color is evenly distributed throughout the yarn
	Package dyed Beam dyed	Yarn is wound on a spool or beam and immersed in dye bath; dye may be forced through to saturate yarn for even color
	Skein dyed	Unwound skeins are dunked into dye bath; small quantities can be dyed this way for custom color
	Space dyeing	Yarn is printed in colors and the pattern of the printing gets randomized when fabric is made
Piece dyeing	Fabric is dyed after it has been woven	If a single fiber is used, fabric will be a single color; if two different fibers respond differently to the dye used, various effects can be achieved

Hand-Printed

Hand-printed fabrics are less common because they are labor intensive and expensive, but they are the only way to produce a small quantity or custom order. Hand-printed fabrics are appreciated for their imperfections denoting the handmade process. Block-printed fabrics use a block of wood and cut away all but the pattern area for each color in the print. The blocks are inked and pressed facedown on the fabric to transfer the ink to the fabric. The alignment of the colors is called the registration. Hand-printed fabrics are often just ever so slightly out of register, and that belies their handmade origin. The same is true for hand-screened fabrics. A fine mesh has areas blocked off with a resin. When ink is squeezed through the open parts, the pattern is printed. A separate screen is required for every color in the print.

Table 3.7
Printing methods.

Type	How	What It Means for Your Selection
Handmade		
Block printing	Carved blocks are inked then pressed down onto fabric; carved away portion applies no ink	Expensive but makes small quantities possible; registration and saturation are not perfect but this handmade quality is considered to be the charm of the process
Screen printing	Mesh screens are painted to allow ink to only pass through areas intended to receive color	Expensive but makes small quantities possible; registration and saturation are not perfect but this handmade quality is considered to be the charm of the process
Resist printing	Fabric is tied or painted with (removable) solution that prevents dye from being absorbed where tied or painted and fabric is then dyed	Expensive but makes small quantities possible; registration and saturation are not perfect but this handmade quality is considered to be the charm of the process
Machine Made		
Roller printing	Ink is continuously supplied to a roller with the pattern incised on it; the part carved away holds ink and transfers it to the fabric	Large quantity of goods makes this economical; precise registration is more easily achieved so different colors used align accurately; considered by some to be the highest quality fast method of printing
Rotary screen printing	Similar to flatbed-screen printing but ink inside a cylinder is forced out	Large quantity of goods makes this economical; precise registration is more easily achieved so different colors used align accurately; fastest method
Flatbed-screen printing	Automated screen printing with flat screens; the fabric moves along a conveyer belt	Faster than hand-screened but not as fast as rotary screen
Warp printing	The warp yarns are dyed, then strung on the loom	Pattern is irregular at top and bottom of motif but crisp on left and right
Discharge printing	Fabric that was piece dyed is selectively bleached to remove color from some areas, creating pattern	Motif will be white or very pale and ground will retain color
Digital printing	Prints images similarly to ink-jet printers for documents	Uncommon for fabric, used more frequently for carpeting
Heat transfer	Design is printed on paper that is placed facedown on fabric and when heated, transfers to fabric	Customization is easier than for roller and warp printing

For the Connoisseur 3.2

Hand-printed textiles are more highly valued by some discerning consumers. Precision is more difficult in patterns printed by hand and these small imperfections in registration are a hallmark of hand-printed patterns. Your connoisseur client may prefer a less-than-perfect product if it is hand-printed.

The need for multiple applications of ink, one for each color, holds true for machine-printed fabric as well. Mechanized versions of blocks and screens use carved rollers or perforated cylinders to continuously roll the pattern colors onto fabric. See Figure 3.37 for a diagram of how these mechanized screens and blocks differ. The successive rollers or cylinders, each holding a different color of ink, do not have to be lifted, inked, and moved the way hand-printing blocks must be stamped and lifted for every repeat. Rotary screen and flat-bed screen printing push ink through perforations as hand-screened printing does. Roller printing is less like block printing. Remember that blocks for hand-printing are carved so that the design rises above the block to be inked for printing. With roller screens, the design to be printed is incised and ink is removed from the rest of the roller so only the incised areas carry ink to the fabric. See Figure 3.38 for an idea of how this works.

Prints will require pattern matching and large prints require special attention. Take a look at Figure 3.39. Even if this pattern is nondirectional (has no up-down/right-left) you may decide to not railroad it, even though the fabric will now have to be seamed on your wide sofa frame. See how the position of the large motif must be carefully positioned on the sofa's form?

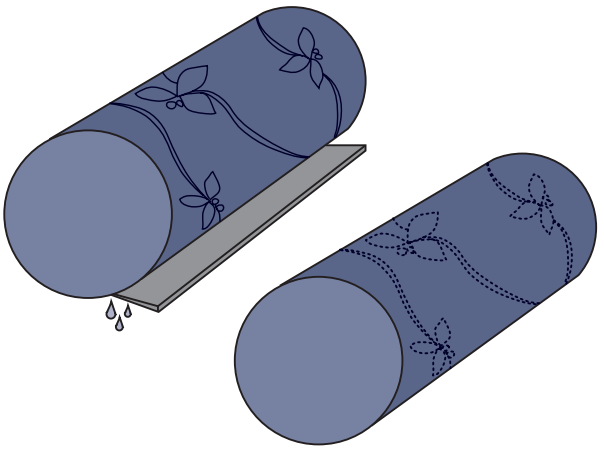


FIGURE 3.37 Imitating hand-print techniques, drums are either incised or perforated to selectively distribute ink.

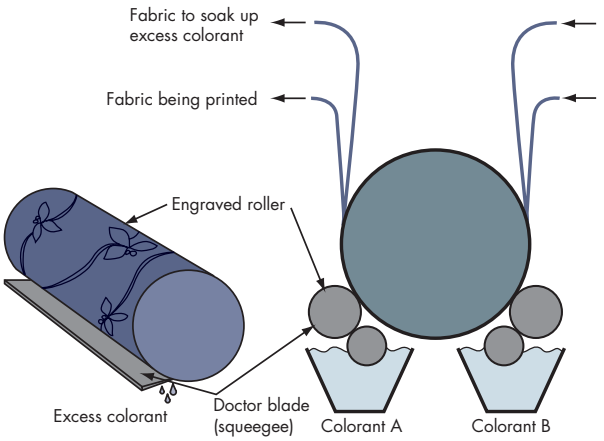


FIGURE 3.38 The drums are positioned to apply the individual colors in perfect registration. The incised groove holds ink until it comes in contact with the fabric and then the ink is transferred to the fabric.

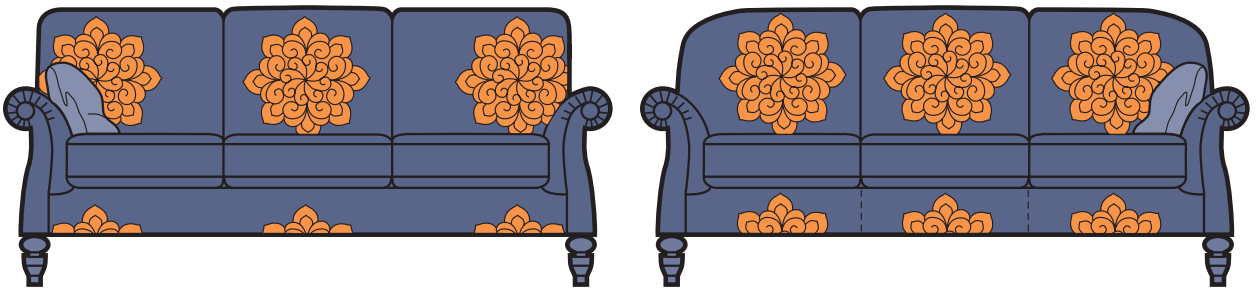


FIGURE 3.39 The placement of this motif straight off the bolt is not well balanced on this piece. You would have to ask your upholster to cut the fabric more often than the style of the sofa would require to achieve better positioning of this motif.

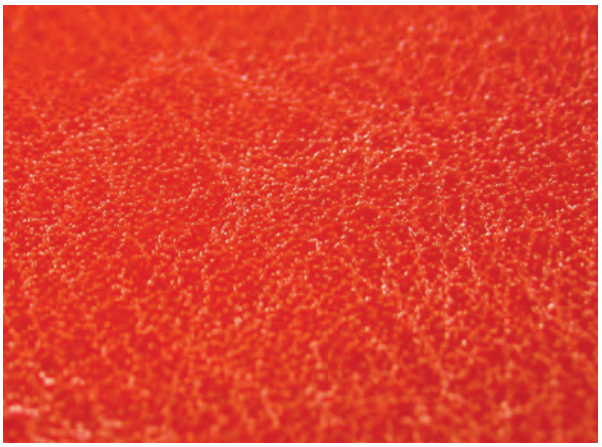


FIGURE 3.40 A plastic film is embossed to impart a skin texture to imitate leather.

Embossing

Embossing forces a texture onto the structure of the fabric. This is very common in faux leathers where the fine wrinkles on animal skin are imitated by pressing a texture onto the surface (Figure 3.40).

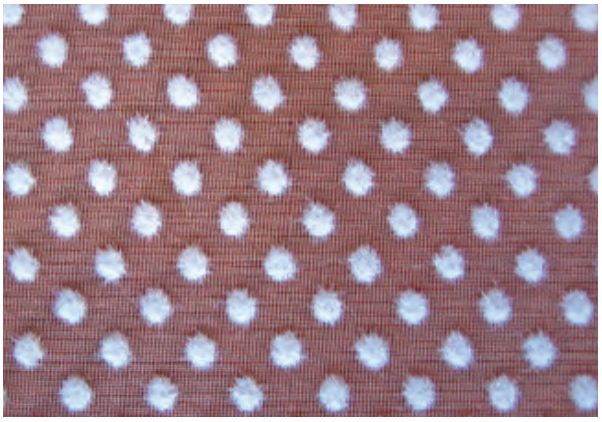


FIGURE 3.41 Dotted swiss can be made with a clipped dot-spot weave or flocked as this one was. Small drops of glue hold the fibers that were sprinkled on the surface.

Flocking

Dotted swiss fabric can be constructed as a dot-spot weave (as shown in Figures 3.21 and 3.22) or the small fuzzy dots can be flocked. A machine deposits dots of glue onto a batiste and small fibers are sprinkled over it to imitate a clipped dot-spot weave. If you look closely at Figure 3.41 you can tell that these random fibers are glued on and are not part of the woven structure.

Calendering

Calendering is similar to embossing, in that the face of the fabric is subject to pressure and heat to flatten out some areas. Chintz fabrics are calendered to give them a smooth, flat, lustrous face. Moiré has been calendered to impart a subtle marking that resembles a watermark or wood grain surface that gives moiré its name (Figure 3.42). Related processes of beetling and schreinering are also done with the aim or imparting more luster. Beetling flattens the fibers so they present a flatter, more reflective face and schreinering embosses a fine diagonal onto the surface, also with the aim of reflecting more light. None of these calendering processes is permanent and improper cleaning or abrasion can remove them.

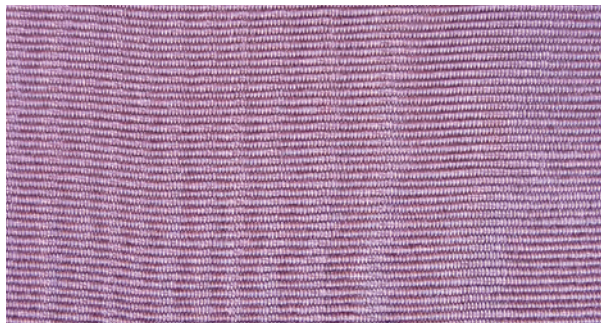


FIGURE 3.42 Calendering alters the profile of the yarn; in the case of this moiré calendering a texture that looks like wood grain or a watermark shows up in certain angles of light.

Crushing

Purposely heat-set wrinkles in fabric are called crushed. Crushed velvet (Figure 3.43) exploits the shading that is normally part of a pile fabric to enhance the crushed appearance and it becomes randomly reflective in a way that really shows off the crushing.

FIGURE 3.43 Crushed velvet interacts with the light in a very different way from velvet left uncrushed.

Glazing

Glazing adds a resin to the surface to make the fabric shinier. The glaze is also likely to make the fabric stiffer and give it a crisper hand. Resins vary in their permanence and they can be worn away or accidentally removed when the fabric is cleaned.

Optical Brighteners

Optical brighteners are sometimes applied to white fabrics to further brighten them beyond what can be achieved by bleaching. These brighteners react to light and fluoresce, appearing brighter still. In clubs that use black lights you can see the optical brighteners of white clothing glowing blue.

Soil Retardants

Soil retardant formulas may coat the fiber, laying on the surface, or they may bond molecularly with the fiber in the case of nanocoatings. In both instances soiling is repelled. Nanoprotectants also repel water and odors.

Heat Setting

Heat setting is required for some fibers and fabrics to keep them from relaxing out of shape. One example of heat setting is the crimp added to synthetic yarns. Filaments are smooth when initially spun and in order to make the fabric more resilient, the fiber is given some curl or crimp that is heat set to make it permanent.

Flame Retardants and Antimicrobial Finishes

Flame retardants are applied to fabrics that would not otherwise meet fire code. Antimicrobial finishes are required for fabrics used in health care applications.

Singed

Fabric may be singed to remove small ends that project beyond the yarn surface to make it smoother. Actual flame is used for cellulosic fibers; hot plates are used for thermoplastic synthetics. Protein fibers cannot be acceptably singed. Converse to singeing, napping the surface of a woven fabric will bring these loose ends to the surface.

FIGURE 3.44 This flannel fabric has been so thoroughly brushed or napped that it looks like felt.

Napping or Brushing

Flannel fabric has a woven construction made with staple fiber. After weaving, the surface is brushed to bring the short staple ends to the surface. If the surface is really worked over it can be hard to tell that there is a woven structure at the foundation of the fabric. Figure 3.44 shows a flannel that is so napped that it looks like felt. It is not until the structure is picked apart (see close-up of corner) that you can see the warp and weft yarns that indicate that this is not felt but flannel napped on both sides.

Quilting

Recall how the cloque fabric construction (Figure 3.45) looked quilted but the pillowing was actually the result of the weave. Actual quilting bonds two or

FIGURE 3.45 The cloque fabric looks quilted but the effect is a characteristic of the weave.

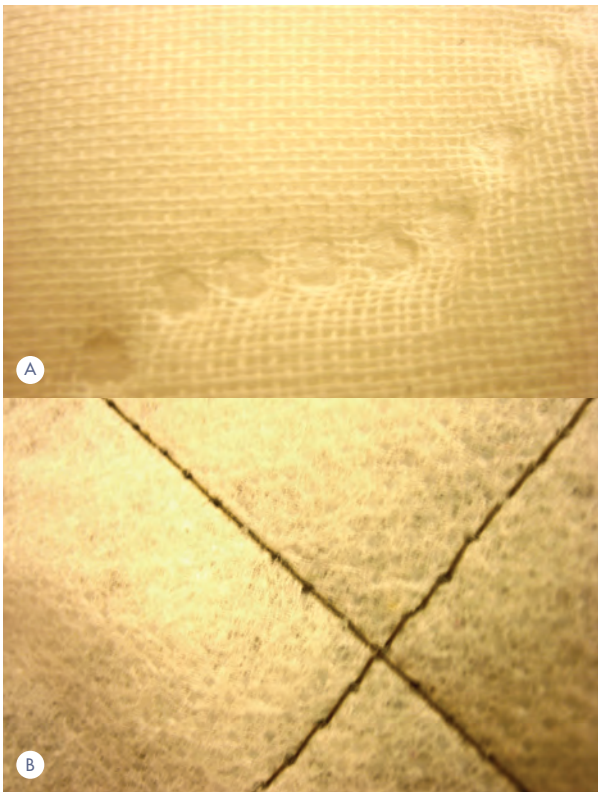


FIGURE 3.46A–B These quilted constructions bind three layers together: (a) by means of fusing and (b) with stitching.

three layers of fabric together. Whether done by fusing (Figure 3.46a) or stitching (Figure 3.46b), quilting binds fabric to a layer of padding. The padding is usually fiberfill or foam products that are formed into sheets, not loose fill like ground foam, feathers, or kapok. The stitching or fusing can follow the outline of a pattern printed on one of the fabrics, follow a straight grid or diamond trellis or a random, curving pattern called vermicelli.

Embroidery

You are likely familiar with this needlework as a handicraft. Machine-embroidered goods are commonly available in silk, wool, and polyester. When you are comparing embroidered silk to the embroidered polyester options, developed to save money over silk options, you will notice that the silk options tend to pucker around the embroidered areas whereas the polyester fabric tends to lay flat.

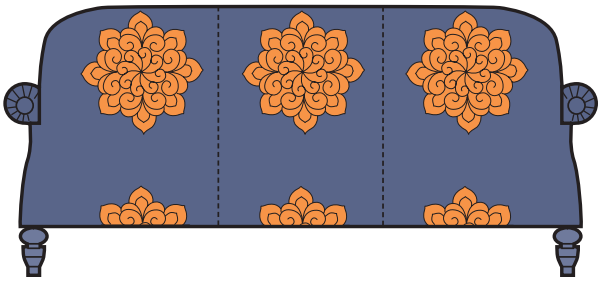


FIGURE 3.47 Large patterns must be carefully positioned. A to-scale drawing is a good tool for confirming the appropriateness of your selection.

Uses and Implications for Selections

If the fabric cannot be railroaded (applied to the piece horizontally) there will be seams on a wide sofa back (Figure 3.47). Seams will occur along the back as well as on any wide seat cushions, or on a tight back. Seams should be aligned with cushions or relate to the design. You should always plan the seam locations, rather than being driven by the fabric width alone.

When shopping for drapery fabric you will see a lot of polyester options. Consider that polyester does not pleat well, the flip side of not creasing is a memory for its untrained state. When drapery is tied up to "train the pleats" these pleats will be temporary for polyester fabrics. Your design should decrease in fullness and still look good with a looser structure. Tailored drapery will not be satisfactory if made up in polyester.

For the Connoisseur 3.3

Oddly, there are instances where a defect is actually preferred. Take the example of the puckering around embroidered motifs on silk fabric. The lower-priced imitators made of polyester do not pucker and it is the puckering that indicates that the fabric is the higher-priced silk option, considered more exquisite. Another example is an off-register, hand-blocked print. Hand-blocking to apply a pattern to a fabric is labor intensive and costly. Machine-printed goods are carefully calibrated to make sure that each color area is aligned accurately with other colors in the pattern. Hand-blocked prints display misalignment that is understood to mean that the print was handmade. This indicator of hand-blocking makes the product desirable.

PROTECTION AND MAINTENANCE

Laminating other materials to a fabric can make the fabric better suited to the installation. Fabric may receive a sheet of vinyl on its face to make it impervious to moisture and easy to wipe down in a family restaurant. A knit backing applied to a less durable fabric construction, like a chenille, can strengthen the fabric for upholstery use. Many chenille fabrics are also latex-backed by the manufacturer, to lock the yarns in formation to prevent **seam slippage**. These processes are not just for chenille though, many fabric constructions can be reinforced with a backing. Fabrics are also laminated to paper for use as wallcoverings.

A Cautionary Tale 3.1

I found a most intriguing casement fabric for a client that was woven out of polyester. A casement fabric is not good for anything except a drapery because it is loosely woven like a net and is intended to be seen through. I figured that, because it was certainly intended for drapery it had, somehow, been engineered to hang gracefully, even though polyester typically does not hold a pleat.

After having drapes made up for a client in the casement fabric, they were tied up to "train" them to hang gracefully. The client dutifully waited two weeks to untie them and they reported that they thought the drapery looked great. However, a few days later my client called and said the drapes pouffed out "like a prom dress." When I saw them for myself I could not disagree. Polyester is polyester no matter what form you fashion it into and it has not been engineered to pleat well. With greater and greater desperation, I instructed the workroom to heat set such a hard crease in them that they would have no choice but to conform to shape. Eventually they were ruined, with hard pointy creases separated by springy sections of fabric that still pouffed out like a prom dress. We replaced them at our expense.

Backings

Companies that apply these backings will offer a few different kinds to meet the needs of unique jobs. The process is typically something like this: Fabrics are forwarded from a number of designers to receive specific types of backings. The fabrics that are to receive the same type of backing are stitched together and run through the laminator (or stitched together to have the latex or acrylic spread down the length of the fabrics) in a continuous piece. The fabrics are then cut apart and each is shipped to the fabricator of the upholstery, drapery, or wallcovering. This is one reason why the backers require that you ship more yardage to them than will be required by your fabricator; there is some waste when the fabrics are stitched together and then cut apart.

If your fabric is not dimensionally stable there is a possibility that it will be off-grain when you receive it from the laminator/backer. Since your fabric is stitched to another designer's fabric, there is also the possibility that an unstable fabric stitched to yours will pull your fabric off-grain for some short distance as well. Send a piece of your fabric to the baker/laminator before you finalize your specification to get their advice on how successful the backing process will likely be. They see the response of fabric to lamination all day every day and you should take advantage of their expertise and ask their advice.

Helpful Hint 3.2

It is a good idea to include a small piece of the fabric with your order to the workroom so they know what it looks like. A busy shop will receive dozens of fabrics every day and if the manufacturer has not tagged it with your name and order number your fabricator may set it aside until someone calls asking about it. This will delay your production.

In addition to letting them know what the fabric looks like, I will also write on samples I send the word *Face* on the front of the fabric and the word *Back* on the wrong side so there is no confusion about which side is to go out.

Polymerization Treatments

Polymerization is related to backings, because it is applied in a similar manner, and effectively inhibits stains, and fungal and microbe growth. These proprietary processes are, most simply, a bath of different liquors that are pressure-forced into the fibers of a woven fabric and then heat set to bind permanently to the fibers. Other characteristics that can be imparted with this technology include antiodor, antimicrobial, enhanced water resistance, abrasion resistance, antistatic, insect repellent, infrared reflection, UV reflectance, wicking, and enhanced absorbency. In a separate process, a waterproof backing can be applied to the fabric. This second step makes it impossible for moisture to leak through or to be drawn through the fabric and into the padding and cushion of upholstered furniture (except at seams). These processes are most often specified for locations that will have spilled liquid (such as beverages or urine) threatening the cleanliness and appearance of the installation.

Nanotechnology

A new kind of technology is showing up in fabrics. It is called nanotechnology because it works on a molecular level. Materials are bonded, molecularly, with the fibers, becoming part of the fiber itself. Silver nanoparticles are the ones that you are likely to encounter most frequently because silver is a natural antimicrobial that is believed to not affect human health even though the particles can migrate into our bodies through contact with materials. Nanocoatings are applied after the fabric is woven and finished. They can make fabric easier to clean and in some cases, increase abrasion resistance. These coatings can be applied to most fabrics but not to heat-sensitive fabric like olefin.

Cleaning Codes

Investigate the recommended cleaning procedures provided by manufacturers. If you want to maintain a low-toxicity environment, product maintenance is going to figure prominently in your selection criteria.

- W—Means the fabric should be cleaned with water. For general cleaning, your client's maintenance staff will whip a mild detergent to create a soap foam to clean light soiling. Any residue remaining after the fabric has dried should be lightly brushed and vacuumed away.
- S—Means the fabric should be dry-cleaned, so solvents, not water should be the basis for the cleaning products used.
- W-S—Means that the fabric can be cleaned with either water-based or solvent cleansers.
- X—Means do not use cleansers of any kind; brush and vacuum the fabric only. This is also recommended for drapery regardless of the fabric cleaning code. There will be instances where you must have the drapery cleaned (dry-cleaning is best) but if you can avoid taking the drapes down, having them cleaned, and then reinstalled, try to design and specify to allow for this most conservative approach. Why would this be true of drapery and not other fabric uses? It is because drapery is more dependent on the fabric properties than any other item that you specify. It has no other "structure" to support it and maintain its shape and there is frequently a lot of fabric in the construction. Recall that many materials will change with time and environmental conditions and when they do so it is as a percentage of their size. The long length of many drapery styles will naturally indicate that any change that takes place as a reaction to cleaning will be more significant than if it is used on a sofa, where the largest piece of fabric used is much smaller.

SAFETY

The safety issues that are most prominent for textiles are risks associated with fire and finishes. The use of flammable products in commercial interiors is restricted to small percentages of overall surface. A variety of test methods have been devised to test the flame resistance of fabrics as well as constructions that are covered in fabric, like furniture and mattresses. Loose-hanging fabric, like drapery, has a lot more air available for combustion than a fabric used as a wallcovering, and the upholstery padding under the fabric, made of a foamed petroleum

product, could also be a source of fuel. Tested fire-rated materials are a legal mandate for most occupancies, and even in occupancies where fire codes are less stringent, such as single-family homes, fire safety should be part of your design program and you should design to exceed the safety of code mandates whenever possible because codes are the minimum standard of safety allowable.

Safety Codes

Local codes that will govern your project will reference a class distinction for fire-resistive properties. Classes may be defined as A, B, C, or D or they may be defined as Class I, II, III, IV depending on the test method used. Several different agencies have devised tests that are referenced by municipalities and jurisdictions as they craft fire safety codes for their areas. Some of the tests that will be referenced in the code book that applies to your specific job have tested materials only; others have tested typical assemblies (ignited a piece of furniture or left a lit cigarette to smolder on a mattress, for example). Interior designers do not perform testing of materials; we rely on testing data provided by others. You will use test data to help you make the best selections for your client's job; even when the exact assembly that you intend to use has not been tested, the materials that you will specify for your commercial job must have been tested and must meet the standards defined by the code governing your client's site.

MANAGING BUDGETS

Fabric pricing ranges widely and additional processes can add to the cost. When you are purchasing a large quantity there may be a bolt discount or bolt price that is lower than the cut yardage price, but you will generally have to ask for the special pricing.

There are some small compromises that you might make to bring prices in line with a restricted budget even if quantity discounts do not apply. For alternatives to expensive fibers like silk and wool, specify rayon or mercerized cotton for silk and polyester or acrylic in place of wool. When you specify a synthetic fiber, make sure you give preferred status to manufacturers who have recycled and recyclable options. These fibers will not decompose as will natural fibers.

If you are using a printed pattern, the more colors there are in the print, the higher the price will be. Cotton chintz with 8 screens will be less costly than cotton chintz with 38 screens. To compound the price discrepancy, the cotton chintz with 38 screens is likely to be printed on better quality cotton—who would waste all the effort of orchestrating 38 screens on cheap cotton?

Avoid pronounced trends that are likely to go out of fashion or that do not jibe with your client's style or cannot be reconciled to the architecture in any other way but to say "this is the current trend." If your client's site will have to be freshened up frequently because they must demonstrate current style in their facility or if they will experience hard use, it is even more critical that you perform life-cycle cost analysis on your selections and seek out sustainable options.

ORGANIZATION OF THE INDUSTRY

Let's trace the steps of your fabric from the textile designer to the product installed in your client's project site. A textile designer employed by a mill or by a fabric company designs a textile, or resurrects a historical textile, and develops a palette of color schemes they believe will work with current market preferences. If a historical colorway does not work with current market colors, it may be appealing, but it will be difficult to work it into a scheme with fabrics currently on the market, and it will end up not being specified by designers who must build an entire scheme for their jobs.

The mill will weave a "blanket," which is the new (or resurrected) pattern, in several different color combinations called colorways. This blanket will travel to textile shows where mills and wholesalers will place orders with the manufacturer for selected colorways. Some colorways in the pattern will be open, meaning anyone can buy them. For other colorways the manufacturer will grant exclusivity so no other seller will represent that colorway among their offerings, although others may have the pattern in a different colorway.

Point of Emphasis 3.4

The fabric market is somewhat synchronized across all textile manufacturers. If one fabric in a scheme wears out prematurely and you have to replace it, you might find it is difficult to match a color that was popular a few years ago. Color preferences are constantly shifting; one year reds tend to be more orange and the next, more blue. Companies pay a lot of attention to the predictions of color forecasters and align their products with what experts expect to be the preferred colors in the upcoming years, and if a color combination does not fit with those predictions, it will be hard to work into schemes with other fabrics.

The danger to the designer from an open line is that you may specify a fabric that you find for an item for your client—say a custom duvet envelope. You may be unaware that the fabric that you selected from your trade resource is part of an open line—until the day your client tells you that they saw a bed-in-a-bag at a big box store in the same fabric as their own custom (and costly) bedding. So as a designer you will want to specify exclusive patterns and colorways.

You will purchase the fabric from your trade resource and request a cutting of the current dye lot, called a cutting for approval (CFA). In your specification to the workroom that is going to make the item, you will state that the COM fabric (customer's own material—meaning the workroom will not provide the fabric to make the item) is to arrive from such-and-such manufacturer and you will include a brief description in your order. Most workrooms will start counting the stated lead time from receipt of fabric, so you do not get in line for production until the fabric arrives at the workroom or manufacturer.

Helpful Hint 3.3

If you are going to have a fabric or other material backed for use on walls, send a couple of yards to the backer to test prior to shipping the whole order to make sure the fabric stays on grain and the effect is what you are after. When you proceed with the order, don't forget to treat the surface with a stain repellant before installing it so that any glue that finds its way onto the face of the material can be more easily cleaned away.

A Cautionary Tale 3.2

I got a call from a friend of mine, who is also a designer, explaining that she had just gone to the warehouse to see a sofa that had come in for her client and the fabric was inside out. If she had noted on her swatch to the manufacturer which side was the face of the goods, they would have been obligated to re-cover the sofa. It is a very simple matter to take a ballpoint pen and write the word *face* on the outside/front of the fabric swatch that you include with your order and the word *back* on the wrong side. Since she had not done this it was left up to interpretation and she had to negotiate a resolution. The deal that she finally struck with the manufacturer was that she would replace the fabric and they would pay for all the shipping and re-cover the sofa at no charge. It still cost her thousands of dollars to skip this little step.

This simple version of the flow of fabric from the textile designer to your workroom may or may not have additional parties to the process represented. All fabrics are milled, but not all go through converters; most, but not all, are handled by jobbers. There will be some kind of representation before it comes to the attention of the designer and in many cases this will be someone affiliated with the trade resource from whom you specify.

- Mill—Makes the fabric and sells it in large quantities called minimums. The minimums vary but generally conform to market expectations of at least 1,000 yards in Europe, 3,000 yards in Asia, and 5,000 yards in the U.S.
- Converter—Buys **greige goods** directly from a fabric mill, and dyes, finishes, prints, or otherwise alters the greige goods and sells them in smaller quantities, often around 500 yards or so, to jobbers or wholesalers.
- Jobber—Purchases large quantities of excess finished fabrics from mills and converters and then sells them wholesale, in even smaller quantities, to design firms, manufacturers, and retail fabric stores.
- Rep—A sales representative or "rep" shows fabrics from one or more mills and is the link between manufacturers and wholesalers or resellers.
- Wholesalers—Sell the fabric to resellers like designers, fabric stores, smaller manufacturers, and other links to the end users.

SELECTION CRITERIA

Testing data available to the interior designer will include a variety of measures, some more important to your planned use than others. Depending on your program needs you may look for the following for a commercial interior.

The American Association of Textile Chemists and Colorists (AATCC) is a well-respected, second-party organization that performs unbiased testing of textile characteristics. You may notice references to AATCC ratings on commercial fabrics. They generally rate textiles on a five-point scale with five being excellent and one being poor. The American Society for Testing and Materials (ASTM) is a nonprofit, third-party organization with testing procedures covering many materials, not just textiles. You may also see references to ASTM data on fabric information. ASTM data that you will find will list the testing method and the results. The results may be all inclusive, such as "resists fungal growth," or they may list a numerical result like "seam slippage 25 lbs for warp and weft per ASTM D 4034." You may decide to organize your thinking about your program's selection criteria in a manner similar to that in Table 3.8.

Table 3.8
Selection criteria.

Characteristic	Examples	Select
Flammability	Danger of fire when users may not be familiar with closest exit location; consider application (i.e., adhered with no air space or loose like drapery?)	Class A or Class 1 fire-rated fabric generally; drapery should also list NFPA 701-Pass
Germs	Health-care providers, child care spaces	Antimicrobial treatments
Abrasion	High-use interiors	Select heavy-duty fabric surviving minimum 30,000 double rubs Wyzenbeek or 40,000 on the Martindale test scale; 50,000 double rubs or more for 24-hour facilities
Fade resistance	Exposed to sunlight	Grade 4 or 5; Grade 4 at 40 hours generally or Grade 4 at 60 hours for drapery; depending on exposure, for outdoor use specify Class 5 only
Tear strength	Upholstery fabric that will be subject to high or rough use (recall the children who stand and walk on airport seating) or where fabric might become caught in a hinge or cart, or a briefcase with pointy corners might be set on upholstery	50 lb minimum in warp or weft generally or 35 lb for panel fabrics
Pilling	Abrasion and yarn characteristics combine to create abrasion problems when the short ends of a staple fiber stick and get matted together from abrasion	Class 3 minimum
Seam slippage	Stress at stitched seams causes fabric to open up in the direction of the stress; if the seam runs parallel to the warp the warp threads will slide over leaving only the weft threads for some distance	25 lb in warp and weft direction
Crocking	Colorant rubs off	Generally Grade 3 minimum wet or dry but upholstery should be Grade 4 minimum
Stain resistance	If a fiber is oleophilic, it will tend to soak up oil-based stains; if it is hydrophilic it will soak up water-based stains, so you will consider the fiber chemistry as well as the test method to make sure fabric resists what it must for your client's site	Grade 4 or 5; coatings can enhance fabric stain resistance; chemical or molecular (nano) coatings perform differently so compare properties before specifying to match best to your client's needs
Toxicity	Toxins in location of production as well as in your client's site	Check for heavy metals used in colorants as well as finishes that use formaldehyde and other toxins; check for VOCs in manufacturing and in use
Sustainability	A consideration for all environments but especially those where wear indicates the materials will be replaced one day	Recycled content; ease of recycling and existence of a program for recycling; water use and recycling in production; recommended cleaning methods

Many of the above are recommendations from the Association for Contract Textiles (ACT).

RELATED MATERIAL

Materials that are similar to textiles include leather, which is used in place of fabric in installations and items to which textiles are applied. Each of these topics require a fair amount of information in order to understand them and so are covered rather extensively here. The application of textiles to items is restricted in this chapter to soft goods. Because soft goods have little structure beyond that supplied by the fabric (unlike upholstered furniture for instance) they are heavily dependent on the textile used to make them.

Leather

While leather is not, strictly speaking, a textile, it is used in many of the same instances where we specify fabric; so this is a logical place to consider leather as a material for your interiors. Although we may automatically think of cowhides as the source of all the leather we specify, leather may be harvested from pigs, deer, snakes, calves, and many other animals. Leather is priced by the square foot but sold by the hide or half-hide. The conversion rate is 18 square feet of leather for every yard of 54-inch-wide fabric required for your client's job. This means that a single hide of approximately 50 square feet is about as much covering as provided by 2.75 yards of fabric. Hides vary in size and they are not neat rectangles (Figure 3.48) so you should err on the generous side when estimating how much leather will be required for your job.

There are numerous quality differences between leathers, some arising from conditions in which the cow was raised. Its nutrition plays a small role in the quality of the skin as do scars acquired during life, which remain visible on some kinds of hides. If the cow was raised in a safe environment and was not scarred or injured, the hide will be relatively free of such blemishes. It will still have natural skin wrinkles in some places—like at the neck, and "fat wrinkles" (creases that soak up dye differently than surrounding skin)—but will not be scarred from barbed wire or bug bites. Many will claim that European hides are superior to the free-range hides from cows grown for the meat industry in the U.S. because European cows are raised in safer, cleaner environments and they are generally free of these scars. European hides are more expensive to buy, but the fabricator does not have to cut around damaged areas, so some of the cost is offset by a reduction in waste.

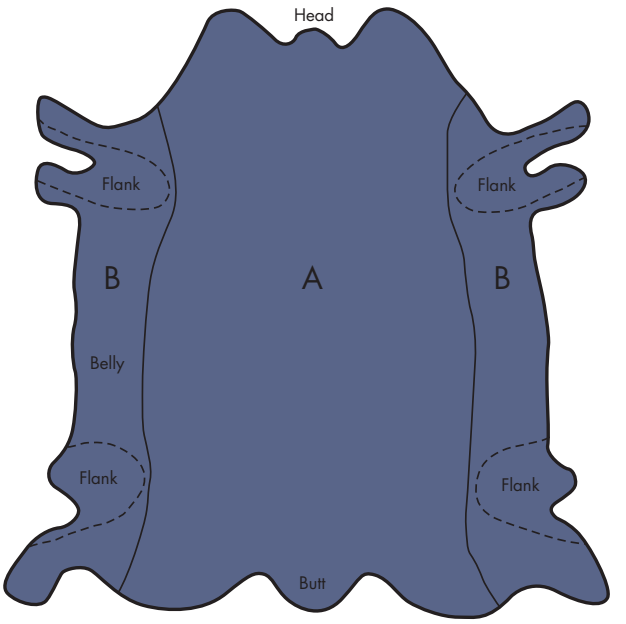


FIGURE 3.48 Hides are not neat rectangles of consistent material, so estimating quantity of leather required gets a little tricky. Ordering returnable overage is often a good idea.

Grades

Although it is not information that interior designers use directly, tanneries grade the skins they process according to their quality and the presence of damage to the skin.

- 41 hide—A 41 hide is a hide free from holes, cuts, deep scores, or gouges more than halfway through the hide, visible grain defects, and broken grain (over one inch long) and has a correct pattern. An exception would be rear shanks containing one hole or cut below the hock that measures less than one inch in length and holes less than four inches from the edge of the hide, which can be trimmed without spoiling the pattern of the hide and not result in a downgrade.
- 42 hide—A 42 hide is a hide that contains either one to four holes, cuts, deep scores or gouges in an area located inside a straight line drawn through the break in the hair of the fore and hind shanks, or a great break over one inch, or an area of warts no longer than one square foot, or a hole regardless of size within the confines of a brand.

- 43 hide—A 43 hide is a hide that contains either five or more holes, cuts, deep scores, or gouges in an area located inside a straight line drawn through the break in the hair of the fore and hind shanks, or one hole or cut over six inches, or an area of warts or open grub holes larger than one square foot. A machine-damaged hide will be considered a 43 hide if at least 50 percent of the surface area of the hide is present and usable for leather manufacture. If less than 50 percent is present the hide will be considered untannable.

Skins are processed through a short series of steps to turn them into nonperishable leather hides. The raw hides (stiff and hard like a dog's rawhide bone) are either vegetable tanned or chromium tanned. The vegetable-tanned hides are rolled in a drum with tree bark, fish oil, and other natural vegetable and mineral ingredients.

> **Point of Emphasis 3.5**
> Vegetable-tanned hides feel stiffer and crisper than chromium-tanned hides.

Chromium-tanned leather is also rolled in a drum but with mineral salts. Chromium-tanned leather is softer than vegetable-tanned leather. Leather that is only tanned is called crust. Crust leathers are completely "naked," and therefore vulnerable to soiling, so from this stage it will receive other processes and materials altering its delicate characteristics. See Figure 3.49.

Grain

The texture of the skin is called the grain of the leather. Top grain may sound like the best quality but it is second best. The real grain of top grain leather has been sanded away and an imitation grain is stamped into the leather. When the genuine grain remains, the leather is called full grain, or full top grain, not simply top grain. Top grain leather will typically be more resistant to soiling because of its unnatural surface. For leather chairs where people will be eating and drinking, top grain is a better choice than the better quality full grain.

Full grain leather displays the natural markings and grain characteristics of the animal from which it was taken. They are dyed through with transparent aniline dyes. Because the full, natural grain is retained, you should be able to see the fat wrinkles and the feel, or **hand**, should be natural to the touch.

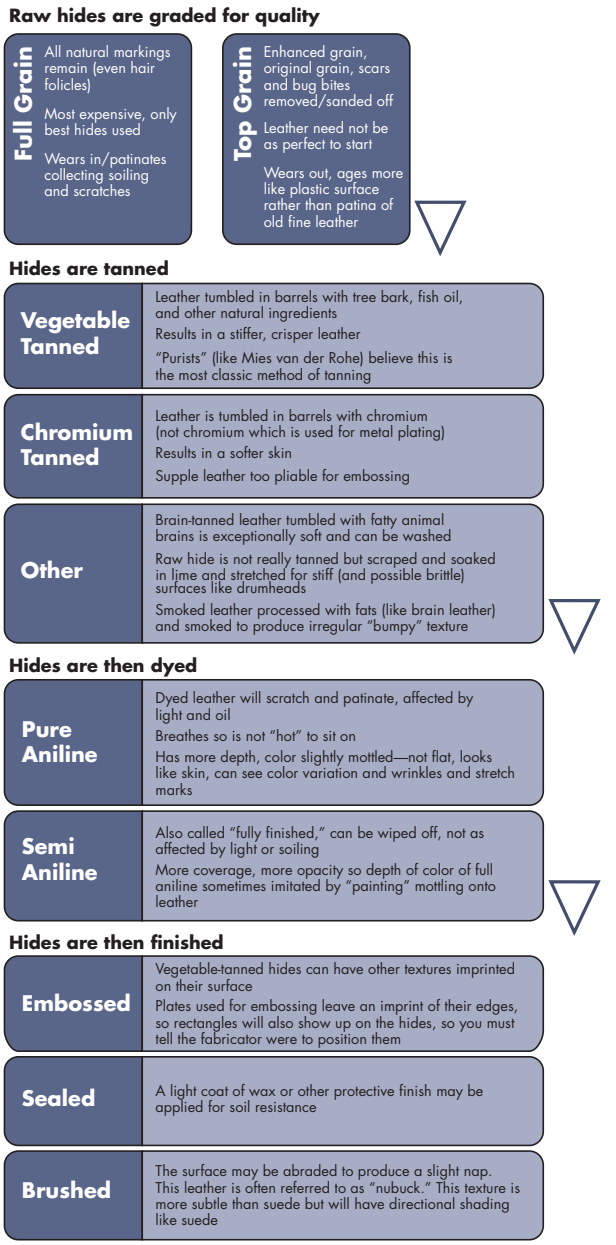


FIGURE 3.49 Numerous processes may be applied to leather. Not all of these processes are used on any single hide but the combinations of processes alter the performance and appearance of the hide.

The highest quality skins with the fewest blemishes will be processed as full grain leather; lower quality hides will be processed as top grain. Full grain hides do not conceal any of the natural markings or hair follicles that will be removed or concealed by more extensive processing of top grain hides. Both full grain and top grain hides may be dyed with either vegetable or chromium dyes.

For the Connoisseur 3.4

While your specification should address all functional needs of the program there will be times when you want to specify leather that is considered to be "classic." Vegetable-tanned leather is considered to be just such an instance and full grain is a given as well. Vegetable-tanned leather will be more light sensitive and has a stiffer hand than chromium-tanned leather but the connoisseur is willing to live with these frailties in order to have classic leather for their upholstery.

Full grain hides are processed as full aniline and top grain hides are processed as semi-aniline.

Full Aniline or Pure Aniline:

- Only the finest hides in the world fall in this category. It may be only dyed and has no other finish applied other than a light protective wax.
- This type of leather scratches, picks up oil and soiling, and develops a patina.
- Only 5 percent of the total world hide supply are clean (clear of marks and scars) enough to fall in this category.

Semi-Aniline:

- More processed than pure and full aniline: dyeing in large drums like full aniline, but then also finished on top; spray pigments are applied to the hides to even out the finish and camouflage naturally occurring imperfections.
- These leathers are light and scratch resistant and are more easily cleaned.
- Provides 10 to 15 percent of the worldwide hide supply.

What Would You Do? 3.2

Review the different attributes of leather and consider what might be a proper specification for an airport lounge, a plastic surgeon's waiting area, a bachelor who has a connoisseur's perspective on materials, and a family room for a family that has dogs and children. Assume logical budgetary constraints.

Cow leather is the split hide, meaning the skin was double the thickness of the tanned hide because during processing it was split to half of its thickness. The outside of the skin is used for leather; the meat side of the skin is used for suede. Suede retains a nap after processing. Nubuck is a leather (the outside of the hide) product that also presents a nap but the nap on nubuck has been raised by sanding the leather.

Helpful Hint 3.4

When ordering leather for your job it is better to err on the side of too much leather rather than not enough, especially if you are using full grain leather; here's why: Leather is sold by the hide (or half hide), though estimated and priced by the square foot. Even hides of similar size may yield different amounts of usable leather—it depends on the quality of the skin and on the size of the cuts that the upholsterer needs to complete the job. Some hides may have more unusable leather than others and the upholsterer cannot know this until the leather is in the shop.

Full grain leather is the most natural: it is tanned and dyed and very few additional processes are applied to it. This means that natural variation from one lot or batch to another cannot be cosmetically modified to make one batch look like the next. Top grain leather is typically more processed and more processes yield more opportunity to modify the appearance and achieve a match between two different lots.

What to do: Ask your leather supplier if you can return any uncut hides (many will allow this) and add an extra 10 percent to your fabricator's estimated quantity instructing the fabricator to return any uncut hides to you so you can ship them back to your supplier for a refund.

Hides that still have their hair, called hair-on hides, are also dyed sometimes they are selectively dyed to resemble other animal pelts, such as zebra or leopard.

SOFT GOODS

Fabric is fashioned into a product that the industry refers to as soft goods. These are products that do not have a rigid framework to support the shape of the

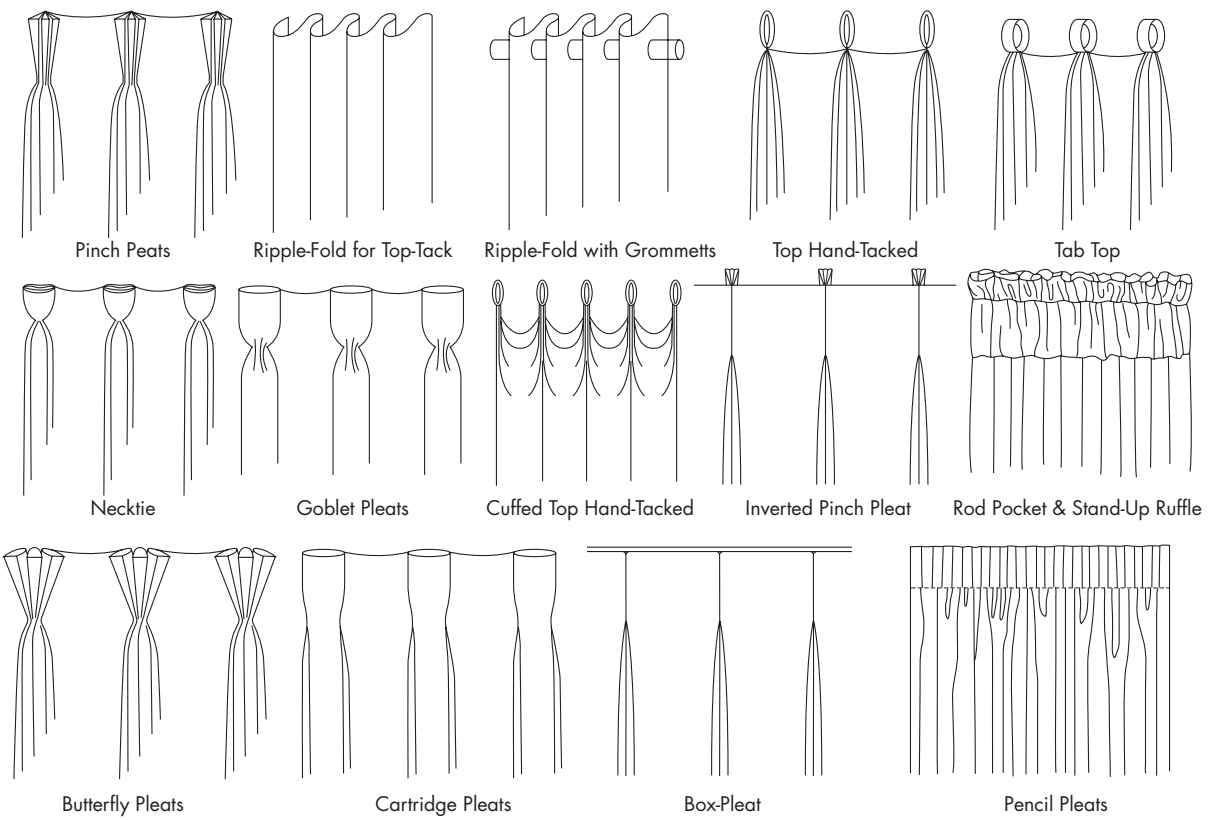


FIGURE 3.50 The top of the drapery is called the header. It not only fastens the drapery to the support that holds the drape up, it adds fullness to the construction. Some headers must be movable so the drapes can draw, others are stationary. Movable drapery will hold hooks or fasten to rings at the pleat location.

fabric product, they rely on sewing and padding alone to present their forms. Window treatments, bedding, table linens, pillows, and the like are considered soft goods. The drapery workroom will also fabricate simple furniture items such as upholstered headboards and will upholster walls. The distinctions between these various soft goods are sometimes loosely defined because there will be items that resemble more than one category.

Window Treatments

There are many issues of style that you will orchestrate according to your design program. Basic categories of treatments that you will utilize or combine might include drapes, curtains, toppers (both hard and soft), custom fabric shades, or manufactured blinds (not technically soft goods but the function is strongly related).

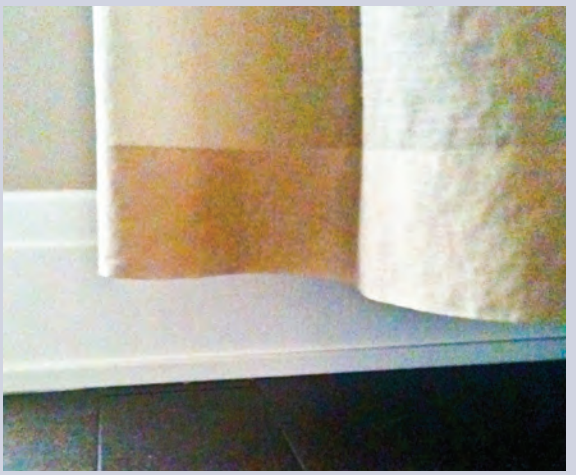
Drapery

Drapery is often assumed to mean treatments that draw open and closed via rigging controlled by a pull cord or motor. *Drapery* and *curtain* are terms sometimes used interchangeably, although the implication of curtains is that they are simpler than drapes and have nonmechanical hardware.

Drapery headers (the hem at the top) are pleated so that even when the drapery is closed over the window, it still has some fullness and ruffling. The hooks that latch the drapery to the rod are fastened to the pleat. There are many different pleat styles (Figure 3.50). Some of them are fatter than others. This will affect how much space the treatment must have when open.

Café curtains, for instance, cover only the lower half of the window and are not strung on movable rigging. They are often assumed to include a companion valence of some sort. Dress curtains are stationary panels that frame the window opening but do not draw across it. So curtains do not require moving hardware.

A Cautionary Tale 3.3



Just as wood expands and contracts due to changes in humidity, fabrics that are made of plant-based fibers will shrink and grow in response to humidity. Rayon was selected for this drapery because, although silk was desired, it was recognized that silk would rot from exposure to sunlight. Since the idea was to use the drapes as sheers, without lining, there would be nothing to protect the silk from the sun.

Rayon is a man-made cellulosic fiber, meaning it started its life as wood. Wood expands and contracts with changes in humidity as a percentage of its size and the rayon fiber here did the same. Because the drop from hem to hem is over nine feet the 1.75 inches of shrinkage that occurred (the angle of the photograph visually exaggerates the shrinkage) is only 1.6 percent of the height. It doesn't sound like a lot when discussed in terms of such a small percentage but it is certainly enough to make a difference in this installation.

Possible solutions:

(1) Lower the rod and repaint the wall.
(2) Take the hem down and hem the drapes with a small "handkerchief" hem with a weighted, beaded chain sewn in so the drapes still hang properly.
(3) Select a similar rayon fabric in a contrasting color to make a decorative band along the bottom.
(4) Select a similar rayon in a similar color, sew it to the bottom, and then turn the new fabric up as the hem.

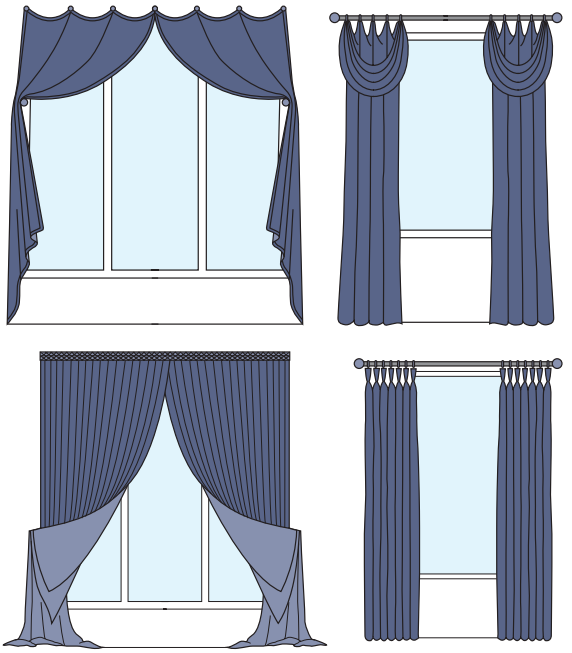


FIGURE 3.51 Dress curtains are stationary.

Dress Curtains Dress curtains are also stationary panels that look like functional draperies (Figure 3.51). You might use them if your client would like the softening look of draperies but the window does not require covering and the cost of drapes is too high. Because dress curtains are not meant to draw, they are often detailed with a tieback (Figure 3.52). If your client intended to use this curtain to cover the window, you would not specify this dress curtain for a couple of reasons. When the tieback is released, the fabric will be wrinkled where it had been held by the tieback. Arranging the pleating flows out of the tieback takes skill and is not as easy as you might think, so it is likely that only your experienced installer can get such perfect results as shown in Figure 3.53.

You also have more options for the header (top of the treatment) because they do not have to move along the rod (Figure 3.54). You may elect to use a header that could potentially move (like the last two on the second row) but that is not required for stationary panels. Figure 3.55 shows stationary panels with tiebacks suspended from rosettes since the drape need not move. Make sure that the dress curtains have sufficient width to maintain attractive proportions. This can be determined with a scale drawing or even more quickly with a to-scale sketch. Remember that after side hems, a 54-inch-wide panel pleats to less than 20 inches. This looks skimpy on windows wider than 2½ or 3 feet.

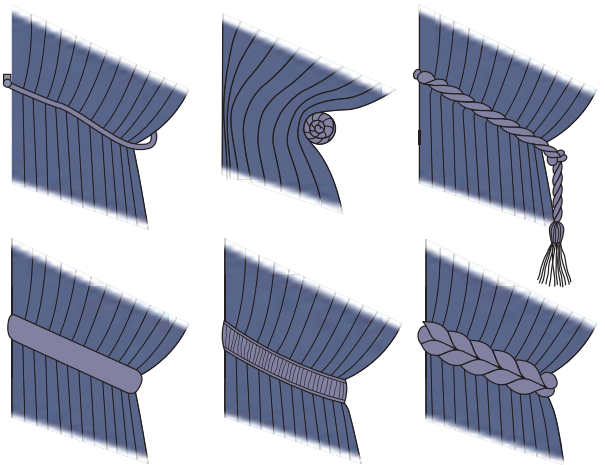


FIGURE 3.52 Stationary panes may be held back. While this looks functional, it is really decorative; the panels may even be hemmed so that they are only the correct length when drawn back.

FIGURE 3.53 This pencil-pleated header and tieback work best on a stationary pane. Notice that a decorative lining has been used on the leading edge instead of the standard white or ivory. This is because it shows when the curtain is drawn back.

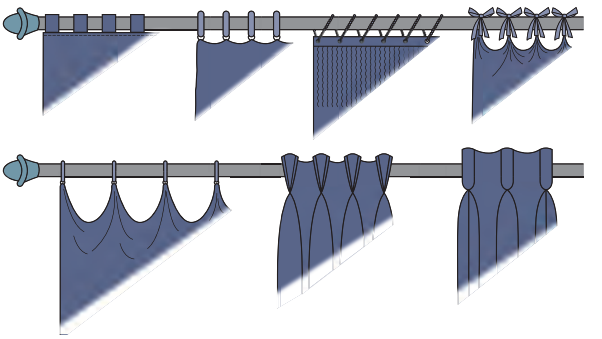


FIGURE 3.54 You have more options for headers when the drape does not draw. Some of these means of fastening would not move easily enough.

FIGURE 3.55 This stationary panel can easily conform to the arch as it hangs from individual rosettes.

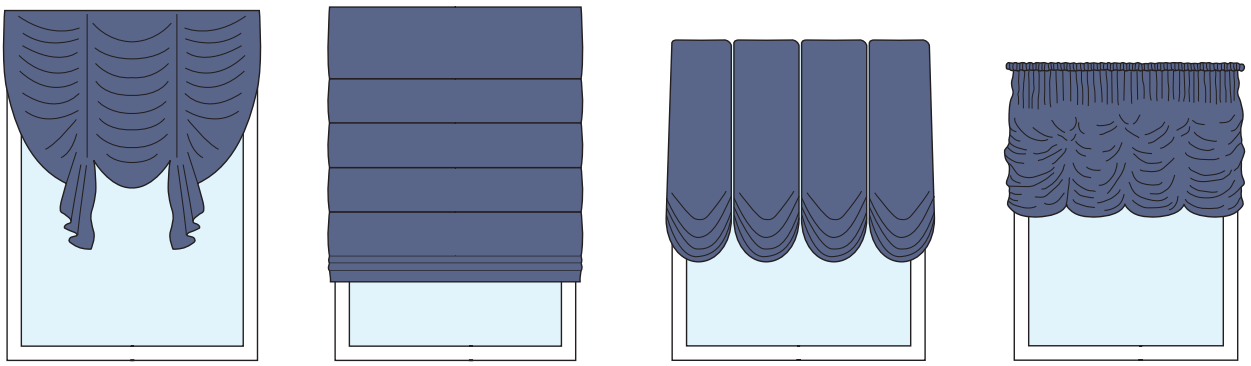


FIGURE 3.56 Custom shades are frequently constructed from selected fabrics.

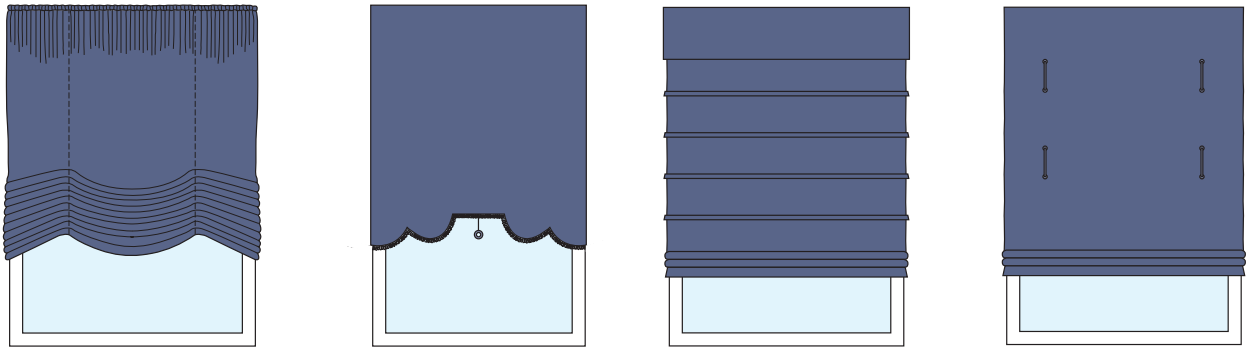


FIGURE 3.57 Shade styles may draw up or roll up.

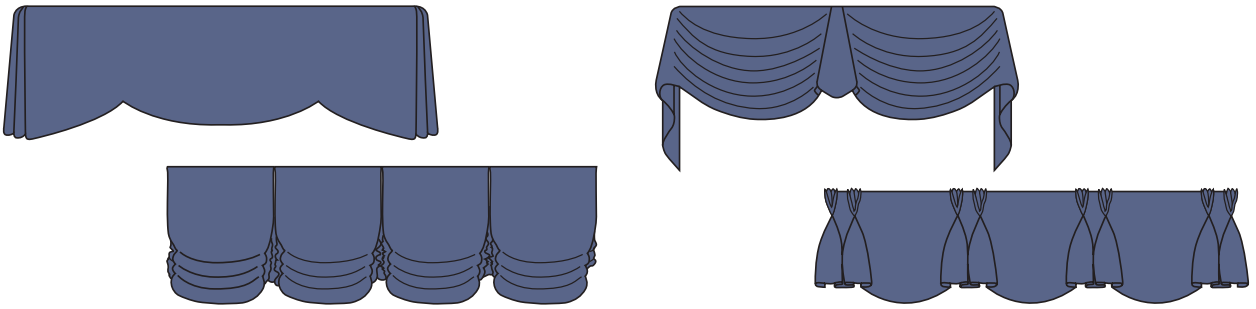


FIGURE 3.58 Valences are soft treatments, meaning they may hang from a board but their structure comes from the shape given to the fabric when stitched rather than by a stiff material underneath.

Top Treatments Top treatments such as swags and jabots or valances are softly constructed, decorative drapery treatments of fabric, often combined with other coverings (drapes, shades, blinds, etc.). Custom shades can be made up in your selected fabric. See Figures 3.56 and 3.57 for custom blinds and shades. If you elect to cover the window with a shade or blind and install stationary panels at the sides, you can save money. This approach requires less fabric, and less labor cost and no rigging, saving labor and fabric requirements.

Soft top treatments include valances (Figure 3.58) and swags (Figure 3.59). Swags look the best if they are cut on the bias, so keep this in mind when selecting fabric that will hang on grain for all of the treatment except the swag. Swags can be cut on grain but they do not hang as gracefully. Notice how smoothly the curves flow in the drape of the swags shown in Figure 3.60; this is only possible if the fabric is cut on the bias or is a very loose weave that can be blocked into shape. Valances are cut on the grain (Figure 3.61 shows a custom valance used above a manufactured grass shade).

Top treatments also include upholstered items (Figure 3.62), cornice boards, lambrequins, and cantoneers, which are often constructed of plywood or

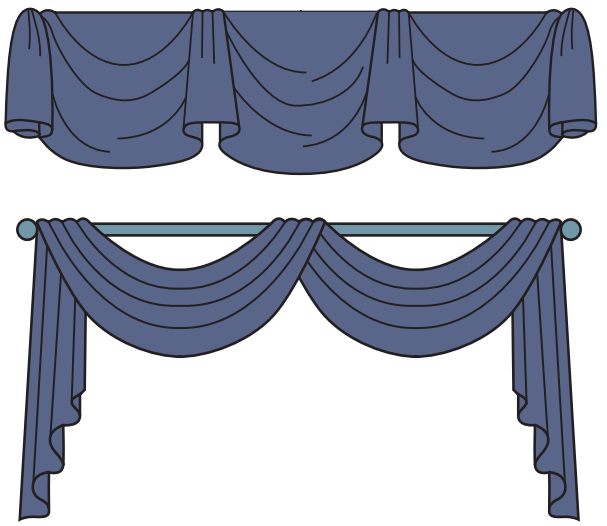


FIGURE 3.59 Swags look very casual but they are highly constructed, so much so that if removed from their support they would stay in shape.

FIGURE 3.60 These swags were cut on the bias so the sweep of their folds is unkinked. *Photograph by author at Baird's Drapery Services, Chicago, IL.*

FIGURE 3.61 A manufactured grass shade is paired with a custom valence. *Design by Tracy Hickman of Chicago, IL.*

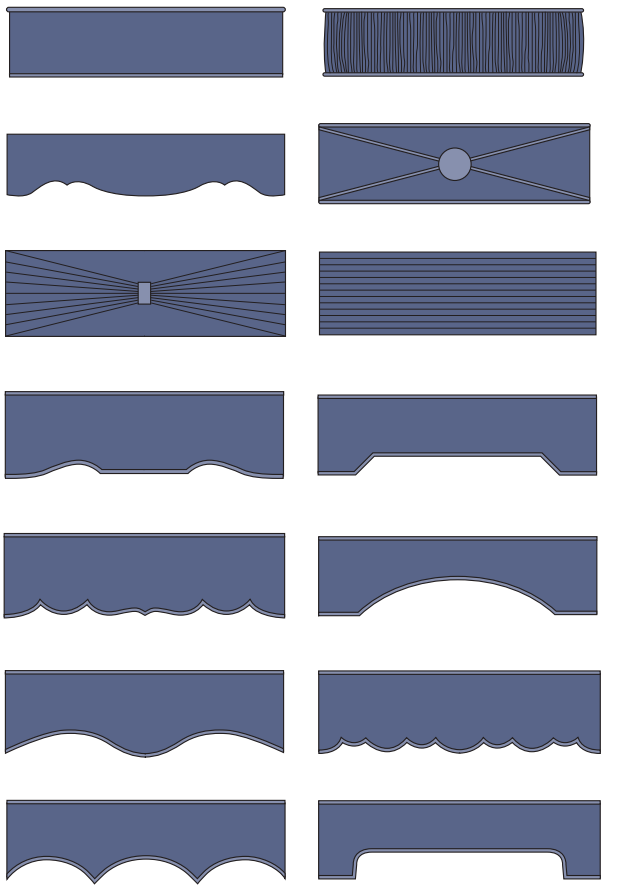


FIGURE 3.62 Cornice boards are fabric-upholstered boards, padded out and covered.

FIGURE 3.63 Window treatment that relies on a stiff substrate to give it shape spans the distance between architecture and soft goods. *Design by Joan Schlagenhaft, Mequon, WI.*

FIGURE 3.64 Lambrequin can lend architectural detail to spaces. *Design by Deutsch Parker, Chicago, IL.*

another engineered substrate, are padded and covered with fabric. They usually have a complementary relationship to the architecture as they transition from structure to window treatment but they are sometimes used to lend a little architectural interest. Cornice boards (Figure 3.63) cover the top of the window, lambrequins (Figure 3.64) cover the top and some portion, or all, of the sides, and cantoneers frame the window completely on all four sides.

Lining When supplied by the workroom, linings will be a standard lining in white, black, or ivory, a black-out lining, or a thermal lining (Figure 3.65). Interlining (a fabric of a variable weight sandwiched between the face fabric and the lining, often a flannel) can be used to give a treatment more body or better thermal properties if necessary.

White or ivory lining became a standard to accommodate the exterior presentation of the building and because it does not alter the color of the treatment when the light shines through it. If the face fabric has a strong color it may be apparent from the outside when drapery is closed at night and lights are turned on inside. Ivory may add a little bit of yellow to the face fabric when the light shines through it; this is most noticeable if the field color of the finish fabric is pale. If you are supplying your own lining, because the design planned will allow the back to show, remember that the seams on the lining should line up with the drapery seams so ideally you purchase the same width as the face fabric or wider and then pay the labor charges to have the workroom cut it to width. Select lining fabric that is most similar to or most compatible with the face fabric so that it reacts the same. You can also supply a special lining or interlining if your treatment calls for it. Figure 3.66 has jabots that are lined with a finish fabric rather than the workroom lining because the design reveals the back of the jabot.

FIGURE 3.65 Standard lining offerings available through your workroom. *Image courtesy of Baird's Decorating Services, Chicago, IL.*

Fitting the Window Treatments to the Space

A simple draw drape on a traverse or other rod could be specified with a written specification alone, but most window treatment designs are best communicated with drawings that show the treatment in plan and elevation showing all pertinent dimensions, alignments to architectural features, and information to the installer. Included in the dimensions are the height, the treatment in relation to the floor or window frame, and the width of the treatment, including stackbacks. The depth of a multilayered treatment or a treatment where the projection would become an issue (bay windows, drapery pockets, or any close proximity) should also be shown on the plans. The location of the control cord or wand should be noted on a plan view.

The plan view that you forward to the workroom will show the depth of the treatment and the anticipated size of the stackback; the location of the pull cord or wand will be noted along with the correct location of floor vents, switch plates, and other service controls.

FIGURE 3.66 Swags and jabots are lined with the same fabric as the face when the back will show. *Design by Art and Design, Chicago, IL.*

Depth of the Treatment Estimate that each layer of drapery will project six inches and consult the manufacturer's stack chart for purchased shades and blinds. Some woven grass and bamboo Roman blinds require up to a foot of depth projection to stack up. This can eliminate them from consideration in a situation where two windows meet in a corner or in a bay window. A lambrequin, cornice, or valance adds a couple of inches more to the depth. Show all these layers in your plan view so you can confirm furniture locations and to fully comprehend the scale of the 3D treatment in location. Sometimes it's quite a massive presence. If the drapery will retract into a pocket, there should be room on front and back so the fabric does not drag and snag; in which case, add two or three more inches.

Width of the Stackback The **stackback** is the width required for the open drapery to stand, either off the glass covering wall space or on the glass covering part of the window. It is typically one-third the width of the entire treatment but you can control for some variation. There are a few factors influencing the size of the stackback. One is the fullness. Typical minimal fullness for multipurpose fabric (medium-light drapery weight) is 2.75 times the fullness. Heavier fabric can look okay with 2.5 times fullness; that is fortunate if the stackback is getting too wide, because heavy fabric needs more room to stack. So the second factor influencing the size of the stackback is fabric fullness. The number of pleats and kind of pleats also contributes to how tightly the treatment can stack. You can adjust the fullness and the

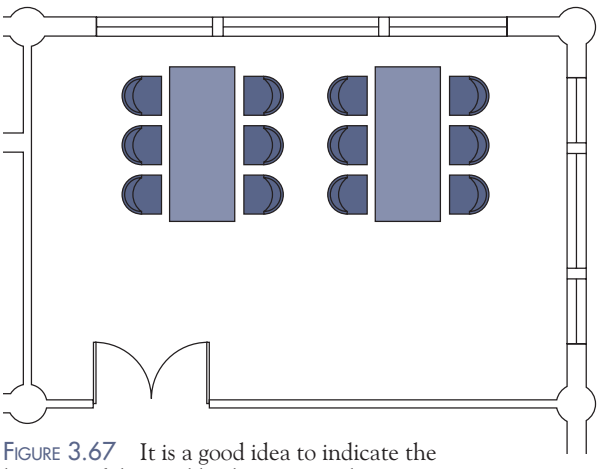


FIGURE 3.67 It is a good idea to indicate the location of the stackbacks on your plans so you account for the space they will take up.

FIGURE 3.68 These goblet pleats take up more space than pinch pleats so the stackback will be wider for this treatment. *Design by Tracy Hickman.*

number of pleats independently of each other. Fewer fuller pleats can reduce the stackback without making the drapes look skimpy. Lining will add to the bulk of the stacked treatment; lining and interlining (as is irresistible for taffeta and other thin solids) doubles the contribution of the bulk from lining. The kind of pleat selected contributes to the stackback (Figure 3.67). Some of the pleat styles shown in Figure 3.50 are so fat, such as the goblet (Figure 3.68), that you might only consider them for stationary panels. They just need too much stackback for most locations.

Size and Mounting Location The mounting height can best be determined on elevation with all casings and moldings indicated in correct scale. A general rule is that treatments should rise minimally 4 inches above the top of the window and extend 4 inches beyond the side of the window, so that is a good place to start when you make your to-scale sketch showing the treatment. If the treatment does not go to the floor (½ inch above finished floor) it should fall 2 to 4 inches below the apron.

Location and Type of Control Also on your plan view will be the control location and type. The location of a wand at the leading edge or a pull cord for the rigging at the outside should be indicated on your plans so that the workroom and the client can comprehend the logistics of getting behind furniture to reach the wands or pull cords.

Location of Room Features There will be times when you complete your plan view to discover that some of the existing room features are in conflict. For new construction, the light switch can be precisely located beyond the stackback, HVAC vents can be positioned so they don't billow drapery, and windows can be located to provide enough wall space for stackbacks. In existing construction, the client may have to make the determination as to whether such conflicts will be a nuisance, in which case the plan of the architecture should be modified. It may be most convenient to open and close them with the flick of a switch, so you'll need to add information to the electrical plan and locate the place in the wall cavity where you can position the motors to drive each rod. You may require an outlet behind the stackback for each pair of drapes that use a motor.

Hardware Drapes can traverse on a track rigged with cords to open and close them or can hang from a rod and be pulled by hand or by a wand hidden behind the leading edge of a drape (so the client isn't tugging on the fabric when moving the drapes). Decorative options for hardware with rigging are limited, and if traversing drapes are desired, you might select one of the hollow-back estate rods or plan to cover the economical white traverse rods with an architectural or soft goods detail. Drapery headers might be pleated, requiring one kind of hanging system, or ripple-fold, requiring ripple-fold hardware. Some treatments are stationary (that is they do not move). Such treatments can be hung on a rod or mounted on a board.

Other Window Treatments

In addition to custom drapery, window treatments include manufactured shutters, blinds, and shades that are made of or incorporate special fabrics, perhaps along with other materials.

Shutters Shutters are bulky treatments unless you can **inside mount** them, so detail how they can be integrated into the architecture. If the site has complicated architectural construction at the windows, it is a good idea to meet the installer at the site or review the plans.

Good shutters are constructed with the same considerations that you would give to cabinet doors. As with cabinet doors, the stiles must be a minimum 2 inches wide on their faces and 1 to 1¼ inch thick for stability. The joints are ideally a slotted joint construction (like mortise and tenon). Shutters should be made of kiln-dried hardwood for transparent finish but could be an engineered wood product if they will be painted. In high-moisture situations (pool houses exposed to a lot of weather conditions and not always controlled with the same tenacity as the air inside the main house) you may want to consider vinyl. Vinyl has standard sizes, and you will adjust the opening or framing to accommodate the standards. Purchase shutters from shops that specialize in them.

Materials for shutters include the following:

- *Engineered hardwood*—A great surface for paint; molded edges are crisp; surface is smooth.
- *Alderwood*—A good choice for paint and stain applications.
- *Basswood*—A good choice for stain and acceptable for paint; it does not have a high surface hardness.
- *Poplar*—A less stable wood than other choices.
- *Polys, PVCs, cellulars, vinyls, hollow fills, vinyl clad*—Suitable for use in high-moisture situations, but they discolor and sag over time in hot, south-facing windows.

Blinds Your supplier or installer is likely to represent product from many manufacturers. Because this product is considered to be something of a commodity, the manufacturers rely on proprietary colors and textures as well as quality specifications to differentiate among the many product offerings. Most manufacturers offer a couple of different price points so that blinds that will not be handled by the end user on a consistent basis don't have the same rigorous specs as blinds that they will adjust frequently. These blinds will not cost as much as blinds with superior construction but there is a quality difference, and you do get what you pay for.

Options that you will encounter among blinds manufacturers' offerings will include width of slats; kind of control (cords, continuous pulley, motorized on a battery or hardwired); decorative considerations (color, surface, decorative tapes, special valance profiles to conceal the mechanics at the top of the blinds); and the option to locate controls left or right.

Qualifying Installers and Fabricators

Find prequalified installers by word of mouth. Interview fabricators and installers, and review their work and their standard specifications. Ask them how long they have been in business. Review of their standard specifications should include quality construction and attention to detail.

Drapes for example:

- The workroom is to take all of its own measurements.
- All fabric is to be inspected with bright light shining through it before it is cut, ideally when it is received at the workroom. If the fabricator waits until it is time to cut the fabric before inspecting it, you will have lost valuable time for getting replacement goods in hand if the goods are flawed.
- They always construct double hems and headers 4 to 6 inches deep.
- They blind-stitch hems (1½-inch double-side hems are standard).
- All seams are serged and over locked.
- All corners are weighted.
- Lightweight fabrics have beaded weights in hem for improved draping.
- Pleating of multiple-width fabric should always conceal seams.
- Draperies should be fan-folded for transport and steamed and tied on-site.

It is preferable for suppliers to have their own workroom and their own installers but successful relationships can be maintained as long as the supplier always assumes full responsibility for their subcontractors.

Shop Visit

Our visit to Baird's Drapery workroom in Chicago begins in their showroom. Not all workrooms will have a showroom. This workroom maintains a showroom as a resource for designers. They are a to-the-trade resource (they do not work directly with end users and their contracts are with design professionals only).

From the showroom we proceed into the workroom.

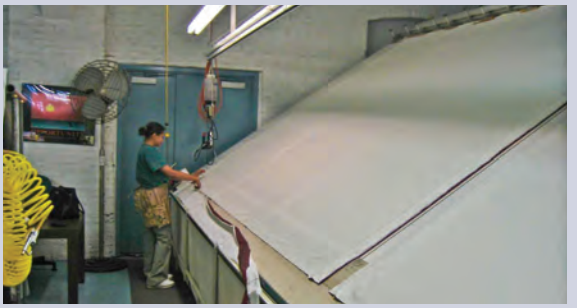
When requests for quotes come in from designers, a file is created to organize the information sent with the request for quote and to keep track of the information that supports the quote generated. When the job moves into production, the job file will also contain copies of work orders, cuttings, and a record of conversations pertaining to the order.

When the fabric comes in, it is checked for flaws using a light table. You can see small slubs in the fabric, which may not be visible until the light shines through them. This is an important step for two reasons. Unless the drapes are blackout-lined, they will have light shine through them when they are installed, so the light table duplicates that condition. The fabric is checked upon receipt so that there will be time to order replacement goods if there is something wrong with the shipment. Drapery workrooms typically have a lead time that is weeks long so defective fabric can be replaced before the job comes up for production.

Fabric is rerolled onto the shipping tube, tagged with the job number, and stored until the job comes up on the production schedule.

When the job goes into production, the fabric is cut to length. This measuring and cutting takes place on another light table. If the workroom wanted to avoid the slubs noticed upon arrival they would need to be able to find them so they could cut around them as they cut the fabric into panels. The panels would be the "cut length," which means the finished length from the top of the pleats to the floor plus the header and hem.

The finish fabric and the lining will be cut together and the cut panels for each job hang on racks waiting for assembly. You can see the work ticket, which contains instructions for each phase of production, hangs on the fabric for the job. A small swatch of the face or finish fabric will identify the work ticket if it becomes separated from the fabric panels. Long side seams are stitched to create the fabric width needed for the drapery. The same step will be performed for the lining and then the lining will be fastened to the finish fabric.



This table is the first of its kind, custom built for Baird's to allow the fabric to "hang out" on the tilt surface before the hems are cut. Fabric is not a solid material, it is a sheet composed of warp and weft threads, and up to this point it has been rolled then wrestled under the machine as the side seams were sewn. On the tilt table the fabrics can assume a natural position for drapery as gravity can help approximate the condition of the drapery in the installation. The drapes relax into position, then the panels are cut to length. The top of the panel is on the low end of the table. You will see why in the next picture.

The header, which contains the pleats, must have a little extra body. Here you can see the roll of buckram, which is applied to the header (the top hem).

After the header has been formed, the drapery panel is moved to the pleater table. You can see a series of small rulers, which will guide the amount of fabric pleated at each pleat location. These guides must be set by hand and the spacing confirmed for each job. It varies with the width of the finished drapery treatment, the fullness of the fabric, and the kind of pleat specified.

Shop Visit *(continued)*

After the pleats are marked they will be tacked to hold their form. These pleats are being tacked on a machine. Some pleat styles are tacked by hand.

The hem of this sheer panel is being sewn by hand. Some hems are sewn by machine.

Drapery installations require hardware. Special hardware such as decorative rods and finials are ordered especially for the job. The utilitarian brackets and pins, traverse rods, etc., are on hand at the workroom. The sheer variety of hardware kept on hand is an indication of the number of options available from custom drapery styles.

The hardware is organized by type and the storage bins labeled.

Custom valences and cornices were being constructed. The valence under construction here is based on a detailed drawing produced by the designer used in conjunction with measurements taken at the job site (after the contract had been awarded).

A paisley swag that was to be mounted to a cornice board was also being worked on. Here its top has been finished and pleated and the bottom edge is receiving a fringe trim.

Its form is checked on a padded pinup board before it is fastened to the cornice board.

The cornice board is constructed of particleboard; it is then padded and covered with the finish fabric. Here you can see that a self-piping (a cord covered in the same fabric as the cornice board) is being applied to the top edge.

Here are a couple of swagged cornice boards already completed and "hanging out." The swags can relax into shape for a while before they are removed (Velcro tabs hold them on so they can come down for cleaning in the future) and hung on hangers for transporting to the job site.

UPHOLSTERY

Fabric and leather are frequently applied to furniture and, as mentioned in the passage pertaining to fire safety on pages 88–89, fabric and the construction that it covers are inextricably bound together when selecting the appropriate fabric for your client's space.

Bedding and Pillows

Among the many kinds of items that you will have constructed out of fabric, or covered in fabric, for jobs are headboards and upholstered box springs, pillows, and bedding. It's a good idea to sketch these items to scale during the planning stage to confirm proportions and sizes. A sketch with fabric identified for each area clarifies the details for the client and the workroom and locates multiple fabrics, if used. If the spread has piped seams, a banded edge, and a contrasting backing fabric, a drawing will confirm everyone's understanding of where those four different fabrics will be positioned in the final construction. The same can be true for pillows. Include swatches keyed to the sketch. It is a good idea to identify on the swatch which side is to be the face (even if it is obvious). It is very labor-intensive (therefore expensive) to pick the seams apart and flip the fabric right-side out—if it can even be done.

Cushions

Cushions may have foam, down, spring-down (springs wrapped with a down blanket), a Marshall unit, or even cotton padding at their core. Cushions with a foam or spring core will likely be wrapped in a layer of polyester batting (poly-batt) or down. Cushions may be 20 percent down and 80 percent feather (designated as 20/80).

Foam cushions will be described in a couple of different ways. Pounds per cubic foot will be listed and foam categorized by a two-digit number from 10 to 32 relating to the weights. Number 10 is 1 pound per cubic foot, number 18 is 1.8 pounds per cubic foot. More to the point is the indentation load deflection (ILD). If a cushion is described as being 30-pound foam that means that it requires 30 pounds of force to indent the cushion by 25 percent of its total height. A 4-inch cushion of 30-pound foam requires 30 pounds of force to compress it down to 3 inches. The preferred range for comfort is generally 30 to 33; 26 is considered soft and over 40 is considered firm and used for things like church kneelers and car seats. The two measurements are not directly correlated because a low density can be chemically engineered to be firm. If a tufted design is planned (the top of an ottoman, for instance), the foam padding should have a triple-layer laminated construction that is firm on the bottom, medium in the middle, and soft at the top to properly pad the piece and allow for good tufting details. Padding on the frame should be firmer than that used for seat cushion cores.

The fabric that covers the cushions will affect the way the construction feels. Leather upholstery is stiff compared to fabric upholstery, especially vegetable-tanned leather. Thin fabric or fabric with a soft hand will be less firm than heavy or densely woven fabric. Custom upholstery is often covered in muslin for a "test sit" before applying the finished fabric. Be sure to consider the difference between the thin, loose muslin and your selected finish fabric.

Look for new sustainable options; soy-based plastics are being used for inserts.

Inspecting the Fabric Application

Fabric application should be taut, smooth, and consistent. The tucks and seams should be neat, the location of seams consistent (especially relative to their location on the frame), and the seams should be precisely positioned at the corners, not shifted around to the front side of one corner and the back of another. The pattern must match consistently from top to bottom and side to side. The motifs should be well positioned and balanced. Welting should be straight, even in dimension, and smooth on cushions and frames. If the fabric cannot be railroaded, the seams that will occur along the back as well as on any continuous seat cushions or on the tight back should be aligned with cushions or relate to the design, rather than being driven by the fabric width alone.

SUSTAINABILITY OF FABRICS AND LEATHER

The Association for Contract Textiles (ACT) is voluntarily working to assemble a set of guidelines that can be used to evaluate the sustainability of textiles. The guidelines include such considerations that are as applicable to leather as they are to other textiles. Figure 3.69 lists the considerations for determining just how sustainable a textile or leather material is.

You will notice that the guidelines address production as well as content for textiles. Sometimes leather and textiles are produced in areas that do not adhere to our ideas of environmental protection or human rights. In addition to inquiring about the chemistry of the fibers, dyes and finishes, look into country of origin. Labor practices in some countries are more likely to ensure safe production conditions than in other areas. Clean air and water mandates vary around the world. Select textiles that are produced as near to your job site as practicable to reduce transportation fuel. Not all issues are as easy to confirm as recycled content and it will take some investment of time to select textiles conscientiously.

The triple bottom line of *people*, *profits*, and *planet* is important to remember in a world market, because some of the products that you might specify are produced in countries that do not enforce equally high standards for all three *P*s in that equation. As always, look for reliable third-party confirmation that the products you are considering are sustainable according to triple bottom-line principles. NSF International along with ANSI developed NSF/ANSI 336 Sustainability Assessment for Commercial Furnishings Fabric. The National Center for Sustainability Standards (NCSS), in collaboration with the Association for Contract Textiles (ACT) and GreenBlue, has developed various approaches to sustainability and would provide food for thought as you devise your own criteria on the job. The LEED point system also has standards for sustainability that can contribute to your considerations as you select fabric for your jobs.

You must evaluate all aspects of production and disposal to really analyze sustainability of textiles. For example, with bamboo you would certainly account for the exceptional renewability of bamboo. As a quick-growing

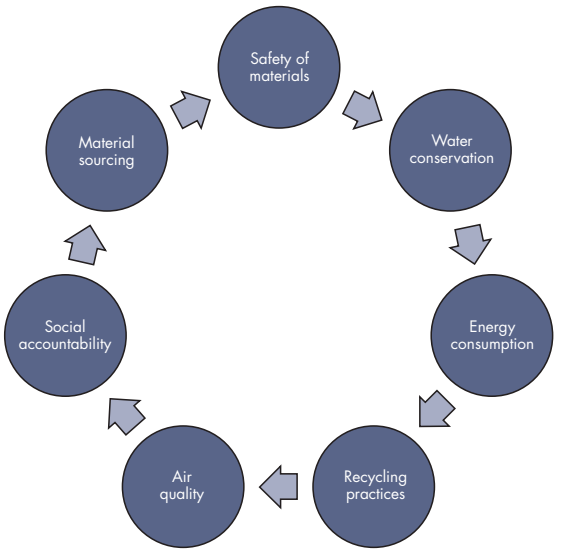


FIGURE 3.69 Considerations when analyzing the sustainability of a textile choice.

grass that requires minimal pesticide use, it has that point in its favor. However, chemically processed bamboo used for fabric (rather than mechanically processed) may use chemicals that can cause nerve damage to the workers who are exposed to them. You will want to find out what kinds of environmental and worker protection standards were in place for the production of the fabric you are specifying if you are doing a full sustainability analysis. Don't forget that this same chemical production also applies to rayon and acetate, which are made of chemically modified plant fiber (often wood) too, so this is not unique to bamboo.

As a general guideline, look to manufacturers that limit the application of additional chemicals (retardants, sizing, etc.) by selecting fibers that are inherently suitable to your program needs. Undyed wool and organic plant-based fibers, grown without pesticides, are more sustainable choices. The fewer processes that a leather or textile undergoes, the more sustainable it is likely to be.

Modern cotton production presents a number of sustainability challenges. In order to make this fiber cheaply, **economies of scale** have encouraged a **monoculture** that intrinsically limits **biodiversity**. Balanced ecosystems require less chemical maintenance than monocultures. A biodiverse area can support a variety of insect and animal life. In the expanded acreage devoted solely to cotton production, birds that eat harmful insects

have no habitat to live in, so cotton farmers rely on pesticides instead of the bird to control harmful bugs. These chemicals do not discriminate and will kill beneficial insects, like ladybugs, along with the pests. This chemical solution is damaging to ecosystems and to the workers who apply the chemicals and harvest the cotton. Cottonseeds are used for animal food and cottonseed oil is consumed by people. The residual toxins that remain when animals and people eat the cottonseeds and oils is stored in fat cells in the body. Alternative pest control that uses repellents derived from chili oil and other nontoxic ingredients is being tested in parts of the world. A better solution would be to have balanced ecosystems, but this interferes with the economies of scale that keep cotton cheap. Thus, it is easy to envision the ongoing dilemma that challenges the sustainability of cotton.

Recycled material is used to make some synthetic fibers and used natural fiber is now being unwoven and converted into new yarn. Old leather is reduced to fiber and mixed with resins to produce recycled leather sheet goods. Look for sustainable options in production; leather that is chromium tanned is often mistakenly assumed to be more harmful to the environment than vegetable-tanned leather but the environmental effects are very nearly equal. Chromium tanning does not use the toxic chromium VI; chromium III is safe if reasonable precautions are used to keep it out of the environment around the tannery. Heavy metals used in colorants are more likely to be environmentally and physiologically problematic.

SUMMARY

In this chapter we looked at how yarn, weave, and finish processes define the characteristics of a textile and how the chemistry of the fiber affects performance.

You took a look at what to consider when selecting and specifying a textile for a certain use. We reviewed leather used in place of textiles and how to evaluate leather for your client's job. Soft goods are so dependent on textiles for their characteristics it is important to understand their use and design as well as forms and installation; thus soft goods were considered at some length, as was upholstery. The organization of the various industries involved in the production of items using textiles was reviewed. Sustainability issues associated with fabric and leather as well as some considerations for related materials were also reviewed.

WEB SEARCH ACTIVITIES

1. Perform an image search for pictures of each of the yarn constructions mentioned in the section about novelty yarn on page 70 to see what they look like.
2. Perform an image search for pictures of *machine quilting* and notice the variety of patterns that are possible.
3. Using the ACT sustainability guidelines, evaluate leather. Go to www.treehugger.com as well as vendor Web sites to get alternative views on the subject.
4. Go to the Web sites for NSF, ANSI, USGBC, and ACT, to become familiar with the resources available at each site.
5. Go to a fabric manufacturer's Web site and search as you would if you were working for a client. Find the information that you would need regarding fiber chemistry, construction, durability, maintenance, sustainability, flame resistance, etc.

PERSONAL ACTIVITIES

1. If you have a to-scale plan elevation of a project that you designed, imagine that you would upholster one of the walls in leather. Go to a supplier's Web site and select hides that you would use, noting the size of the hide. Sketch an elevation and layout for the seam locations. Consider the details that you would use to conceal seams and make the product removable without damage to the walls beneath.
2. Find a picture of a piece of furniture covered in a large print. Analyze the quality of the fabric application and the positioning of the pattern. Do you agree with the decisions made? Why or why not?
3. Find a picture of an interior that you think would have benefitted from a different kind of window treatment. Using a tracing paper overlay, design a treatment that you think would have improved the interior a little more than what was used.

SUMMARY QUESTIONS

1. What kinds of effects can each component of fabric have on its properties—the fiber, the yarn, and the weave?
2. What kinds of finishing processes are common for fabric?
3. What are novelty yarn constructions and what are the implications for fabric, or what kind of fabrics will each produce?
4. What other processes might be applied to fabric after it has been woven and finished?
5. What is the implication of pile for application on fabric? What does *down and out* mean?
6. What processes are applied to protect fabrics?
7. What kinds of things will add cost to your fabric budget?
8. What is the significance of an open line and exclusive patterns?
9. What is the difference between full grain and top grain leather? What is their connection to full aniline and semi-aniline?
10. What sustainability considerations pertain to textiles and leather?
11. What third-party resources help designers sort out sustainability considerations?
12. What does the *triple bottom line* mean for textile selection?
13. Which soft goods are made by sewing fabrics together and which ones require another support underneath the fabric?