

Material Selection & Specification

introduction	292	narrative	293
---------------------	------------	------------------	------------

activities - core*	308	activities - elective	313
---------------------------	------------	------------------------------	------------

- | | | | |
|--|-----|--|-----|
| <input type="checkbox"/> Develop One Section of an Outline Specification | 308 | <input type="checkbox"/> Specifications Table of Contents Comparison | 313 |
| <input type="checkbox"/> Product Evaluation and Selection | 309 | <input type="checkbox"/> Security Versus Life Safety | 314 |
| <input type="checkbox"/> Learning Through Comparison | 310 | <input type="checkbox"/> Substitutions That Don't Work | 315 |
| <input type="checkbox"/> Observe a Building Element | 311 | <input type="checkbox"/> Drawings Versus Specs | 316 |
| <input type="checkbox"/> Applying LEED for Homes to Materials Research | 312 | <input type="checkbox"/> Using a New or Untried Product | 317 |
| | | <input type="checkbox"/> Value Analysis by the Contractor | 318 |
| | | <input type="checkbox"/> Translate Project Requirements into Product Options | 319 |
| | | <input type="checkbox"/> Dysfunctional Drainage System | 320 |

*A maximum of 40 hours of core credit may be earned in this experience area.

exhibits

Material Selection & Specification

Introduction

By completing the activities in this chapter, you will gain an understanding of materials selection and specification. The following information is taken from the NCARB IDP Guidelines:

Material Selection And Specification

Minimum Material Selection and Specification Experience: 160 Hours
Definition: The analysis and selection of building materials and systems for a project. The materials specified for a particular project communicate the requirements and quality expected during construction. Specifications are included in a project manual that is used during bidding and construction.

Tasks

At the completion of your internship, you should be able to:

- Prepare specifications based on performance criteria
- Research, select, and specify materials

Knowledge Of/Skill In

- Adaptive reuse of buildings and/or materials
- Alternative energy systems and technologies
- Basic engineering principles
- Building design
- Building envelope
- Building Information Modeling (BIM) technology
- Building systems and their integration
- Characteristics and properties of construction materials
- Constructability
- Construction details
- Construction sequencing
- Critical thinking (e.g., analysis, synthesis, and evaluation of information)
- Design principles
- Furnishings, fixtures, and equipment
- Hazardous materials mitigation
- Implications of design decisions (e.g., cost, engineering, schedule)
- Indoor air quality
- Interior materials and finishes
- Interpersonal skills (e.g., listening, diplomacy, responsiveness)
- Life safety
- Managing quality through best practices
- Oral and written communications
- Problem solving
- Product evaluation, selection, and availability
- Project scheduling (e.g., construction document setup, storyboarding, staffing projections)
- Site design
- Specifications
- Sustainable design
- Technological advances and innovative building products
- Vertical circulation

resources

Download the current Intern Development Program (IDP) guidelines at www.ncarb.org/Experience-Through-Internships.aspx.

The American Institute of Architects. Demkin, Joseph A., ed. *The Architect's Handbook of Professional Practice*. 14th ed. Hoboken: John Wiley & Sons, 2008.

- Chapter 12.8 - Environmentally Preferable Product Selection

The American Institute of Architects. Demkin, Joseph A., ed. *The Architect's Handbook of Professional Practice*. 13th ed. New York: John Wiley & Sons, 2001.

- Chapter 18.6 - Construction Document: Specifications

The American Institute of Architects, *The Architecture Student's Handbook of Professional Practice*. 14th ed. Hoboken: John Wiley & Sons, 2009.

- Chapter 7.2 - Environmentally Preferable Product Selection

Narrative

As the art and science of building developed and the responsibility for construction shifted from the designer to a separate contractor, the need for explanatory information in the form of written notes arose. Then, as the complexity of the construction process grew, so did the volume of written notes needed to fully communicate the design intent to the constructor. Ultimately, the notes were removed from the drawings, organized, and placed in a document of their own. Thus, specifications evolved as a way to supplement drawing notations, eliminating the need for large amounts of text on the drawings, which tended to clutter what should be a clear image of the intended construction.

The following discussion examines the relationship between drawings, specifications, and the other documents that, combined with the specifications, make up the project manual. It also considers the importance of evaluating materials, products, and building systems and assemblies before incorporating them in a specification.

A Complementary Relationship

One of the primary concepts in the organization of construction information is that drawings and specifications support one another with neither having priority over the other. This concept is clearly defined in AIA Document A201™ General Conditions of the Contract for Construction, as quoted here:

§1.1.5 The Drawings

The drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

§1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§1.1.7 The Project Manual

The Project Manual is a volume assembled for the Work which may include the bidding requirements, sample forms, Conditions of the Contract and Specifications.

The next statement in A201™, §1.2 Correlation and Intent of the Contract Documents, addresses the complementary relationship between drawings and specifications:

§1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by

notes

Take brief notes while reading the narrative and list key resources you used to complete the activities. Note discussion outcomes from meetings with your supervisor, mentor, or consultants. When finalizing the activity documentation (PDF), include your notes and the Emerging Professional's Companion activity description.

Material Selection & Specification

the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

Because the documents are complementary, it is important for specific types of information to be located in the correct place. As stated in the Construction Specifications Institute's *The Project Resource Manual—CSI Manual of Practice*, the primary rule of specification writing is that “each requirement should be stated only one time and in the right place.” Adherence to this concept simplifies retrieval of information and reduces the possibility of discrepancies, conflicts, and errors and omissions.

To paraphrase *The Project Resource Manual—CSI Manual of Practice* (PRM), “Both the drawings and specifications are needed to fully describe a construction project. The drawings show size, form, quantity, relationship, generic type, and graphic representation of construction materials. Specifications define the qualitative requirements for products, materials, and workmanship upon which the construction contract is based. The specifications also describe administrative procedures that relate to both drawings and specifications.” Many resources help define what information should be located in the specifications or drawings. Among these are the United States National CAD Standard, published by the National Institute of Building Sciences (NIBS), and *The Project Resource Manual—CSI Manual of Practice*.

Project Manual Concept

The project manual, commonly referred to as specifications, is actually a bundling of procurement requirements, contracting requirements, and specifications into a unified document. Procurement and contracting requirements are not specifications and, in most cases, are prepared by or in coordination with the owner and the owner's legal counsel, not the architect. As stated in *The Project Resource Manual—CSI Manual of Practice*, “the project manual concept provides an organizational format and standard location for all the various documents involved.”

The organization of the project manual is based on MasterFormat®, the familiar industry standard for organizing written construction information published by the Construction Specifications Institute and Construction Specifications Canada. In 2004, a new Division 00—Procurement and Contracting Requirements was added to cover documents other than specifications. It includes procurement requirements; contracting forms; project forms; conditions of the contract; and revisions, clarifications, and modifications. Division 01—General Requirements contains procedural and administrative requirements that apply to the rest of the divisions, which contain the product specifications. For additional information on the use of MasterFormat® and the organization of the project manual, refer to the MasterFormat® application guide, *The Project Resource Manual—CSI Manual of Practice* and *The Architect's Handbook of Professional Practice*.

resources

AIA Contract Documents are considered the industry standard. Learn more at www.aia.org/contractdocs.

The Construction Specifications Institute. *The Project Resource Manual: CSI Manual of Practice*. New York: McGraw-Hill, 2005.

MasterFormat®

MasterFormat®, a product of the Construction Specifications Institute and Construction Specifications Canada, is a master list of numbers and titles for organizing information about construction requirements, products, and activities into a standard sequence. The 2012 master list of numbers and titles can be downloaded from CSI's website for free via the following webpage: www.csinet.org/mfnumber

The way in which the six-digit MasterFormat® 2004* numbers work is explained using the following example:

03 20 00 Concrete Reinforcing

The three pairs of numbers represent three levels of classification. Because each level is represented by two digits, up to 99 subjects can be addressed at each level. The numbers and titles in MasterFormat® are grouped under the following general headings:

- Procurement and Contracting Requirements Group (Division 00 containing documents)
- Specifications Group (Divisions 01-49 containing sections)

The Procurement and Contracting Requirements Group indexes administrative and procedural subjects that deal with introductory material, procurement and contracting requirements. The subjects in this group are defined by a document number and title. The Specifications Group describes the physical aspects of construction. Subjects in this group are defined by a section number and title. The Specifications Group is made up of several specialty subgroups of divisions.

MasterFormat® arranges related construction practices, or “work results,” into a series of level 1 titles, called divisions. Several of these divisions lack content and titles and are reserved for future expansion.

Central to the use of MasterFormat® is the notion that all types of construction should be addressed equally. Thus, the more basic, or common, divisions are generally placed near the beginning of the document. These contain work results likely to be specified in all types of construction. For example, most projects have contractual requirements, common requirements, and some type of structural materials. Subsequent divisions contain sections applicable only to specific types of projects (building construction, heavy civil work, process plant construction, etc.) come later in the specifications document. In addition, there is a space in Division 01—General Requirements for specifying performance requirements for all or part of a project. A list of MasterFormat® division numbers and names is provided with this sidebar.

For more information on MasterFormat® and its use in the construction industry, visit www.csinet.org/MasterFormat.

**The Construction Specifications Institute has since released a 2012 version of MasterFormat®.*

Division Numbers and Titles

PROCUREMENT AND CONTRACTING REQUIREMENTS GROUP

Division 00 Procurement and Contracting Requirements

SPECIFICATIONS GROUP

GENERAL REQUIREMENTS SUBGROUP

Division 01 General
Requirements

FACILITY CONSTRUCTION SUBGROUP

Division 02 Existing Conditions
Division 03 Concrete
Division 04 Masonry
Division 05 Metals
Division 06 Wood, Plastics, and
Composites
Division 07 Thermal and
Moisture Protection
Division 08 Openings
Division 09 Finishes
Division 10 Specialties
Division 11 Equipment
Division 12 Furnishings
Division 13 Special Construction
Division 14 Conveying Equipment
Division 15 Reserved
Division 16 Reserved
Division 17 Reserved
Division 18 Reserved
Division 19 Reserved

FACILITY SERVICES SUBGROUP

Division 20 Reserved
Division 21 Fire Suppression
Division 22 Plumbing
Division 23 Heating, Ventilating,
and Air Conditioning
Division 24 Reserved
Division 25 Integrated
Automation
Division 26 Electrical
Division 27 Communications
Division 28 Electronic Safety and
Security
Division 29 Reserved

SITE AND INFRASTRUCTURE SUBGROUP

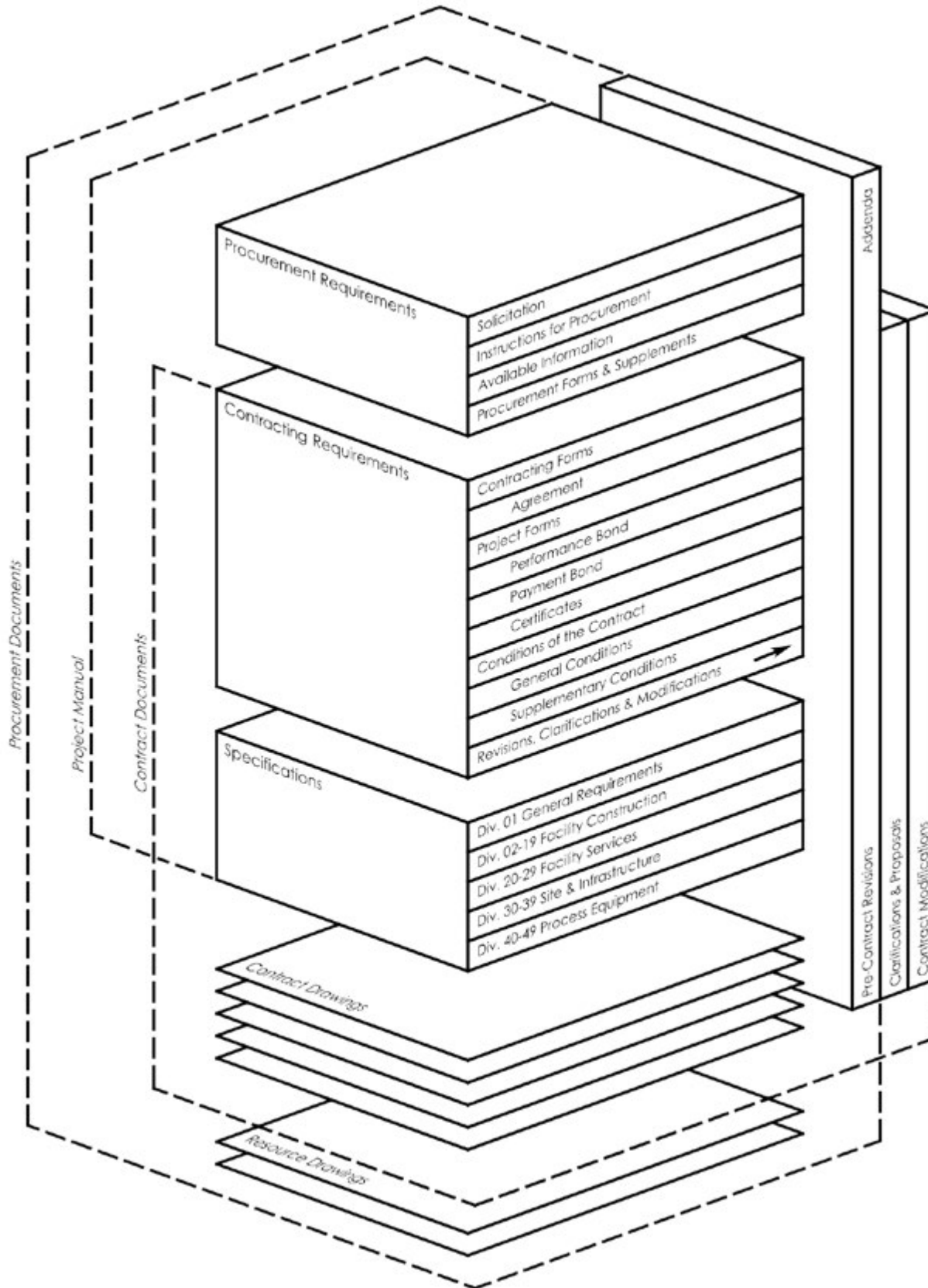
Division 30 Reserved
Division 31 Earthwork
Division 32 Exterior
Improvements
Division 33 Utilities
Division 34 Transportation
Division 35 Waterway and
Marine Construction
Division 36 Reserved
Division 37 Reserved
Division 38 Reserved
Division 39 Reserved

PROCESS EQUIPMENT SUBGROUP

Division 40 Process Integration
Division 41 Material Processing
and Handling
Equipment
Division 42 Process Heating,
Cooling, and Drying
Equipment
Division 43 Process Gas and
Liquid Handling,
Purification, and
Storage Equipment
Division 44 Pollution Control
Equipment
Division 45 Industry-Specific
Manufacturing
Equipment
Division 46 Reserved
Division 47 Reserved
Division 48 Electrical Power
Generation
Division 49 Reserved

Please note: In 2012, the Construction Specifications Institute released MasterFormat® 2012. Changes to the above Division Numbers and Titles consists of an edit to the name of Division 44, now "Pollution and Waste Control Equipment," and the addition of Division 46 Water and Wastewater Equipment.

Material Selection & Specification



Relationship of Construction Documents

Excerpted with permission from *The Project Resource Manual—CSI Manual of Practice*, Module 5 Construction Documents, Figure 5.1A.

Material Selection & Specification

Purpose Of Specifications

As specifications are developed, it is important to remember their purpose. The goal of construction documents is to communicate the needs of the owner, as represented by the design, in a form easily understood by those responsible for construction. In an ideal world, the development of specifications would be linked to the development of the drawings, and both would reflect a consistent level of detail. All too often, however, project drawings are nearly complete before they are turned over to the person or persons responsible for developing specifications. Preferably, drawings and specifications would be developed in tandem, each to the same level of detail at the same time, throughout the project.

The information provided in specifications may be used in many ways during project delivery, and the form or structure in which information is presented should reflect its purpose. For example, at the end of the schematic design (SD) phase, a client may use the SD documents to explain the project to its staff or for fund-raising. In this case, a narrative description of the building systems may be easier to understand and still contain enough detail to document the design decisions made to that point. Such a narrative, called a preliminary project description, is organized around a system of building elements called UniFormat (a publication of CSI and CSC). This narrative does not need to be static but can grow and reflect an increasing level of detail until a natural transition to preliminary specification format is made.

During the design development (DD) phase, project documents may be used to provide a more accurate estimate of probable construction cost as well as a checklist for development of the final construction documents. At this time, more detailed information is required about individual building materials, products, systems, and assemblies that will be incorporated in the project. For this purpose, an outline specification may be most appropriate. Based on MasterFormat®, an outline specification should include the sections that will be needed for the final project manual. Outline specifications contain information that typically would be included in Part 2—Products of a typical three-part final specification section. See pages 300 and 301 for more information on SectionFormat, another publication of CSI and CSC.

Final construction documents are used for bidding or negotiating, and for construction of the project. The specifications included at this stage of project delivery contain detailed requirements for the materials, products, equipment, and systems to be incorporated into the project.

The three parts of a final specifications package begin with Part 1—General, which includes administrative, procedural, and quality assurance requirements. Part 2—Products includes specific product attributes, while Part 3—Execution includes special installation requirements. Refer to *The Project Resource Manual—CSI Manual of Practice* or resources in the bibliography for additional information about these three formats.

Material And Product Research

Material and product research begins with analysis of the project program and a statement of performance requirements and desired results in the selection of specific products.

This process involves simple problem solving, which begins with defining the problem. Each product, system, and assembly incorporated into a project is intended to satisfy certain criteria, and each product has a set of attributes that should match these criteria. The first step is to establish the desired criteria for a specific product or system.

Next, the criteria are ranked by priority. Product selection would be difficult and client expectations might not be met if products were evaluated with all criteria considered to be equivalent in importance. What is most important about a particular product? Is it technical performance, aesthetics, cost, environmental impact, or something else? It is important for all members of a project team to agree on the priority ranking so there is no misunderstanding about why a particular product is selected.

UniFormat

According to *The Project Resource Manual—CSI Manual of Practice*, UniFormat, a product of the Construction Specifications Institute and Construction Specifications Canada, is a “uniform classification system for organizing preliminary construction information into a standard order or sequence on the basis of elements or systems.” Like MasterFormat®, UniFormat is organized in levels, each with a different level of detail. This format can be used throughout project delivery to document the decisions made at each phase. It can be used to document selected construction materials in narrative form, identify performance of a specific building element, and organize preliminary cost estimates.

The first level of UniFormat organizes information into the following categories, which are identified with letter designations:

- A–Substructure
- B–Shell
- C–Interiors
- D–Services
- E–Equipment and Furnishings
- F–Special Construction and Demolition
- G–Building Sitework
- Z–General

At level 2, UniFormat classifies 25 basic building elements and systems. This level uses an alphanumeric designation as an identifier. For example, category B, Shell, includes the following building elements:

- B10, Superstructure
- B20, Exterior Enclosure
- B30, Roofing

UniFormat level 3 is designated by adding two more digits to the number. At this level, each building element is expressed in further detail by its specific type. For example, B20, Exterior Enclosure, includes the following:

- B2010, Exterior Walls
- B2020, Exterior Windows
- B2030, Exterior Doors

UniFormat can be used to organize preliminary project descriptions, preliminary cost estimates, and drawing detail filing.

notes

Material Selection & Specification

SectionFormat

SectionFormat, a product of the Construction Specifications Institute and Construction Specifications Canada provides a structure for organizing specifications information into three parts: General, Products, and Execution. Each part is organized in a hierarchical fashion into articles and paragraphs. SectionFormat includes suggested titles for article headings as well as a suggested order for presenting information. This flexible format makes it possible to demote or promote articles and paragraphs according to the importance and detail of the information being specified. A partial listing of SectionFormat article headings provided by CSI appears on the next page.

Part 1–General, provides a location for administrative, procedural, and quality assurance information. It expands upon the general information included in the general conditions of the contract and Division 01–General Requirements.

The relationship between the general section and the more detailed sections is illustrated in about the following example, using the topic of submittals. AIA Document A201™, §4.2.7, states, “The Architect will review and approve or take other appropriate action upon the Contractor’s submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.” The Division 01 section on submittals states that the contractor submits “one reproducible (shop drawing) and two blue line prints” and that “the Architect (after review) will return one reproducible sepia after making copies required for Architect’s use.” Part 1–General, of a wood door specification may include the following requirement: “Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, factory machining criteria, factory finishing criteria.” As you can see from this example, the submittal requirements are related but it is in the specification section that specific requirements for the specified material or product are identified.

Part 2–Products, as the title suggests, provides the location for the information describing a specified material or product. Part 3–Execution, is where product-specific preparation and installation requirements are located. Refer to the partial listing of SectionFormat article and paragraph headings for examples of the type of information included in these headings. Refer to the resources listed in this chapter for more detailed explanations of SectionFormat and its use in the construction industry.

Material Selection & Specification

Section Format Outline

PART 1 GENERAL	PART 2 PRODUCTS	PART 3 EXECUTION
SUMMARY	MANUFACTURERS	INSTALLERS
Section Includes Products Supplied But Not Installed Under This Section	EXISTING PRODUCTS	EXAMINATION
Products Installed But Not Supplied Under This Section	MATERIALS	Site Verification of Conditions
Related Sections	MANUFACTURED UNITS	PREPARATION
Allowances	EQUIPMENT	Protection
Unit Prices	COMPONENTS	Surface Preparation
Measurement Procedures	ACCESSORIES	ERECTION
Payment Procedures	MIXES	INSTALLATION
Alternates	FABRICATION	APPLICATION
REFERENCES	Shop Assembly Fabrication Tolerances	CONSTRUCTION
DEFINITIONS	FINISHES	Special Techniques
SYSTEM DESCRIPTION	Shop Priming, Shop Finishing	Interface with Other Work
Design Requirements, Performance Requirements	SOURCE QUALITY CONTROL	Sequences of Operation
SUBMITTALS	Tests, Inspection Verification of Performance	Site Tolerances
Product Data		REPAIR/RESTORATION
Shop Drawings		RE-INSTALLATION
Samples		FIELD QUALITY CONTROL
Quality Assurance/Control Submittals		Site Tests, Inspection
Design Data, Test Reports, Certificates,		Manufacturers' Field Services
Manufacturers' Instructions, Manufacturers' Field Reports,		ADJUSTING
Qualification Statements		CLEANING
Closeout Submittals		DEMONSTRATION
QUALITY ASSURANCE		PROTECTION
Qualifications		SCHEDULES
Regulatory Requirements		
Certifications		
Field Samples		
Mock-ups		
Pre-installation Meetings		
DELIVERY, STORAGE, AND HANDLING		
Packing, Shipping, Handling, and Unloading		
Acceptance at Site		
Storage and Protection		
Waste Management and Disposal		
PROJECT/SITE* CONDITIONS		
Project/Site* Environmental Requirements		
Existing Conditions		
SEQUENCING		
SCHEDULING		
WARRANTY		
Special Warranty		
SYSTEM STARTUP		
OWNER'S INSTRUCTIONS		
COMMISSIONING		
MAINTENANCE		
Extra Materials		
Maintenance Service		

* Project Conditions is the preferred term in the U.S.,
Site Conditions is the preferred term in Canada

Material Selection & Specification

A list of possible solutions or acceptable products is assembled. Information is gathered about these based on the established performance criteria. The possible solutions are then tested against the criteria to determine which product best meets the project requirements. Product or products that best satisfy the criteria are selected for use on the project.

Establishing Criteria

To evaluate the performance of various design alternatives, project-specific evaluation criteria must be defined. Each material has many characteristics or attributes that contribute to its overall performance and its applicability to a particular project. These attributes can be grouped by category. As an example, the list of categories below was distilled from *Construction Materials Evaluation and Selection: A Systematic Approach*, by Harold J. Rosen and Philip M. Bennett, and from a list of attributes in *The Project Resource Manual—CSI Manual of Practice*. Sample material attributes are provided for each category. Consult the above publications for more detailed lists and discussions of the material attributes that would be included in these groups:

- Structural serviceability: natural forces, strength properties
- Fire safety: fire resistance, flame spread, smoke development, toxicity, fuel load, combustibility
- Habitability: thermal properties, acoustic properties, water permeability, optical properties, hygiene, comfort, safety
- Durability: resistance to wear, weathering adhesion of coatings, dimensional stability, mechanical properties, rheological properties
- Practicability: transport, storage on site, handling at installation, field tolerances, connections
- Compatibility: jointing materials, coatings, galvanic interaction or corrosion resistance
- Maintainability: compatibility of coatings, indentation and puncture (patching), chemical or graffiti attack
- Environmental impact: resource consumption at production, life-cycle impact, LEED points
- Cost: installed cost, maintenance cost
- Aesthetics: visual impact, customizing options, color selection

It can be helpful to use a product evaluation matrix such as the one shown on page 303 to record the established criteria and tested performance of products and systems, along with salient qualities or product attributes. The general categories of performance criteria listed above can be included in the matrix as the default and then customized to meet project requirements. Another column can be used to identify specific tests and results that demonstrate a product's performance. Not all product analysis is objective, however, so a column for noting subjective comments is useful. Finally, include a column for other comments. Using such a matrix serves as an especially helpful tool when critical products and systems or new products and systems are being evaluated.

Prioritizing Criteria

After the project-specific evaluation criteria have been determined, a priority is established for each of these criteria. This may be the most difficult step.

resources

Rosen, Harold J., and Philip M. Bennett. *Construction Materials Evaluation and Selection: A Systematic Approach*. New York: Wiley, 1979.

Material Selection & Specification

Product Evaluation Matrix

SECTION NUMBER: _____		PRODUCT EVALUATION SUMMARY SHEET		PROJECT _____	DATE: _____
CRITERIA	TEST RESULTS	SUBJECTIVE EVALUATION	COMMENTS		
Structural Serviceability					
Fire Safety					
Habitability					
Durability					
Practicability					
Compatibility					
Maintainability					
Environmental Impact					
Cost					
Aesthetics					

<p>Structural Serviceability: Natural forces, Strength properties.</p> <p>Fire Safety: Fire resistance, Flame spread, Smoke development, Toxicity, Fuel load, Combustibility</p> <p><small>FSP02K15CHCOMSTANDARINPROSOEVA L.FRM</small></p> <p>Habitability: Thermal properties,</p>	<p>Acoustic properties, Water permeability, Optical properties, Hygiene, comfort, safety.</p> <p>Durability: Resistance to wear, Weathering, Adhesion of coatings, Dimensional stability, Mechanical properties, Rheological properties</p> <p>Practicability: Transport,</p>	<p>Storage on site, Handling at installation, field tolerances, connections</p> <p>Compatibility: Joining materials, Coatings, Galvanic interaction or corrosion resistance.</p>	<p>Maintainability: Compatibility of coatings, Indentation and puncture (panching), Chemical or graffiti attack.</p> <p>Environmental Impact: Resource consumption at production, Life-cycle impact.</p> <p>Cost: Installed cost, Maintenance cost.</p> <p>Aesthetics: Visual impact,</p>	<p>Customizing options, Color selection.</p> <p>Criteria from "Construction Materials Evaluation & Selection" by Harold Rosen and Philip Bennett</p>
---	---	---	---	--

Material Selection & Specification

Questions considered in determining the importance of the criteria include these: What is most important to the success of the project? Is it the technical performance of the product, or is it appearance or cost? Members of the project team may not agree. To the technical architect, durability characteristics may be most important. To the designer, aesthetics may be more important. The owner may feel cost is the most important characteristic. Who ultimately makes the decision?

This task provides a great opportunity to involve the owner in what can be viewed as an extension of programming process. For critical facility systems, it is important for project team members to reach agreement on the criteria and their importance to diminish the chance for unmet expectations.

Identifying Options

Once product attributes have been identified and prioritized, it is possible to begin assembling product options. Information about specific products is collected and organized. Possible sources for such information include Internet search engines such as Sweets.com, SmartBIM.com, and ReedConstructionData.com. These sites, among others, allow product searches based on product attributes. Product representatives can also be a valuable source of information. However, if a manufacturer cannot provide information about a specific performance characteristic of a product or material, the product or material should not be considered unless the manufacturer or a testing authority will conduct the required tests and provide the missing information.

Product literature may include criteria that are not relevant to the intended application. It is important to focus on the qualities of a product that will affect its intended performance in the project. The evaluation of the product is based only on such pertinent qualities, and these characteristics are that which is included in the project specifications.

Evaluation And Selection Of Products And Materials

Each possible product is evaluated against the criteria established for it and rated by how well it would satisfy project requirements. The scores thus calculated are multiplied by a weighting factor based on the priority given to the criteria and then added to get the total score. For example, consider a project that requires a coating for existing elevator doors. After discussions with the owner, you determine that although color selection and compliance with [Environmental Protection Agency \(EPA\)](http://Environmental Protection Agency (EPA)) VOC requirements are important attributes, durability has top priority. Thus, coating durability gets a weighting factor of 10, color selection gets an 8, and VOC content gets a 6. Possible products are evaluated, and their compliance with the evaluation criteria established for the project is rated based on test results. One of the products being evaluated has test results that indicate it has a pencil hardness of 2H, the highest of all the products being evaluated, and it is assigned an 8 for compliance with the requirement for durability. The score of 8 times the priority factor of 10 would give the product a score of 80 for that category. After all the scores have been totaled, the product with the highest score would be considered the best match to the specified performance criteria.

resources

Learn more about ASTM, formerly the American Society for Testing and Materials (ASTM), by visiting their website: www.astm.org.

In some cases, it may be helpful to change the priority ratings and go through the evaluation again to see how this affects the possible solutions. Note that products are not rated against each other, but against the established criteria. This is important because some products may have attributes that outperform those of other products but are not relevant to the ultimate performance or success of the product when incorporated in the project. A detailed explanation of this process is contained in [ASTM E1765, Standard Practice for Applying Analytical Hierarchy Process](#), which offers a standard method for “performing multi-attribute decision analysis in the evaluation of buildings and building systems.”

Documentation

As mentioned at the beginning of this narrative, it is best to develop drawings and specifications concurrently and to a similar level of detail. This is also true for the product evaluation process. At schematic design, the narrative description or preliminary project description may contain descriptions of the project’s major elements, as well as performance and other criteria identified during the process of establishing criteria for project materials, products, and systems. At design development, the outline specification may contain generic descriptions of materials and products to be incorporated into the project as part of the process of identifying options. Finally, at completion of construction documents, the detailed specifications include descriptions of specific products and procedural, administrative, and quality assurance requirements and special installation instructions.

In most architecture firms, the process of creating specifications involves editing master guide specifications. The process usually begins with the table of contents of the master set of specifications, from which sections needed for the project are selected. Many firms have their own in house master specification system, but a number of commercial systems are also available. With a few exceptions, the editing process for these systems is similar. Text is selected and organized to produce the desired level of detail. The sections can also be customized with project-specific text added by the editor.

A master specification section may include one or a combination of specification methods, which are reviewed below. When editing, it is important to review the specifications to determine whether more than one method of specifying has been used to define the product requirements. If more than one method has been used, the specification must be coordinated carefully to eliminate any contradictory requirements.

After each section of the specifications is complete, evaluation criteria should be reviewed again to ensure that the pertinent qualities of the products have been correctly identified. The sections should then be reviewed for any relationship to other sections and to resolve possible conflicts or contradictions.

Methods Of Specifying

There are four basic types of specifications—descriptive, performance, proprietary, and reference standards. The first three can be used to specify the essential qualities of materials for a project. Reference standard specifications are published by standards organizations such as the [American Society for Testing and Materials \(ASTM\)](#) or organizations that represent manufacturers of specific building elements, such as

notes

Material Selection & Specification

the Steel Door Institute (SDI), and are typically referenced without customization. *The Project Resource Manual—CSI Manual of Practice* notes that more than one specifying method is used in most project specifications, although all four methods may be used in a single specification section. PRM cautions, though, that “the A/E should be careful about combining methods in the specification of a single product.”

Descriptive specifications include a detailed written description of the required properties of a product. They are often lengthy and tedious. Their preparation involves researching products and critical features, determining which features to specify, describing critical features, and providing information about submittals, tests, etc.

Performance specifications identify the performance characteristics that must be met by a product or system. Writing performance specifications is a two-part process that includes preparation of a statement of required results and identification of a method for verifying compliance. Avoid use of both descriptive and performance specifications for a single requirement; the resulting specifications are redundant and open to conflicts. Performance must be technically possible.

Proprietary specifications identify desired products by manufacturer’s name, model number, or unique characteristics. There are two types of proprietary specification, open and closed. Closed proprietary specifications do not allow substitutions. Open proprietary specifications provide for requested alternates, often proposed by the contractor proposed. Avoid combining the use of descriptive, proprietary, and performance requirements for a single requirement, as this multiplies the opportunities for conflicts.

Reference standard specifications are published standard specifications that can be incorporated into project specifications by reference. According to *The Project Resource Manual—CSI Manual of Practice*, reference standards are “documents established by a consensus that provides rules, guidelines, or characteristics for activities, and their results” They are published by trade associations, professional societies, standards organizations, governments, and institutions.

Beyond The Basics

As its title suggests, this narrative concentrates on a basic two-step process of selecting and documenting materials, products, and systems for construction projects. For this purpose, the development of an individual section has been the primary topic. Assembling sections into a project manual, development and coordination of Division–01 sections, and general and supplementary conditions have not been discussed in detail. For additional information on these topics, refer to the resources listed in this chapter.

Written by Garry Betts, AIA, FCSI, CCS

Garry Betts, principal and director of specifications at Chicago-based LoebI Schlossman & Hackl, is a nationally recognized expert in the field of specifications.

resources

As you research and look for more information on topics presented in the *Emerging Professional’s Companion*, remember that a quick internet search of keywords can be incredibly useful to completing your Activities.

notes

Take brief notes while reading the narrative and list key resources you used to complete the activities. Note discussion outcomes from meetings with your supervisor, mentor, or consultants. When finalizing the activity documentation (PDF), include your notes and the Emerging Professional's Companion activity description.

Material Selection & Specification

Develop One Section of an Outline Specification

Supplemental Experience for eight (8) Core IDP Hours

For this activity, select a small project in your office or a mentor's office that has been completed at least through design development (DD). It may be best if this is a project that you have not worked on; however, any project will suffice.

Activity - Core

First, review the drawings (preferably DD drawings) in preparation for developing an outline specification. Take note of various key elements of the design. Speak with the project architect or project designer if appropriate to gain additional insight into the goals for the project. Then, using the table of contents from the office master specification system (or MasterFormat®), develop a table of contents for the project.

After consulting with your supervisor, select one of these divisions:

- Division 07 Thermal and Moisture Protection
- Division 08 Openings
- Division 10 Specialties

Take the material from the office master specification system for the division you have chosen, and edit it to create an outline specification for the division. Next, research the materials and products to include in your outline specification section. Identify important characteristics of each material and product. (Note: Refer to the criteria discussed in the narrative regarding material and product research.) Finalize the outline specification for the division that you have selected.

Consider the following:

- How does the product fulfill project requirements?
- What priorities might you have to place on the material or product criteria if your project is 20% over budget?
- What challenges did you encounter in developing an outline specification at the design development stage?
- If available, compare your work to the project's actual outline specification. How do they differ? Why?
- What did you learn that you might apply to future projects?

Be prepared to discuss why you chose the products and how you incorporated them into the outline specification.

Share your work with your IDP supervisor or mentor and make suggested changes. Document the final version as a PDF.

Product Evaluation and Selection

Supplemental Experience for eight (8) Core IDP Hours

Select a small or medium sized base building project in your or your mentor's office that has recently been completed and for which you have access to drawings and specifications. This assignment will be most effective if you select a project you did not work on previously.

Activity - Core

Document the process used by the project design team to evaluate exterior building enclosure systems for the project. Review the final drawings and specifications and gain access to earlier iterations, if possible. It will be useful to interview members of the project team who can share their insights to the project. Conduct your own independent research of exterior systems.

Consider the following questions:

- How were the performance criteria established?
- How are compatibility issues addressed?
- Are there coordination issues where different components meet?
- Does the selected product's performance meet or exceed project requirements?
- Is the product adequately documented, and is the documentation consistent between drawings and specifications?
- Based on your independent research, would you have done anything differently in the specification of the system(s)?

Prepare a 2-3 page resource for your office that can be used by future project teams, especially interns, defining an office standard operating procedure for researching, selecting and documenting exterior systems.

Share your work with your IDP supervisor or mentor and make suggested changes. Document the final version as a PDF.

Material Selection & Specification

Learning Through Comparison

Supplemental Experience for eight (8) Core IDP Hours

For this assignment, choose a project outside your studio or office for which you have access to detailed information. The project can be of any size and should be substantially complete.

Activity - Core

First, review the drawings for the project you have selected. Note the design concept and how the building systems that are specified for the project will impact the design. Speak with the project architect or project designer if appropriate to gain additional insight into the goals for the project.

Next, select one of the following building systems:

- Roofing system
- Below-grade waterproofing
- Windows
- Wood doors

Use the appropriate section from the office master specification system (or MasterFormat®) to develop one specification section for the project you have chosen.

Consider the following:

- What are the project requirements for the specifications section you have selected?
- Document the products you have selected to be used in this project.
- Analyze the characteristics of each product that meet the requirements for the project. Note the reasons why you selected one product over another (e.g., cost, lead time, aesthetics, etc.).
- Compare the information in Part 1 General of the specification section you have written and the information in Division 01 General Requirements of the office master specification system. What is the relationship of these two sets of information?
- Using the narrative as a reference, are there any suggestions you could make to your office to improve these general requirements sections. Why?

Share the specifications section you have developed with your supervisor or IDP mentor and provide a written explanation of your product selection decisions. Also document in writing your analysis of the relationship between Part 1-General and Division 01-General Requirements as well as any improvements that may be considered.

Share your work with your IDP supervisor or mentor and make suggested changes. Document the final version as a PDF.

Observe a Building Element

Supplemental Experience for eight (8) Core IDP Hours

With your IDP supervisor or mentor, choose a building element to research, for example, a window wall system or revolving doors. Tour your local business district, strip retail centers, and school and hospital campuses, observing the installation conditions for the element you chose. Also, spend time in the library or online researching manufacturers, standard details and specifications for the building element you have chosen.

Activity - Core

Keep a notebook and document from your tour at least fifteen (15) applications in different building types. Take photos of each application. Also keep in your notebook cut sheets, references and other research you conduct on the building element.

Consider the following:

- For each application, note the differences in detail and quality and whether the quality is adequate for the installation.
- Concentrate on the interface between the selected building element and adjacent elements, and follow the transition around the perimeter.
- Consider whether the quality of each installation is consistent with the quality of the building type and of individual building elements.
- Do your findings out in the field match your impressions of the desired level of quality for the building and the chosen element?
- How do your findings in the field compare to the standard specifications and details you found in the library and/or online?

Prepare a report outlining your findings and research. Share this with your office or mentor as a research for others who may consider using this building element in the future.

Share your work with your IDP supervisor or mentor and make suggested changes. Document the final version as a PDF.

Material Selection & Specification

Applying LEED for Homes to Materials Research

Supplemental Experience for eight (8) Core IDP Hours

Become familiar with the LEED for Homes requirements. It may be helpful to print out the checklist for this assignment. Next, locate a residential showroom (such as in Lowes or Home Depot) in your local area. Make at least one visit to the showroom to research materials and appliances that may be used for a kitchen design in a new home.

Activity - Core

Write a set of specifications for a residential kitchen. The residential project must meet quality for LEED Certification.

Consider the following:

- Which materials are prohibited by the LEED criteria? Are you able to locate sustainable alternatives for your project in the showroom?
- Consider the appliance options. What opportunities and challenges arise when selecting a refrigerator, dishwasher and oven for the project?
- Assuming the client is not a wealthy millionaire, what budget considerations are there when selecting materials and appliances for a residential kitchen in a LEED certified home?
- What trade-offs have you considered in your selection process? Energy vs. aesthetics? Others?
- Assume for that you can salvage 3 items from the original kitchen. Which would those be and why? Note carefully the salvage requirements in the specifications.

Share your work with your IDP supervisor or mentor and make suggested changes. Document the final version as a PDF.

Specifications Table of Contents Comparison

Supplemental Experience for eight (8) Elective IDP Hours

For this activity, work with the project architect and with a spec writer, if your office or your mentor's office has one.

During the construction document (CD) process, drawings are periodically reviewed and coordinated with specifications. Milestone reviews typically occur at 30 percent, 60 percent, and 90 percent completion and before the documents are issued for bid and construction. Reread the sidebar "What Constitutes CDs" in the chapter 8 narrative. Understanding the relationship between drawings and specifications is essential to executing a fully coordinated set of construction documents of the highest quality.

During the CD phase, components of the building design are developed and documented in detail, and materials and systems are identified and specified. Although the owner has approved the overall building design in the design development phase, interior finishes and roofing, cladding, waterproofing, glazing, and curtain wall systems require detailed exploration and development. During this process, many things can change, and it is important to keep track of drawing changes that affect specifications.

A good way to become familiar with the relationship between construction drawings and specifications is to review a set of drawings and the project specifications table of contents (TOC) side-by-side. Make sure that all materials and systems on the drawings appear in the specifications, and vice versa.

Activity - Elective

Choose a project in the CD phase then create your own specifications TOC for this project. Compare your TOC with the one used for the project and make note of any changes that need to be made. Compare your revised TOC with the drawings for the project. Write a report detailing your comparison and answering the following:

- Identify any materials and systems that appear on the drawings but not in the specifications TOC; add them to the specifications.
- Identify any items in the specifications TOC that no longer appear in the drawings; delete them from the specifications.
- Identify systems and materials that have changed, making it necessary to update certain specification sections; note these on the specifications TOC.

This kind of comparison can be tedious, especially on large projects. However, the task is essential to achieving comprehensiveness and quality. If you have questions, ask the project architect or spec writer. When you have finished the review, you will have identified items in the drawings and specifications that require attention to ensure the documents are fully coordinated. Review your additions and deletions with the project architect and, if your firm employs one, with the specifications writer for the project.

Discuss your findings by sharing a redlined set of the specifications and drawings.

Share your work with your IDP supervisor or mentor and make suggested changes. Document the final version as a PDF.

Material Selection & Specification

Security Versus Life Safety

Supplemental Experience for eight (8) Elective IDP Hours

In this scenario, you have been assigned to a project team that is designing a renovation for the Uptown Hospital in your local community. One of your responsibilities is to evaluate and select architectural doors, frames, and finish hardware. The hospital intends to update its labor-delivery-recovery (LDR) rooms and nursery in a space currently occupied by administrative and patient treatment functions. The hospital's security consultant has provided information on high-tech security and monitoring systems. His recommendations include leg bracelets for the babies and sensing devices around the nursery unit that close and lock doors leading away from the nursery when a device senses a signal from a bracelet. Security measures also include door monitors, keycard access control systems, and cameras—all designed to limit and monitor access to the nursery.

The code search indicates that no major changes are needed to the existing construction because there has been no change in occupancy classification. However, the original construction included a smoke barrier separating the floor into two smoke compartments. This barrier runs through the center of the area designated for the new nursery. A number of corridors run from one side of the existing space to the other to provide access to emergency exits. The smoke barrier and access to the exits have to be conserved or replaced.

Because of the movement patterns of patients, four of the cross-corridor doors will be on automatic operators. Two of these doors are part of the smoke barrier and must be self-closing and positive latching; all four are in exit access corridors; and all four have been identified by the security consultant as needing the lockdown feature.

There is a conflict between program requirements and code requirements, between the desire for security and the need for life safety.

Activity - Elective

Prepare a letter to your client describing the type and extent of the conflict between security and life safety requirements in this project. Provide an attachment to the letter that provides specifications on the products you have chosen and lists the reasons why you made those selections. Address the following in your response:

- Research technology options that might allow the doors to meet all code and program requirements. What alternatives might be available to your client?
- Review the local building code. What exceptions might allow the need for security to be held above the need for life safety? How would you make the case to the building code official?
- Describe how you could work with the design team and the security consultant to revise the design in a way that would eliminate or reduce the conflict.

Share your work with your IDP supervisor or mentor and make suggested changes. Document the final version as a PDF.

2G

Substitutions That Don't Work

Supplemental Experience for eight (8) Elective IDP Hours

In this scenario, you are the project architect working closely with the client over the past few months, designing an addition for a historic church in your home town of Springfield, Ill. The entire design team has been very sensitive to the issues involved in designing an addition to a historic structure. The client is adamant that materials and finishes for the project be true to the historic context of the existing structure.

As you conduct research for this project, the windows become a significant area of focus. You recognize that because of the historic nature of the addition, the requirements for the windows must be very specific.

As the project architect, you will be following this project through to completion. On a recent project, a historic renovation of a commercial building in the downtown area, you had a negative experience with a contractor who submitted substitutions for windows because of claims that the manufacturers cannot deliver windows fast enough to meet the project schedule. You were concerned the product the contractor proposes would not meet all the project requirements. There were many heated exchanges about the issue resulting in the client blowing up at a project meeting because the architect and the contractor were not working together to resolve the issue. You don't want to have this situation happen again.

Activity - Elective

Prepare a specification section for Division 08 Openings. Research three manufacturers and list them in the specification section. Consider the following:

- What are the critical performance criteria for the window specification for this project?
- For which materials might you accept a substitution from the contractor other than those specified in the project manual?
- What criteria will you use for approving substitutions during the submittal process in construction administration?

Share your work with your IDP supervisor or mentor and make suggested changes. Document the final version as a PDF.

2G

Material Selection & Specification

Drawings Versus Specs

Supplemental Experience for eight (8) Elective IDP Hours

In this scenario, you are a project architect in a Northwestern U.S. firm of about 75 people. Projects are diverse ranging from institutional to commercial base building work; however, your firm does not do any residential projects. The office has had a quality assurance (QA) process for years and you are one of five architects who are available to project teams to perform a QA prior to issuing a set of project documents. An important step in the QA process is to ensure coordination between the drawings and specifications. According to office policies, sets are not to be issued unless QA is complete.

On Monday, you were given a set of drawings for a new computer science building at the local community college. It appears that in an attempt to “make things easier” the project architect has tried to eliminate the spec book by putting as much of the specifications information into the drawings. Not only is this not the office standard, but the drawings are difficult to read. You have concerns that during the bidding/construction process, contractors will complain, the office will be flooded with RFIs and the firm’s reputation will be damaged.

Activity - Elective

Develop criteria for what type of specification information is appropriate to list on drawings versus in a specifications manual. Consider the following:

- What is the purpose of specifications? Purpose of drawings?
- How do specifications and drawings complement each other?
- How might you, as the project architect, avoid conflicts or duplication between the specifications and drawings?

You decide to give him a head start on the specifications book that must be prepared. Prepare an outline specification for this project using MasterFormat®. Consider the following:

- Which divisions are likely to be needed for a project and location such as this?
- For those divisions that you have excluded, provide a brief paragraph explaining why you do not think it is needed?

Speak with the project architect immediately to get this issue resolved. With the criteria and the table of contents in hand, you set off across the office to find him/her and have this difficult conversation.

Share your work with your IDP supervisor or mentor and make suggested changes. Document the final version as a PDF.

Using a New or Untried Product

Supplemental Experience for eight (8) Elective IDP Hours

In this scenario, your firm is designing a two-story addition to the local middle school. It is a concrete structure with the first floor slab on grade. Your research indicates a vapor retarder will be required under the slab.

During the process of selecting finish materials for the floor, you discover that different types of flooring have specific requirements for the dryness of the slab and the alkalinity of the slab surface. You carefully record this information in preparation for developing the specification for the vapor retarder and defining the substrate conditions required before installation of the finish flooring.

Before the bidding documents are issued, a product representative calls you about a product he says is perfect for this project. It is a new product and (in advertised performance only) is a match to the products you were planning to specify.

When the principal in charge gave you this assignment, she also gave you an article to read about a school in a neighboring district that was closed for more than six months because of an outbreak of mold. It was determined the under-slab vapor retarder had failed, allowing moisture to migrate through the concrete slab and provide the moisture source the mold needed to feed on the organic compounds in the adhesive and in the flooring itself.

Activity - Elective

First, prepare a matrix or worksheet that allows you to evaluate the attributes of possible products against project requirements and to determine which products are the best match. Consider the following:

- What criteria will you use to evaluate the products?
- What are the project requirements that should be considered?
- What steps would you take to ensure the new product will meet project requirements?

Second, demonstrate in a report how you would specify two products using different technologies that both meet the project requirements.

Share your work with your IDP supervisor or mentor and make suggested changes. Document the final version as a PDF.

Material Selection & Specification

Value Analysis by the Contractor

Supplemental Experience for eight (8) Elective IDP Hours

In this scenario, you are working on the documentation of a new neighborhood retail development in Fort Worth, TX. This is a developer client with whom your firm has done a number of projects. You have heard through the office grapevine that the client is going to be looking for bids that are under budget, and that he will try to increase the project scope with add-alternates that provide additional amenities in the retail space for hardware, finishes, and the window wall system.

Of course, you want the client to be happy. Reluctantly, you agree to develop these three add-alternates. This means that the drawings and specifications will include baseline specifications for the three systems as well as a second upgraded set of specs for the add-alternate selection. Your gut tells you that both should be written as proprietary specifications to reduce the chances of value analysis suggestions from the contractor.

Upon reviewing the contractor's suggestions, you do not think the suggested products meet the performance criteria used to select the products included in the original bidding documents. If these changes are implemented, the suggested products would lower the quality level of the project.

Activity - Elective

Research and select baseline products for door hardware, entrance lobby flooring and a window wall system. Develop proprietary specifications for each appropriate division. Then, select upgraded products for each of the three systems add alternates. Develop proprietary specifications for each appropriate division. Consider the following for your final report:

- What are the benefits of using a proprietary specification in this instance?
- Compare the two specifications for each system. What are the distinguishing characteristics between the baseline and upgraded systems?
- If value analysis suggestions are made by the contractor, how will you support your decision for the materials and systems selected in the original drawing set?
- How else can you ensure during the design process that the client's expectations for the desired level of quality and performance are clearly understood and integrated into the specifications?

Share your work with your IDP supervisor or mentor and make suggested changes. Document the final version as a PDF.

Translate Project Requirements into Product Options

Supplemental Experience for eight (8) Elective IDP Hours

In this scenario, you are the project architect for a seven-story, 70,000 square foot commercial office building located in Washington, DC. The client is a developer who is looking to maximize his return on investment by keeping costs low and offering a Class A office building that will attract long term tenants. The potential tenants include government contractors and technology companies who work closely with the Pentagon, CIA, and other high security divisions of the government. To deliver the project on time and on budget is to ensure a happy client. And, the District of Columbia has recently adopted a Green Building Act which will require this building to achieve at minimum rating of LEED Silver. (Note: U.S. Green Building Council's program Leadership in Energy and Environmental Design and commonly referred to as LEED.)

The developer says to you in an early meeting: "I've done lots of these buildings before. We need to spend our money on the exterior finishes and the lobby. I don't want to waste money on things no one will see like the roof."

Back at the office, you are reviewing the LEED checklist and have some reservations about being able to make the Silver rating. You begin to review the project's design development drawings for ideas. The roof design immediately jumps out at you as a perfect opportunity for some points. If you could just convince your client to consider a green roof or other products that reduce heat island effect, perhaps the project could qualify for the Sustainable Sites; Heat Island Effect, roof credit.

Activity - Elective

Develop criteria for evaluating different roofing products or systems for a generic commercial building with a flat roof. Research products or systems that meet these criteria. Which products are the best choice for this project and client? Why? List your criteria and describe the selection process, giving specific reasons for the choices you made.

Then, using the U.S. Green Building Council's LEED evaluation criteria, revise the project criteria so the roof system will meet the requirements under the category Sustainable Sites; Heat Island Effect, roof.

- How did the criteria change?
- How will the application of the LEED criteria would affect your selection of roofing products or systems?

Write a memorandum (250 words minimum) to the client. List the pros and cons of each system and make a recommendation regarding the best choice for the roof design and product selection for this project.

Share your work with your IDP supervisor or mentor and make suggested changes. Document the final version as a PDF.

Material Selection & Specification

Dysfunctional Drainage System

Supplemental Experience for eight (8) Elective IDP Hours

In this scenario, you are asked to take over the completion of a project after the project manager, who has worked on the project for the past two years, resigns. This is a five-story poured-in-place concrete parking garage in Poughkeepsie, NY.

The project is the first your office is doing with integrated project delivery. The team of engineers, contractors, architects and subcontractors has been assembled since the inception of the project. The project has been designed using BIM.

You are about three weeks from having to deliver the set for permit. You know that once the permit is pulled, the project is going into high gear. You want the set to be in good shape to ensure a good project start for the client and to be a best practice for the firm with this new project delivery method.

Soon after getting up to speed with the project team, you become aware that the foundation drainage system that was selected for the perimeter of the garage is not adequate. There are opportunities for waterproofing failures that will compromise the system. You have to go back to the drawing board on this system and want to make minimal changes to the design in the process. It took you a week to identify this issue, now you only have two weeks to solve it before the deadline.

Activity - Elective

Please reference the following sources:

- *Integrated Project Delivery: A Guide*, by the American Institute of Architects.
- *Architectural Graphic Standards*, 11th edition, by Andy Pressman. Hoboken, NJ: John Wiley & Sons, 2007.

First, research foundation drainage systems to be used in this scenario. Select three alternatives that may be effective in this application. Consider the following:

- What criteria did you use to select the systems?
- What are the project requirements that should be considered?
- How might the constructor team be of use to you in evaluating products?
- What information can you gather from product manufacturers and representatives? How will you evaluate the information they share with you?

Second, write an outline specification for Division 07 Thermal and Moisture Protection for the one system you selected as best for this project. Consider the following:

- How is the approach to this problem different in Integrated Project Delivery than it would have been if the project was Design-Bid-Build?
- What advantages and disadvantages did you see in addressing the problem with the team?
- How would you share lessons learned with your office to ensure that other teams don't run into the same issues with future projects?

Share your work with your IDP supervisor or mentor and make suggested changes. Document the final version as a PDF.

notes

Take brief notes while reading the narrative and list key resources you used to complete the activities. Note discussion outcomes from meetings with your supervisor, mentor, or consultants. When finalizing the activity documentation (PDF), include your notes and the Emerging Professional's Companion activity description.

Material Selection & Specification

2G

This page left blank intentionally.