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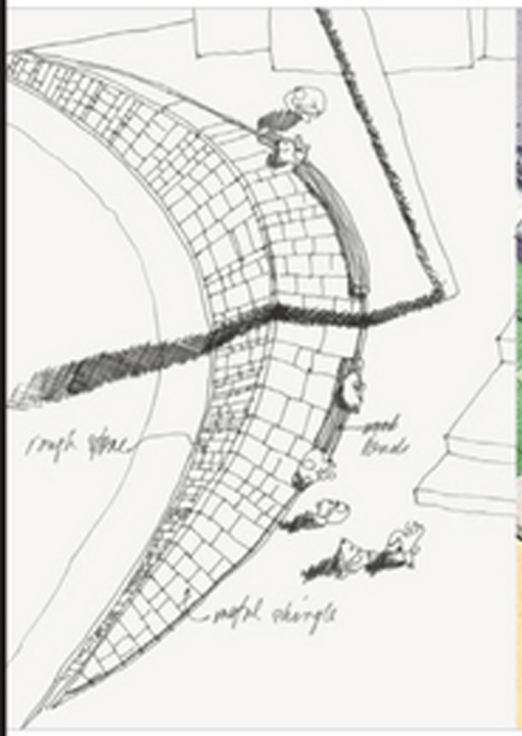

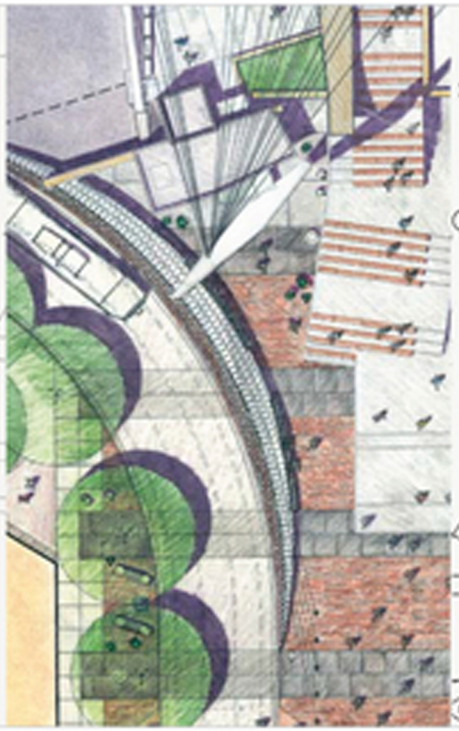

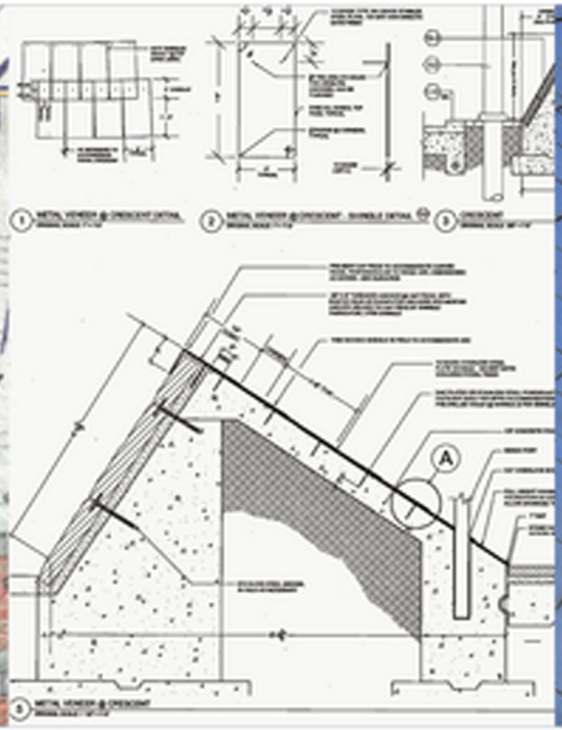

LANDSCAPE ARCHITECTURE DOCUMENTATION STANDARDS

PRINCIPLES, GUIDELINES, AND BEST PRACTICES

WILEY

Landscape Architecture Documentation Standards

Landscape Architecture Documentation Standards: Principles, Guidelines, and Best Practices

DESIGNWORKSHOP

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TABLE OF CONTENTS

Acknowledgments v

Section One: Establishing the Foundation 1

1 Introduction 3
- Background 3
- Elevating and Upgrading Design and Documentation Practices 3
- Purpose of the Book 4
- Intent of the Guidelines 5
- Objectives 5
- How to Use the Book 6

2 Documentation Principles 10
- Landscape Architectural Design and Construction Documentation 10
- Organizational Principles 10

3 Operational Principles 18
- Landscape Architectural Design and Construction Documentation 18
- Everything Has a Place: Subject Elements and Reference Elements 18
- Redundancy is Not a Virtue: Say it Once, in One Location 19
- Drawings are Generic, Specifications are Specific 21
- Three-dimensional Design and Documentation—Nothing to Hide 21
- Composite Documentation—Defining Key Relationships 22
- Tell the Most with the Least Graphic Information 23
- Interdisciplinary Coordination—Early and Often 25
- Cross-Referencing Cautions: A Method to the Madness 26
- Two Objects Cannot Occupy the Same Place: Interference Checking 27
- Arriving at Resolution 28

Section Two: Phases Overview 29

4 Pre Design—Establishing the Parameters 30
- Purpose 30
- Documentation Characterization 30
- Pre-Design Components 31

5 Concept Design—Developing the Framework 34
- Purpose 34
- Documentation Characterization 34
- Concept Design Components 34
- Key Coordination Needs 35
- Typical Concept Design Coordination Needs (Partial List) 35

6 Schematic Design—Establishing Intent 36
- Purpose 36
- Documentation Characterization 36
- Schematic Design Components 38
- Key Coordination Needs 39
- Typical Schematic Design Coordination Needs (Partial List) 39

7 Design Development—Design Solutions 40
- Purpose 40
- Key Distinctions Between Design Development and Construction Document Phases 41
- Documentation Characterization 42
- Document Set Mock-Up 44
- Document Review Process 50
- Key Coordination Needs 52
- Design Development Components 53

8 Construction Documentation—The Implementation Contract 55
- Purpose and Overview 55
- Documentation Characterization 57
- Construction Documentation Best Practices 58
- AIA CAD Layer Guidelines 59
- Best Practice: Conformance Review 59
- Best Practice: Formalized Drawing–Specification Coordination 60
- Best Practice: Graphic Diligence 62

Section Three: Guidelines and Best Practices 65

9 Key Documentation Practices 66
- Digital Organization 66
- Composition of a Document Set 70
- Keynote System—The Backbone of the Documents 75
- Graphic Symbol System 80
- Drawing and Specification Relationships 82

10 Preliminary Design 93
- Prerequisites for Preliminary Design 93
- Pre-Design 94
- Conceptual Design 102
- Schematic Design 126

11 Design Development and Construction Documents 202

Title Block 203
Design Development Cover Sheet 206
Construction Documentation Cover Sheet 215
General Sheets: Design Development Site Reference Plans* 220
General Sheets: Construction Documentation 225
General Sheets: Design Development Key Plan 228
General Sheets: Construction Documentation Key Plan 233
General Sheets: Design Development General Information Sheet 236
General Sheets: Construction Documents General Information Sheet 246
Design Development Plant Protection and Removal Plan 249
Construction Documentation Plant Protection and Removal Plan 258
Design Development Site Demolition Plan 262
Construction Documentation Site Demolition Plan 269
Design Development Site Materials Plan 271
Construction Documentation Site Materials Plan 279
Design Development Site Layout Plan 281
Construction Documentation Site Layout Plan 298
Design Development Site Grading and Drainage Plan 304
Construction Documentation Site Grading and Drainage Plan 321
Design Development Site Lighting Plan 326
Construction Documentation Site Lighting Plan 333
Site Details: Design Development Composite Reference Sections 336
Construction Documentation Composite Reference Sections 340
Design Development Site Details 342
Construction Documentation Site Details 360
Design Development Tree Planting Plan 365
Construction Documentation Tree Planting Plan 375
Design Development Shrub and Groundcover Planting Plan 377
Construction Documentation Shrub and Groundcover Planting Plan 388
Design Development Site Soils Plan 390
Construction Documentation Site Soils Plan 395
Design Development Planting Details 397
Construction Documentation Planting Details 408

Index 413

For supporting information including Glossary, Documentation and Quality Control Checklists, and Additional Drawing Requirements, please visit the book companion website at: www.wiley.com/go/landscapedocumentationstandards

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Principles, best practices and documentation requirements were gathered in extensive work sessions dedicated to very specific and detailed topics such as line-weight hierarchies and plan layout strategies. Exhaustive detail was elicited from project teams and the project documents they prepared. Initial versions of this document were prepared as part of an internal training course to educate professional landscape architects in a private-practice setting. These training courses, across a number of offices, were also used as forums to debate and develop additional content.

Over the course of several years, the guidelines were further developed and re-issued as improved and expanded versions. Quality Management Directors within the landscape architecture firm were asked to administer the application of the guidelines and solicit additional input and content. Peer reviews were conducted on early versions, whereby comments were collected from reputable landscape architects across the United States and university faculty responsible for teaching documentation practices.

The publication includes graphic documentation from several Design Workshop offices for projects and are used to guide teams in successfully completing project design and documentation in a variety of cities. These guidelines were applied to these projects.

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SECTION 1

Establishing the Foundation

Introduction
Documentation Principles
Operational Principles

1 INTRODUCTION

BACKGROUND

In its relatively short American history, the role of landscape architecture has been broad, diverse, and impactful. Landscape architects have been influential in making the post-industrial city more humane and livable. They have broadened the duties of transportation networks and transformed the function of open space systems. They have defined and redefined what makes great communities. They have been integral to environmental progress and are conceiving new approaches for infrastructure to provide environmental and community benefits. Also, landscape architects have brought art and culture to many through their work. Moreover, their work has significantly benefited economic development in many cities and regions.

While the impact of landscape architecture has been impressive, the ongoing potential for this noble profession continues to materialize. Its potential can be even more transformative if it responds to the most critical global problems: economic, environmental, and social. Many of these problems languish at crisis level, and consequently, the opportunity for landscape architectural leadership is both critical and challenging. Innovation and change will be key components of this prodigious undertaking.

Solutions to problems will necessarily be derived from rigorous interdisciplinary analyses, research, and exploration. Solutions will be most sustainable if they are comprehensive in nature, deriving long-term synergies between prosperity, environmental healing, and improved quality of life. While much of the work of landscape architects is delivered figuratively in the form of plans, reports, and guidelines, the most decisive impact comes in the form of built work. The built work must be well executed, that is, perform well, in order to fulfill ambitious intent. Processes for translating objectives and ideas into built outcomes need to be advanced and carefully applied just as they are in other industries where vital products are delivered to market.

This book is intended to help advance and elevate these processes, as part of a broader effort to affect the role of landscape architecture in addressing global challenges.

Landscape Architects as Interdisciplinary Leaders

Landscape architecture and related disciplines such as planning and urban design are well positioned to address the most fundamental challenges faced by communities, cities, and nations around the globe. That will require elevating the role of the designer to the highest potential level. It will also require that theory and practice be well integrated.

Landscape architecture is continuing to mature and establish its importance in the design industry. There is growing awareness and support for the central role of built landscapes in accomplishing our highest-level ambitions: economic development, community building, environmental improvement, and even access to art and culture. While many subscribe to this broad definition of sustainability, fewer are successful in attaining the comprehensive pursuit.

The seriousness of these undertakings should be reflected in the depth and rigor of the landscape architectural design and documentation process. The premise suggests the critical need for effective translational relationships between theory and implementation. It will require an ongoing process of elucidation, evaluation, and improvement of design and documentation practices themselves.

This book defines clear processes and guidelines for delivering well-documented and well-built landscape architecture projects.

ELEVATING AND UPGRADING DESIGN AND DOCUMENTATION PRACTICES

The landscape architecture profession is mature and diverse but subject to wide-ranging levels of application. These conditions can result in varied and often underdeveloped delivery methods. Consequently, the profession needs to be committed to elevating and upgrading the processes by which it designs, documents, and constructs landscapes. This profession must continue to evolve and improve its practices in order to maximize potential contributions and doing so will require diligence.

Young and Evolving

Landscape architecture as a term was "invented by Gilbert Laing Meason in 1828 and was first used as a professional title by Frederick Law Olmsted in 1863."[1] Formal recognition was given to landscape architecture with the founding of the American Society of Landscape Architects in 1899 and the establishment of the first degree program at Harvard University in 1900.

Over the course of about 100 years, landscape architecture licensure requirements have been established in all 50 states, reflecting the profession's commitment to protecting public health, safety, and welfare. About 30 of these states maintain continuing-education requirements for its licensees. While licensure is very important, it represents a baseline set of core competencies for the landscape architect. As with all professions, ongoing improvements and collective development is necessary, building upon landscape architecture's historic adaptation to technology, market areas and community need.

A Diverse Profession

The profession practices across a diverse range of subjects; consequently, it is subject to some risk when delving into tangential subject areas. Uniquely, landscape architecture requires both generalized and specialized perspectives and skill areas. As generalists, landscape architects are positioned to lead multidisciplinary teams. As specialists, they can deliver tangible outcomes. Horticulture, social science, material sciences, agronomy, hydrology, ecology, graphic design, traffic analysis, and renewable energy represent some of the subjects that landscape architects address in their daily work.

In order to assimilate and coordinate these subject areas, landscape architects need to be sure that interdisciplinary design and documentation processes maximize benefits and minimize deficiencies.

Wide-Ranging Quality Levels

Landscape architecture is practiced across an extremely broad range of applications; there are those who seek to dramatically improve the human condition and those who solely produce Planting Plans. While most forms of practice are legitimate, many landscapes are not well designed, well built, or intended to accomplish high-level objectives. Uneducated landscape designers proliferate in many communities and cast some confusion on the profession. As an analogy, a landscaper to a landscape architect is what a security guard is to a national security expert. Both are important, but they operate on very different levels of execution.

As only a small percentage of buildings are constructed as LEED® buildings[2]; a similarly small percentage of landscapes are built to accomplish high-performance objectives as discussed earlier and as established by the Sustainable Sites Initiative.™ By elevating the purpose and quality of the design and documentation process, these trends may begin to improve.

PURPOSE OF THE BOOK

This reference book focuses on the key documentation needs of the landscape architectural design and Construction Documentation process. That includes both "design documentation" and "Construction Documentation" as well as all that which occurs in the transition from one phase to the other. Documentation requirements include those components necessary to explore and define design intent, logic, physical proposals, and ultimately, the specific components included within construction and bid documents.

"Documentation" herein generally refers to those diagrams, drawings, models, annotations, and narratives produced and sequentially presented within each phase of the design process. Five phases of the design and documentation process are included: Pre-Design, Conceptual Design, Schematic Design (SD), Design Development (DD), and Construction Documentation (CD). Key components, drawings, sheets, and documentation sets are described for each of these phases. For each of these elements, an explicit set of requirements is defined. Specifications are not described in detail within this edition of the book, although critical issues and relationships between drawings and specifications are highlighted. Documentation needs of the Construction Administration process are also not presently included.

While design process is integral to the development of landscape architectural

[1] "The Origin of Landscape Architecture." The Garden Landscape Guide. January 1, 2014. http://www.gardenvisit.com/history_theory/garden_landscape_design_articles/landscape_theory/origin_term.

[2] LEED (Leadership in Energy and Environmental Design) is a voluntary, consensus-based, market-driven program that provides third-party verification of green buildings. (http://new.usgbc.org/leed). As of April 2013, approximately 40,000 projects were registered as LEED certified.

documentation, this book should not be considered a design methods resource. Nor is the book intended to provide comprehensive technical systems information, such as construction detailing or landscape grading practices. This publication is not intended to function as a design graphics handbook. There are ample resources available for each of those areas of practice.

The book is not intended to mandate a standard or inflexible set of requirements, but rather offers a wide-ranging framework from which to draw best practices. Projects vary in scope and scale; not all projects will require all the documentation components included here. The principles from which the requirements are drawn are most important—explicit emphasis is placed upon documentation principles within the book.

INTENT OF THE GUIDELINES

These guidelines are intended to serve both academic and professional needs. In both realms, they may be used as a teaching tool, helping students and practitioners to understand the landscape architectural design and documentation practice. That process, together with associated graphic requirements, is taught within landscape architecture degree programs. These courses, due to time and to some degree resource limitations, do not typically cover the topic as comprehensively or in great detail.

Professionally, the young landscape architect is usually left to learn these requirements over long-term exposure to projects and through working with experienced staff. That instruction can vary in quality, range, and timeline. Continuing education opportunities focus in part on preparing for the Landscape Architecture Registration Exam, a state-based examination process, drawn from national competency standards established at the Council for Landscape Architectural Registration Boards (CLARB). That process is concentrated on selected Construction Documentation components and tasks and does not incorporate the full design and documentation process. While relationships and distinctions between different design and documentation phases are fundamental to landscape architectural practice, they are generally not taught with much emphasis in academic or professional settings.

These guidelines methodically present the subject matter in a comprehensive and explicit manner. A number of fundamental premises organize the current approach:

- Organizational and operational principles go a long way in clarifying the complexities of the design and documentation process.
- An explicit understanding of the purpose of each component (drawing or sheet) within the documentation set facilitates the development of content within that component.
- Interdisciplinary Construction Documentation cannot rely upon informal, intuition-based processes but should rather be based upon itemized sets of requirements, quality-control checklists and interdisciplinary coordination needs.

These premises suggest that each phase and all associated components of the design and documentation process will be made clear and meaningful. Clarity is initiated with a foundation of intent that can be logically applied from Pre-Design through Construction Documentation, resulting in superior built outcomes.

OBJECTIVES

The following objectives have been established for the guidelines as they apply to professional practice:

Orientation

Orientation refers to the possibility that a firm may adopt these guidelines, or an adapted version of these guidelines, for professional use. The guidelines will be used to orient the new landscape architect to the firm's expectations for executing projects. A prospective employee may also review the guidelines in order to evaluate his or her potential fit within the firm and determine a role for herself within the design and documentation process.

Project Management

The guidelines may be used to inform project management processes: a "road map" of the requirements for each phase of the design and documentation process. Project efficiency will improve with the use of these guidelines. Requirements for each sheet of the documentation process have been defined and can be followed by project teams as a self-management tool. The guidelines do not substitute for rigorous critical thinking, comprehensive quality management, and document reviews.

Quality Management

The guidelines may be used to guide the project quality-assurance review process. Quality assurance represents the specific review,

coordination and improvement or editing processes undertaken as part of the firm's quality-management program (see definitions that follow). At a minimum, the reviewer should address and review requirements identified within these guidelines. The project design team should not present documentation for a quality-assurance review that falls significantly below the requirements of these guidelines. In other words, the guidelines should be used to assist teams in completing minimum requirements established herein.

Quality management can be considered to have three main components: quality control, quality assurance, and quality improvement. Quality management is focused on not only product/service quality, but also the means to achieve it.[3]

1. *Quality Control* * is the ongoing effort to maintain the integrity of a process to maintain the reliability of achieving an outcome.
2. *Quality Assurance** is the planned or systematic action(s) necessary to provide enough confidence that a product or service will satisfy the given requirements.
3. *Quality Improvement* can be distinguished from Quality Control in that Quality Improvement is the purposeful change of a process to improve the reliability of achieving an outcome.

   *Note that *quality control* and *quality assurance* are sometimes used interchangeably in the design industries to define specific actions associated with improving outcomes.

One of the most significant challenges in conducting design-related quality management is the cost:[4]

Approximately 20 percent of design budgets are expended for reviews and corrections conducted after the design documents have been completed. Adding interim reviews and corrections to the cost, an average design project can easily require 30 percent to 50 percent of its budget to locate and correct errors.

Attempts to impose even more stringent quality-control methods to reduce design errors have resulted in a spiral of ever-increasing design costs. As clients become increasingly resistant to higher costs and increasingly demanding of higher quality, design firms are caught in a squeeze that forces them to sacrifice quality, design cost, or both. These sacrifices result in lost profits or lost clients, or both.

[3] Rose, Kenneth H. "Quality Management." Wikipedia. December 1, 2014. http://en.wikipedia.org/wiki/Quality_management.
[4] Stasiowski, Frank and David Burstein. Total Quality Project Management for the Design Firm: How to Improve Quality, Increase Sales, and Reduce Costs. Hoboken, NJ: John Wiley and Sons, Inc., 1994.

A primary thesis of this book suggests that quality management is most effectively and most efficiently applied as an integral, ongoing and well-defined component of the design and documentation process (often referred to as plan check). That approach is distinguished from tail-end and independent processes. The thesis suggests an alignment of principles and performance measures early in the process, as well as a series of inclusive and transparent design reviews and quality-control work sessions from Schematic Design through Construction Administration.

The timing and schedule for quality assurance reviews will vary for each project, depending upon the project's scope and scale. These reviews should be scheduled and budgeted at the project outset to occur at intervals appropriate to the project size and complexity. Reviews should occur at the very least once during each of the Concept Design, Schematic Design, and Design Development phases and twice during Construction Documentation.

High-Quality Built Projects

A project will rarely be constructed well if it is poorly documented. Poorly defined plans and details are not likely to be improved in the field through the contractor coordination process and may result in quality compromises and cost increases to both the client and contractor. The best executed projects are usually most well resolved in the design and documentation process.

Reduced Liability

By utilizing guidelines that improve the quality of project execution, a project will perform better from durability, safety, and user perspectives. In addition, the rate of errors and omissions will be reduced. As a result, the typical firm's liability will likely be reduced.

HOW TO USE THE BOOK

Potential Applications

Potential uses for the book have been defined as a set of tasks or objectives. For each of these objectives, a brief approach is highlighted.

Organizing a Complete Set of Landscape Architecture Documents

The skills required to organize and prepare a well-resolved landscape architecture project result from years of focused professional practice and

deeply engaged involvement with dozens of projects at various scales. Experience generally begets competency but does not ensure superior results.

For those without adequate experience to organize landscape architectural documents independently, these guidelines can serve as a useful tool. It is recommended that the landscape architect first refer to Chapter Two, *Documentation Principles* from *Section One: Establishing the Foundation*. Here, key organizing ideas are promoted. The landscape architect may then refer to *Section Two: Phases Overview,* where a comprehensive description of each potential component of the process is provided by design phase. To determine design process and documentation needs, the landscape architect should combine working knowledge of project circumstances with the project's potential to be comprehensively successful.

Preparing a Project Work Scope and Associated Fee

While every project is unique, and as such requires a custom approach, all projects deserve the initial consideration of a comprehensive design and documentation process. Comprehensive refers to a process that examines all potential considerations and results in a set of documents that represent the full breadth of the landscape architect's role.

In order to prepare a project work scope and fee, the landscape architect should first establish a design process that suits the needs of the project. That process can be outlined initially by drawing from the fully defined design steps itemized within this document, initially found in *Section Two: Phases Overview.* That process may include, for example, initial components such as a site investigation, user interviews, and a code review. These components should be itemized in the project work scope as tasks and deliverables.

Once tasks and deliverables are defined, the landscape architect can explicitly envision the documentation requirements for each phase of the project. Completed on a sheet-by-sheet basis that is known as a *Document Set Mock-Up*. The mock-up set reflects the likely number of plan sheets, based upon decisions regarding plan scale and sheet layout. Some non-plan sheets, such as those that contain details, can be projected based upon assumptions from similar, recently completed work. The mock-up set can be represented graphically or in outline format. It is important to understand the full number and types of sheets that will be prepared, as they have cost implications.

The *Document Set Mock-Up* can then be used to estimate fees required to conduct the landscape architecture work. Some firms may keep historic data on costs to complete project design and documentation. These data can be categorized by project type, level of complexity and other criteria. Cost data should reflect actual fees expended, rather than contractual fees. These fees can be tabulated to reflect costs necessary to complete each sheet within the set by phase. For example, if $322,000 was expended to complete a Design Development set with 28 sheets, that roughly equates to $11,500 per sheet. The per-sheet cost reflects all tasks and activities that precede and ultimately result in the sheet outcome itself, for example, meetings, design analysis and study, coordination, and quality management.

Preparing a work scope fee by analyzing and quantifying the number of sheets in a set is only one of a number of approaches to preparing project fees. Other approaches include Time and Task, Schedule and Manpower, and Fee as a Percentage of Construction. It is recommended that the landscape architect utilize several approaches to examining fees, in order to cross-check assumptions and outcomes.

Establishing Content for Individual Documents

As the primary emphasis of this publication, these guidelines are both comprehensive and explicitly rich with recommended content for each component within landscape architectural design and Construction Documents.

It is especially important that the landscape architect understand content distinctions between associated DD and CD sheets. The relationship between DD and CD content varies by sheet series and is strategically determined. That is to say, more information is not typically better at the DD level. For example, the DD Site Grading Plan and the Site Layout Plan are cautiously developed at a framework level, while the DD Site Materials Plan and the Site Demolition Plan are more thoroughly advanced. The logic of these specific strategies is described within the guidelines for each sheet.

Sheet-by-sheet content information can be found within *Section Three: Guidelines and Best Practices.* DD- and CD-level sheet series are paired within the guidelines for ease of comparison. As the landscape architect sets out to establish a Design Development sheet, he should first understand the stated *objective and general requirements* for the sheet. The project team must agree to these requirements in order to support and follow the logic of the recommended specific requirements. *Specific requirements* are organized in a checklist format and in general order of sequenced application.

Establishing Graphics for Individual Documents

Each drawing within the design and documentation process is devised with a unique purpose. Accordingly, graphic strategies vary from drawing to drawing and from phase to phase. Within these guidelines each drawing or sheet is defined with detailed graphic requirements. Consistent graphic requirements throughout the documents are also defined.

For example, a landscape architect interested to know how to graphically distinguish a DD Site Layout Plan from a DD Site Materials Plan should refer to representative graphic examples and associated graphic checklist requirements for each of these two documents. This information can be found within *Section Three: Guidelines and Best Practices.*

Conducting Design Reviews

In many firms, design reviews embody the heart of the design studio, where pin-ups and critiques of design proposals represent the essential exercise in advancing design. A number of resources within this book may be useful in conducting effective design reviews.

Essentially, the key implications and outcomes of the design and documentation process should be evident and verbalized in design review forums. Missing or underdeveloped process elements may result in weaknesses in the design. Working knowledge of these elements may help one to facilitate an effective design review. For example, during an SD or even DD design review someone might ask questions such as, "Have performance objectives been defined and documented?" Or, "Can three-dimensional clarity be given to an element?" Perhaps a juror may suggest that the interdisciplinary relationships should be better coordinated or that scale relationships between elements deserve study.

Conducting Quality Assurance Reviews

Quality Assurance reviews are completed by experienced staff in an effort to control or improve the quality of the documents. These reviews are extremely important to built outcomes and require methodical and disciplined processes. A number of elements within this book will be useful resources for this process:

- Content Requirements by Phase, in *Section Two: Phases Overview*
- Sheet Requirements, in Section Three: *Guidelines and Best Practices*
- Interdisciplinary Coordination Requirements, in *Section Three: Guidelines and Best Practices,* for each sheet, for example, Design Development Grading Plan, Best Practices, Coordination

The quality assurance reviewer should participate in the design and documentation process from the outset so she can evaluate the intended content of the documentation sets. As the content of the DD and CD documents matures, the reviewer may utilize the requirements included within this publication in order to check conformance to the guidelines.

Conducting Interdisciplinary Coordination

The Role of Quality Management

The implementation of a firm or office Quality Leader is recommended as the primary resource for execution of these guidelines. This person should maintain a detailed understanding of the requirements, stay abreast of the industry's best practices, and report potential improvements to their firm's individual documentation guidelines. The Quality Leader should also be responsible for orienting new employees to the guidelines, providing frequent refresher seminars and ensuring that guidelines are being implemented on all projects.

An initial design and documentation training program should be comprehensive and widespread, with the intent to align all design staff to a common set of practice guidelines. In firms with multiple offices, unique or disparate practices by each office will not allow the firm to operate effectively in completing projects. Regular training allows all design staff to overcome disparate and inconsistent practices and engage themselves in the firm's practices guidelines through a shared learning experience. Design and documentation practices are normally one component of a larger project delivery system within the design firm. Relationships between these practices must be well coordinated.

Literature Review—Defining the Need

The current publication is intended to focus on the all-encompassing role of documentation in the landscape architectural design and Construction Documentation process. Documentation refers to those drawings, images, models and narrative produced and organized sequentially to convey design intent and construction requirements.

Across the industry, a wide-ranging literature base highlights the breadth of the profession. Topics range from design theory and process to countless technical references and built work portfolios. There are, however, a very limited number of resources that focus strictly on documentation practices for landscape architecture.

A range of standards, guidelines and practice-oriented books have been developed for landscape architectural design and construction. Some of these publications are comprehensive and wide ranging, covering a series of topics of interest to the landscape architect. Others are more specialized, focused on a single topic, such as site construction detailing. Some speak to a limited extent regarding documentation issues.

2 DOCUMENTATION PRINCIPLES

Landscape Architectural Design and Construction Documentation
The most meaningful design processes follow a set of principles that establish basic assumptions and beliefs to guide decision making. Landscape architectural documentation practices can achieve similar clarity with the use of principles. Principles help to keep complex processes aligned to core attitudes and philosophies. Principles are applied to the landscape architectural documentation process to illuminate key rules associated with this complex practice. An overview of broad *organizational principles* is provided first: these establish the core values that should be understood theoretically. A set of specific *operational principles* follow: these are used to guide the tangible preparation of landscape architectural documentation.

ORGANIZATIONAL PRINCIPLES

Design and Documentation Synergies

"Synergy" generally refers to two or more entities working together to create the greatest shared outcome. Design and documentation are not independent activities but rather practices that depend upon one another for mutual benefit. Documentation should be used as a design study tool and as part of a process of exploration, evaluation, and discovery. In this way, design benefits from thorough, wide-ranging documentation processes. Conversely, documentation quality is enhanced with rigorous interdisciplinary design processes. When designers work closely together, the results of that collaboration are usually evident in the quality of documentation.

Design documentation represents a core and integral constituent of the design process. There is negligible design exclusive of physical documentation. While design is inherently a critical-thinking process, that thinking must be displayed in drawings and words in order to be evaluated and further developed. The nature and quality of the documentation media has great impact on the design outcome; the two areas, design and documentation, coexist as a synergy. While effective documentation does not ensure superior design, it nearly guarantees that the design will be well resolved. A well-resolved design is comprehensively studied, understood, and documented.

Much has been written about drawing and documentation as a means to design reasoning. In "Drawing [Documenting] as a Means to Design Reasoning" Ellen Yi-Luen Do and Mark D. Gross examine relationships between "various activities of designing, drawing and interpreting."[1]

> There seems to be agreement that drawing plays an important role in supporting design reasoning. However, little work to date has examined this connection in close detail. It may turn out to be difficult. On the one hand, design seems to employ a range of quite different reasoning activities, and on the other hand, designers employ a range of quite different drawing acts. Nevertheless, the time may be ripe to develop a mapping between design reasoning and the drawing acts that designers use to carry them out.
>
> The authors "look at various activities of designing, drawing and interpreting." The authors do "not mean to suggest that the items listed . . . are exhaustive or exclusive, or even necessarily exactly the right categories. And, it may turn out that despite our facile categorization, the acts of drawing, interpreting, and design are not so easily separable. Eventually we would like to understand the relations between these activities, showing how the lower-level activities of drawing and interpreting serve the activities of design, and how the goals of design might direct the drawing and interpreting activities.

The investigation specifically suggests that design documentation is commonly used to depict comparable references, establish analogies and abstractions, refine and evaluate proposals, and interpret all these drawings via cognitive processes.[2] Relationships between documentation and design reasoning are explored as a set of synergies, as highlighted here.

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[1] Do, Ellen Yi-Luen and Mark D. Gross. "*Drawing as a Means to Design Reasoning*." Paper presented at Artificial Intelligence in Design '96 Workshop on Visual Representation, Reasoning and Interaction in Design, Palo Alto, CA, 1996.
[2] Yi-Luen Do, Ellen, and Mark D. Gross. "Drawing as a Means to Design Reasoning." *Artificial Intelligence in Design '96 Workshop on Visual Representation, Reasoning and Interaction in Design*, 1996. http://code.arc.cmu.edu/dmgftp/publications/pdfs/aid96-mdg.pdf.

- **Finding References:** By sketching or otherwise representing historic design precedent, an expedited and immediate discussion is enabled. As an immersive exercise, issues are brought to light and problem statements are potentially refined. References are not sought for imitation purposes.
- **Analogy:** Visual analogies are distinguished from verbal analogies in the act of interpreting and applying the analogy to project conditions. That process is used to test the analogy and determine its suitability. As analogies are used to transfer thought and meaning from one subject to another, they can be used to shift perspective or problem definition.
- **Abstraction:** Rather than focus on tangible or concrete depictions initially, the designer may expedite and broaden the exploratory basis of the proposal by representing ideas with intentionally vague or ambiguous expression. Simplification is often part of this strategy.
- **Refinement:** Abstract notions are made specific through the process of drawing and redrawing, often at increasingly larger scale, and with additional detail. Interdisciplinary engagement is helpful at this stage, as relationships and potential synergies are explored.
- **Evaluation:** Drawing and documentation are fundamental to design evaluation, the venue for assessment of performance intent, both intuitive and quantitative.

These activities reinforce the role of drawing and documentation as a design discovery tool, as a means of refreshing perspective on a project.

The majority of drawing-design exploration takes place in the early stages of the process, where significant leaps, advances, and adjustments in the design proposal are made. These advancements rely, in part, upon the role of design documentation in defining analytical and formative intentions.

Most flexibility in the design and documentation process is encouraged during Schematic Design. Here, inventive and resourceful approaches to representing and analyzing design are encouraged. The unconstrained search for ideas and the broad investigation of issues should not be tempered with uniform protocols or conventions.

That does not suggest, however that key components of the design and documentation process are dispensable. While processes vary from firm to firm, the quality of the outcomes that follow varies, too. The most comprehensively successful outcomes seem to rely upon the overt communication of design logic (reasoning) and evaluation criteria. When this content is not formally documented, it is of uncertain impact.

For example, if principles are not documented, do they exist? Or, can a Schematic Design proposal be properly evaluated without reference to well-documented and measurable objectives? Does Design Development serve its purpose without drawings that resolve interdisciplinary relationships and coordination needs? Unsatisfactory answers to these questions reinforce the need for integral relationships between design and documentation processes. The importance of these relationships suggests a need to strategically define the documentation components themselves, in order to maximize their influence on the design outcome.

Relationships between Documentation Quality and Implementation Quality

If design and documentation processes present synergistic relationships, documentation and implementation quality are strictly interdependent. A well-documented project is much more likely to be well built than a poorly documented project.

In a traditional design-bid process, a well-conceived but poorly documented design proposal is unlikely to be well built. That is not to say that a talented designer working with an accomplished craftsman cannot complete well-executed work. That (latter) scenario would likely result from the craftsman having reason to transform a vague or sketchy idea into highly resolved construction. The competitive bidding environment, however, provides little incentive for such a process. Generally speaking, a contractor will build what the client has contracted or, in other words, what the contractor bid on. In that case, the built outcome will be executed only as well as the quality of the documents presented in the bid. Furthermore, poorly completed documents often result in construction cost overruns and schedule delays.

Accordingly, a number of intrinsic relationships are difficult to overcome:

Poor Design + Poor Documentation = Poorly Executed Work

Good Design + Poor Documentation = Poorly Executed Work

Poor Design + Good Documentation = Poorly Executed Work

Good Design + Good Documentation = Well-Executed Work

Design quality and documentation quality are judged separately and by different criteria. Design firms differ in how they judge design quality. It is often evaluated by project-specific criteria. Aesthetics, environmental performance, social or user function, and even financial performance are used variously by firms and clients to judge good design.

Prior to actual construction, design is initially evaluated through the lens of drawings. Unfortunately, impressive documentation is sometimes confused with good design: a charade of sorts. For example, a magnificently rendered illustrative plan says little about the desirability of the proposal as a community destination or of the durability of the built work. A complex and highly detailed infrastructure-section drawing does not necessarily result in built systems that perform well.

If design quality is judged by self-prescribed metrics, documentation quality should be evaluated by more uniform criteria, defined as follows:

> **Accuracy and Consistency:** Minimization of mistaken identification, conflicts, and redundancies
>
> **Completeness and Level of Resolution:** Minimization of errors, omissions, and incomplete documentation, requiring interpretation and questions
>
> **Organizational Intelligibility:** Capability to be understood as a complexly interrelated set of requirements

Documentation quality is sometimes quantified via Requests for Information, or RFIs, as submitted by contractors to design consultants. "The RFI procedure is used in the construction industry in cases where it is necessary to confirm the interpretation of a detail, specification or note on the construction drawings or to secure a documented directive or clarification from the architect or client that is needed to continue work."[3] Studies show that as much as 60 percent of typical projects RFIs are based on insufficient information. The remaining RFIs result from questionable, conflicting, or inaccurate information.

To minimize these shortcomings on a large complex project is a challenging undertaking, even for well-established firms. A well-designed, well-documented, and well-built outcome requires a comprehensive and rigorous commitment by the entire consultant and client design team, not merely the landscape architect. Fortunately, well-documented work is usually well built, which by no means suggests that well-documented and well-built work is good design. Poor design can indeed be well built. Good design is the subject of many discussions, much literature, and centuries of pursuit. It is not, however, the primary focus of this book.

Documentation Phases, Distinct Purposes

While design is more iterative than linear, each phase of the design and documentation process is driven by a distinctly different purpose and generally should not be blended or combined. There are inherent risks associated with moving ahead into a subsequent design phase without completing the requirements of the prior phase. These risks include poorly or incompletely defined project parameters, unresolved and uncoordinated design, and, ultimately, errors and omissions in the Contract Documents. Most of these risks can be mitigated with a commitment to the primary purpose and requirements of each phase.

Each phase of the design and documentation process can be characterized as a set of responses to questions that evolve from broad to specific. The biggest questions should be asked during Schematic Design. More detailed questions should be asked at Design Development but tied to conclusions made at Schematic Design. A large and exhaustive set of questions and issues should be addressed during the Construction Documentation phase. As an accountability measure during the design and documentation process, both the questions themselves and the responses should be documented. Itemized question and issue checklists become especially useful as the project moves through Design Development into Construction Documentation.

> Example SD Question: How can water be most sustainably used on this particular site?
>
> Example DD Question: If treated sewage effluent is reused for landscape irrigation, how much landscape can that water sustain?
>
> Example CD Question: Having confirmed municipal consent for use of treated sewage effluent for landscape irrigation, how does the local code requirement affect construction details for this application?

The primary purpose of each phase of the Design and Documentation process is defined below. See Section Two: *Phases Overview* for a more extensive discussion.

Pre-Design: Defining the Parameters

Pre-Design focuses on defining project *Parameters.* Parameters are typically defined as factors, issues or attitudes that may be used to guide the project and, ultimately, to evaluate its success. Parameters are largely derived from interdisciplinary dialogue and associated investigations. This dialogue is most effective when it is completed inclusively and transparently. These discussions should result in explicit definition of *Precedential Issues and Objectives.*

[3] "Request for Information." Wikipedia. Accessed April 10, 2011. http://en.wikipedia.org/wiki/Request_for_information.

These investigations culminate with definition of a *key dilemma,* the most important challenge or problem that must be overcome for the project to be successful. The importance of identifying the "right" problem cannot be overstated, as Albert Einstein suggested in his pronouncement "If I had one hour to save the world, I would spend 55 minutes defining the problem and only five minutes finding the solution."[4] Misdefined problems result in poorly serving solutions, regardless of how well developed they are.

Pre-Design first requires an understanding of the *contractual work scope*, that is, the work to be completed. *Schedule, budget*, and *consultant roles* are considered equally important parameters. *Staff roles and responsibilities* are defined to allow the team to function with clarity and accountability. *Work product definition* spells out each deliverable component.

Opportunities to innovate may begin to emerge during this phase, including ideas about how to improve historic approaches to the work. The *project approach* represents the primary strategic idea driving the outcome, and is framed preliminarily as a collective response to defined parameters and dilemmas. For example, site conditions and project objectives might suggest "preservation" as an approach. A different set of parameters might suggest "remediation" as an approach, or "consolidation," "integration" or even "minimalization."

Pre-Design documentation is characterized by specificity and clarity but also by flexibility to accommodate evolving project influences.

Schematic Design: Establishing Intent

Schematic Design requires us to comprehensively define project *intent:* spatially, materially, functionally, socially, financially, and in a host of other ways. Design intent can be documented in a wide variety of means but must explore comprehensive territory, where an exhaustive set of ideas and opportunities is uncovered and addressed. Accordingly, *interdisciplinary dialogue* gathers momentum at this phase.

Several key components deserve consideration in the documentation of schematic intent. *Narrative principles* help to shape a *thesis* position for the project. The thesis represents the primary proposition, supported by an argument or strong logic. *Conceptual diagramming* may accompany the thesis position and will certainly precede any form studies. Measurable *performance metrics* allow the evaluation of *design alternatives* and shape the overall mission. A detailed *program* will be critical to organizing the plan itself.

In order for the best intentions to be realized, distinctly different solutions must be studied during schematic design. Each of these alternatives should be evaluated in *design reviews* and relative to prescribed performance metrics. *Spatial organization* and *three-dimensional character* are key elements of schematic studies. *Illustrative drawings* should be used to depict primary forms and spaces, major material systems, and key components of the proposal.

Design intent should also be tested against *regulatory, client, cost, and other requirements.* A *cost model*, defining order of magnitude strategies for applying a construction budget, should be developed with the client.

Schematic Design documentation is characterized by ambitiously descriptive elements, both graphically and in narrative form. Schematic Design intent culminates as a well-defined vision.

Design Development: Resolving Design

If vision and intent represent the essence of Schematic Design, *solutions* are the key ingredient of Design Development. Design solutions must be documented with full *three-dimensional depiction* of physical forms, materials and interdisciplinary relationships. These elements must be studied exhaustively and iteratively. Functional and operational *performance* must be satisfactorily quantified. Decisions must be made.

Solutions cannot be achieved without thorough study and evaluation, which requires *enlarged-scale interdisciplinary documentation*, *mock-ups*, *modeling*, and full *coordination* with consultants and fabricators. *Interdisciplinary sections* play an important coordination role, as they illustrate relationships between systems and components. *Construction details* must be fully resolved, albeit without necessary technical annotation from which to construct.

Performance metrics devised at Schematic Design are used to evaluate and further develop detailed solutions. Solutions cannot be legitimately completed without rigorous *design review* and *quality control* processes.

Design development documents are composed as *in-progress Construction Documents*, and as such, require a comprehensive definition of all plan and three dimensional forms, materials, technical systems, and components. That suggests that all design decisions (formalization and materialization) are made. A detailed *cost estimate* is critical to confirming the Design Development proposal.

[4] Albert Einstein, original source unknown.

Preliminary or outline specifications are essential documents. *Unresolved issues* should be itemized for final coordination at the Construction Document phase. These may include regulatory and code compliance issues and soil/geotechnical implications.

Design Development documentation is characterized by both technical and illustrative detail.

Construction Documentation: The Implementation Contract

Construction Documentation can best be characterized as an *implementation contract*. Therefore, graphic and narrative language should be uniformly precise, succinct, and predictably organized.

While design form and materialization are resolved during Design Development, the emphasis of the Construction Documentation effort is reflected in its rigorous attention to *interdisciplinary coordination, quality control, value engineering*, and *drawing-specification relationships*. Drawings illustrate material sizes, shapes, and relationships, while specifications define construction products and quality standards.

Construction Documents also provide detailed dimensional, technical, and performance information that allow the contractor to accurately construct the project. This information is provided only in general terms within the Design Development documents.

Plans include all horizontal and vertical control requirements, material and component positions, and references to construction details. *Details* explicitly define all typical and unique construction assemblies, systems, and conditions.

Cumulatively Dependent Documentation: Thresholds and Critical Path Sequences

In some design processes, for some designed elements, a strict sequence of activities and associated decisions is critically interdependent. In designing an aircraft, designers cannot complete propulsion analyses until aerodynamic design is established, and, concurrently, control and stability analyses cannot be completed until preliminary structural design is completed. Both of these processes must be concluded before the first model is built and tested. A prototype cannot be built until a further series of tests, including wind tunnel analyses, are completed on the model.

Landscape architectural design may not be as complex or as life-safety critical as aircraft design, but nevertheless it benefits significantly from the strategic definition of key critical path sequences. For these purposes, critical path sequences are herein referred to as "transitional thresholds." Transitional thresholds represent the level to which individual process documents should be developed and confirmed prior to advancing to the next stage of development. These thresholds are most important and least understood in the transition from Design Development to Construction Documentation.

Well-intended logic suggests that the best Design Development documents are those that are most advanced as preliminary Construction Documents. This perspective simply suggests that more information is better. More dimensions, more spot elevations, more technical detail. However, more information is not necessarily better at the Design Development phase. Better design is better. Better design is achieved at Design Development by focusing on design, rather than on exhaustive documentation.

Construction Documentation instructs the contractor how to build the design proposal and includes explicit definition of proprietary, dimensional, and performance requirements. Design Development drawings illustrate what the proposal looks like and how it is intended to function.

The Design Development phase can be evaluated by addressing the questions that follow. These issues must be largely resolved prior to advancing into Construction Documentation.

1. **Performance Measures Confirmed:** Does it work as intended?
2. **Three-Dimensional Design Resolution:** Is it fully crafted?
3. **Rigorous Interdisciplinary Coordination:** Are feasibility level issues largely resolved?

That brings us back to transitional thresholds and critical path sequencing. Key differences between DD and CD content are derived from the notion that Design Development documentation should be strategically developed to key threshold levels, for review, coordination, and confirmation.

It is critical to fully complete the requirements of each phase of the design and documentation process in order to inform and guide the subsequent phase. A multitude of problems result from retroactive and remedial work, including cost overruns, and timeline and quality problems. Retroactive work usually occurs when work is misguided or poorly substantiated.

Relationships between phases can be best described as critical path. By definition, critical path processes suggest "a sequence of activities that results in the completion of a project in the shortest period of time."[5] Critical path

[5] "Critical Path." Memidex, Encarta Dictionary. www.memidex.com/critical-path.

also refers to the reliance of processes or decisions upon the completion of earlier outcomes. Several examples illustrate implications of the principle in the landscape architecture design and documentation process:

- A Schematic Design program cannot be determined until a Pre-Design code review is completed to identify relevant laws, rules, codes, and regulations governing the site and proposed uses.
- Design Development material systems cannot be selected until the Schematic Design cost estimate has been developed and approved.
- The Design Development planting and irrigation plans cannot be completed until Schematic Design water conservation principles and an associated water budget have been completed.
- Site retaining walls cannot be engineered at the Construction Documentation phase until the Design Development Grading Plan has been adopted.

A closer look at several individual components within the DD and CD documents reveals specific content distinctions, further demonstrating the notion of transitional thresholds.

Design Development Layout Plan

- Shows the primary approach or system to be used for layout, for example, a baseline, coordinate, grid, or centerline system
- Shows only key or primary dimensions
- Shows key relationships and other intent with the selective use of Reference Notes

Construction Document Layout Plan

- Shows exhaustively complete dimensions and Reference Notes
- Utilizes hierarchical layout system

Design Development Lighting Plan

- Applies lighting concept and establishes lighting strategies
- Locates and identifies lights and power sources with key relationships to integral systems
- Reflects completed photometric studies

Construction Document Lighting Plan

- Shows precisely located lights, with key relationships to integral systems

Interdisciplinary Alignment

Alignment First

Interdisciplinarity is generally regarded as the deliberate problem-solving collaboration between professional disciplines. Some have suggested that our problems are so complex and deeply rooted that interdisciplinarity is the only way to solve these problems and create a sustainable future. Some have even suggested that our educational infrastructure should better integrate interdisciplinary thinking.

A primary factor associated with substandard design and Construction Documentation is poor coordination between disciplines. In the design industries, coordination refers to the dialogue and exchanges necessary between design professionals to minimize the incidence of errors, omissions, and inconsistencies. Described more broadly, interdisciplinary alignment refers to the state of understanding and support for a common set of objectives, ideas, and practices that result in a well-executed built outcome.

Most specifically, alignment refers to the coordination of these elements. At the outset, this requires the full multidisciplinary team to adhere to a set of design principles, as well as parameters for design coordination and documentation. While design coordination differs from documentation coordination, they are not always so readily separable. Design coordination and evaluation should be initiated at Schematic Design and culminate at the all-important Design Development phase. Documentation coordination should be fully initiated at Design Development and be rigorously practiced at multiple occasions during Construction Documentation.

To produce a set of aligned, well-coordinated landscape architecture documents is challenging. Therefore, formal and methodical procedures are necessary to ensure alignment of interdisciplinary team practices and work products. That is especially true within the site development disciplines where physical and functional relationships are interdependent.

Relationships

Seldom do works of landscape architecture develop alone, independent from other design disciplines. While landscape architecture requires a unique and specialized set of design and Construction Documents, each component of the documentation set is inherently linked and often overlaid to the work of architects, civil engineers, structural engineers, electrical engineers, irrigation designers, environmental designers, and even artists.

The built site does not function as an autonomous set of construction and operational systems, but rather it performs as a tangled juxtaposition of immensely varied elements. These elements perform and react variably to weathering, human use, and other forces. Stormwater acts on and erodes soils, pavement systems, walls and other site construction. Utility infrastructure results in surface and subgrade conflicts with site structures and plant materials. Building and site systems often move independently and sometimes in opposition. As they mature, plant materials can create damaging impacts to adjoining construction. All these conditions can be mitigated during the design and documentation process with rigorous interdisciplinary collaboration and coordination.

Architectural Coordination Processes

Currently, landscape architectural coordination is largely a plan issue. That presents some limitations, as all design is intrinsically three-dimensional. Typically, building-related interdisciplinary coordination takes place through sophisticated semi-automated processes. Software tools such as REVIT are available to formalize the three-dimensional coordination process. These programs are principally oriented toward coordination within the building envelope and allow the analysis of physical and operational relationships between architectural, structural, mechanical, and electrical systems. These relationships are referred to as "workflow scenarios."

Within the different workflows and interdisciplinary relationships several tools are used to guide collaboration and coordination. "Linked models" are used to show full three-dimensional depictions of each discipline's systems, reflecting current documentation. "Interference checking" is used to determine where interference or conflicts might occur between disciplines. The "coordination monitor" allows each discipline to identify specific items that they wish to monitor and potentially change. These tools allow design disciplines to formally and explicitly track and address the evolving work of the team, minimizing the risk that changes are overlooked.[6]

Landscape Architectural Coordination Processes

For most landscape architectural and site development coordination, elementary tools and processes are typically used. These processes can be effective if applied properly. First and foremost, coordination should not be conducted as a tail-end exercise but instead should occur early and often throughout the design and documentation process. Equally important, landscape architectural coordination requires a shared understanding and agreement on the larger project objectives. For example, water conservation and groundwater recharge objectives require the collaboration of horticulturalists, irrigation designers, civil engineers, pavement designers, mechanical engineers, geologists, geo-technical engineers, hydrologists, and maintenance plan authors. Also, by necessity, the coordination effort requires a strict set of pre-determined procedures, protocols and itemized interdisciplinary checklists.

Ultimately, landscape architectural Construction Document coordination is organized to address objectives similar to those associated with architectural coordination. These objectives are addressed with a verification process and conducted by practiced professionals to concentrate on the following areas of coordination:[7]

- Matching data which appears in two or more places
- Ensuring consistent and complete systems and elements
- Verifying items and elements given in one discipline are supported in all other required disciplines
- Eliminating two or more different items from being shown to be in the same location
- Ensuring that information is logical and makes sense
- Pointing out areas that appear to be missing sufficient detail or information to build

Working in Context

Working in Context is a process to simplify the preparation of and augment the understanding of drawings. It is based on the premise that the organization and presentation of information is as important as the information itself. It is analogous to both defragmenting our drawings and to telling a story. It is ensuring that the "whole is greater than the sum of the parts" by combining related drawings to create more understandable groupings of information that are more simply referenced and easier to find.

Working in Context may be a new term, but it is not a new idea. Our grandfathers and their grandfathers used these ideas well to graphically communicate the often complex fenestration and spaces they were imagining. The stunning richness of the architecture of generations

[6] "Revit User's Manual." Revit User's Manual. May 28, 2012. http://en.wikibooks.org/wiki/Revit_User's_Manual.

[7] Nigro Firm. "KeenLook Redicheck Reviews." Accessed January 2014. http://nigrofirm.com/services/designcoordination-review.php#nigro-firm-do?

past was often conveyed in surprisingly simple ways. Much thought was given as to how to combine the various drawings in a meaningful manner to communicate within the context of the design itself. In fact, many sets of for very complex designs were prepared using no referencing overlay system at all.[8]

Examples of Organizational Strategies

- Organize drawings to tell a story of construction as a sequence.
- Organize drawings to tell a story about systems.
- Organize drawings to tell a story about spaces or major components.
- Group drawings around geographical or component emphasis.

[8] Czap, Michael F., Alan L. Mays, and Grant A. Simpson. "Focus on Construction Drawings: Innovative Project Delivery Methodologies." AIA. http://info.aia.org/nwsltr_pm.cfm?pagename=pm_a_0707_czap.

- Consolidate drawings, for example, Layout and Materials, Site Demolition and Tree Protection.
- Combine plans, sections, and details for selected project areas.

Project Planning

Planning a set of documents is the first step to having a well-coordinated set of drawings. The use of cartoon sets and network diagrams can help in the planning process. Common CAD standards in use today typically espouse a one-size-fits-all, "mail slot" approach to project organization, but as a network diagram will show, it is not an effective way to organize the set. Instead, arranging drawings in a "contextual" manner will result in sets with fewer sheets and will require less cross referencing between sheets.[9]

[9] Czap, Michael F., Alan L. Mays, and Grant A. Simpson. "Focus on Construction Drawings: Innovative Project Delivery Methodologies." AIA. http://info.aia.org/nwsltr_pm.cfm?pagename=pm_a_0707_czap.

3 OPERATIONAL PRINCIPLES

Landscape Architectural Design and Construction Documentation
Broad organizational principles set the stage for the application of operational principles. Operational principles guide the actual preparation of design and Construction Documents. These ideas are presented both in theory and for application.

EVERYTHING HAS A PLACE: SUBJECT ELEMENTS AND REFERENCE ELEMENTS

Singular Purpose

Predictability and consistency in locating information within landscape architecture documents results in improved coordination, more efficient documentation, and better built outcomes. Obscure or misplaced information is often overlooked by contractors, resulting in projects that can be underbid when information is not readily apparent. Some even associate obscurely placed information with ethical impropriety, a form of designer pork-barreling: the process of quietly incorporating furtive and costly additions deep within pending legislation. While improper intent is not likely a widespread impetus for the landscape architect's actions, the implications of poorly placed information can be costly.

Each phase, each sheet, each drawing, and each detail comes with an explicit and specialized purpose. That purpose establishes the focus of the document, unifying and illuminating a predictable data set. A Site Grading Plan will convey only vertical positioning data, not horizontal layout information. Site Layout Plans do not communicate material or detail references but only horizontal positioning requirements. Urban Planting Details communicate planting requirements and do not include construction requirements for adjoining hardscape systems. Pavement details do not include drain-setting requirements.

Hierarchy

A hierarchical system is used to clearly and logically locate data within the landscape architectural documents. The system utilizes a simple two-part protocol, establishing a set of relationships between "subject elements" and "reference elements." Subject elements represent the primary focus of the drawing or sheet. Reference elements are any additional elements shown on that drawing or sheet in order to display significant relationships. The reader should expect to find all pertinent information within the subject element drawing for that element, and be directed to any adjoining systems with referenced elements. Detailed referencing systems and protocols are described elsewhere within this document.

It is very common for this ordering system to be confused and misused. In many landscape architecture documents an information hierarchy is sacrificed for excessive and misplaced information. This culminates in a "the more the better" reinforcement-based approach. Some follow the rule that if there is something shown on a drawing, it deserves an accompanying annotation. When those accompanying notes become excessive, they result in "notes glut," an unrefined and undisciplined practice. By limiting notes to only those associated with the subject element, redundancies and potential conflicts are minimized.

Subject Element Details

A number of examples will help to elucidate the principle. Subject elements are most clearly illustrated with the use of construction details. Consider a site-wall detail. Here, the site wall is the subject element. Adjoining systems and components, such as pavements, planting, or nearby infrastructure, not directly associated with the function or performance of the wall are known as reference elements. Any and all written annotation included on the detail drawing should speak only to constructing the wall itself, the subject element, and not any of the reference elements. Detailed annotation should not be included for reference elements shown on the drawing. Instead, a keynote reference should be included to direct the reader to a separate subject element detail.

Subject element details may include directly associated support systems. For example, with the site wall detail, drainage elements required to capture runoff and reduce hydrostatic pressure are integral to the performance of the structure and would likely be built in association with the wall itself. Other subject elements include subgrade preparation, wall caps, veneer, and guardrails, if necessary.

Subject Element Plan Sheets

Subject and reference element principles also apply to the organization and content of plan sheets within the document set. Each plan sheet is organized around a very specific purpose. That purpose guides the determination of applicable subject element information. Selected supporting information may be included, but only when it is determined that the construction of the reference element includes an integral relationship to the selected subject element.

Site protection, demolition, layout, grading, planting irrigation, and lighting are the "subjects" of common landscape architecture sheets. These subjects strictly drive the content and organization of the sheets. Supporting reference elements are selected according to the importance of their relationship to the subject element.

Several examples display relationships between subject elements and reference elements.

Grading Plan

- **Subject Elements:** Contours and spot elevations, slope percentages, and grade breaks
- **Reference Elements (shown lightly and keynoted):** Drainage structures, to display vertical position of structures, including spot elevations at structure
- **Elements not included:** Material Keynotes for elements not pertinent to Grading Plan

Planting Plan

- **Subject Elements:** Trees, shrubs, and groundcovers; mulches; and metal edging
- **Reference Elements (shown lightly and keynoted):** Proposed contours, to display vertical position of plants
- **Elements not included:** Site furnishings, lighting, pavement identification, and material Keynotes for elements not pertinent to the planting plan, unless these elements include direct relationships to plants

Wall Detail

- **Subject Elements:** Wall stem, wall footing, wall cap, wall subgrade, and wall reinforcement
- **Reference Elements (referenced but detailed elsewhere):** Wall jointing, wall drainage, adjoining pavements, and guardrail at top of wall
- **Elements not included:** Planting, site furniture

REDUNDANCY IS NOT A VIRTUE: SAY IT ONCE, IN ONE LOCATION

The "Say it once" principle works jointly with the subject- and reference-element protocols described earlier. The principle suggests the importance of positioning data or information in only one location within the Contract Documents, including drawings, specifications, conditions, and contract forms. By doing so, "errors of inconsistency" are largely nullified. By accompanying the "Say it once" principle with the "Everything has a place"[1] rule, information should be communicated once, in the right way and in the right location. Duplication for reinforcement's sake is not a valid strategy because of its inherent risks.

Repeating information for the same element in more than one location results in multiple references that may not be identical. Additional risk exists if pre-bid changes are necessary, as it will be difficult for the landscape architect to locate and make consistent changes to all references. Most problematic, contractually, it may not be clear which reference the contractor has used to develop his bid. A contractor may bid on the least expensive of multiple references, while the landscape architect may believe that the most expensive option is most desirable for the project.

Redundancy and potentially conflicting information can take place between several media: between drawings, between drawings and specifications, and within specifications. The discussion within this publication is focused primarily on drawing relationships.

Redundancy between Drawings: Two or more drawings should not contain the same detailed written information. For example, an Enlarged Site Layout Plan may be developed to "zoom in" on a complex or detailed area of the larger site plan. The Enlargement Plan should include annotation, layout, and keynoted information. The coinciding area of the original plan should include none of that overlay information. It may, however, show the same or similar plan graphic base information, consistent with the remainder of the drawing.

[1] O'Leary, Arthur "Which Documents Govern When They Differ? Precedence of the Contract Documents." DCD Construction Magazine. DC&D Technologies, Inc. Accessed July 2014.

A second example speaks to interdisciplinary display of the same elements on different sheets. While it is critical to show these elements graphically for reference and coordination, there is no benefit in providing identical construction requirements in multiple locations. For example, landscape architects typically work with structural engineers to develop structural requirements for walls and other engineered site elements. This collaboration sometimes results in a set of wall details showing reinforcement and other structural devices prepared by the engineer. Landscape architects sometime prepare a separate but similar set of details, focusing on architectural characteristics. These two sets of details should be consolidated as a single set prepared by the landscape architect.

Redundancy between Drawings and Specifications: Drawings and specifications should not contain the same information. Distinctions between drawings and specifications are widely publicized and are not reviewed extensively here. For the purpose of this discussion, drawings should include only generic references, and specifications should include specific or proprietary information. Drawings should never include specification language.

Material or component reference inconsistencies between specifications and drawings should not occur since they should not be specifically referenced in both locations. The drawings should identify the material generically, for example, "Stone Pavement, Type 1." The associated specification should include a stone pavement schedule, for example, that identifies "Stone Pavement Type 1" as "Carnelian Granite" and include detailed information such as size, finish, supplier, and quarry name.

Redundancy in Specifications

Within Individual Sections

It is not common to find extensive redundancies within individual Specification sections, as these sections are often honed as stand-alone documents.

Designers, however, often edit Specification sections individually to reflect custom project needs. These edits can result in redundancies and conflicts. For example, concrete pavement finishes are often defined by the landscape architect to suit project objectives. A landscape architect, for example, may desire a specific sand or aggregate aesthetic, and write a description of these elements into the "Finishes" section of the Concrete Specification. That may bring about redundancy and potential conflict with the existing definition of sands and aggregates in the "Materials" section of the Concrete Specification.

In order to avoid redundancies within a specification section, it should generally be assumed that the initial specification is fully complete and that edits should be included as changes rather than additions only.

Between Sections

It is not common to find extensive redundancies within between specification sections, as these sections are developed somewhat independently. This can occur, however, between sections that include similar content, such as Section 033000 Cast-in-Place Concrete and Section 033300 Architectural Concrete, or Section 057000 Decorative Metal and Section 057300 Decorative Metal Railings.

The best defense against redundancies between sections is to utilize the most definitive section only, avoiding similar content with dual sections. Where similar sections are required, repetitive information should be avoided between sections, that is, one section should lead by providing base information, with a supporting section providing more specialized content.

Between Specified Codes, Standards, or Regulations and Specified Requirements

Landscape architects, architects, and other design professionals often include references to specialized industry standards such as those authored by the American Society for Testing and Materials (ASTM), the American Concrete Institute (ACI), and the American Welding Society (AWS). These are only several of a large number of societies and institutes that develop standards for materials, products, systems, and services used in construction and manufacturing. Some of these standards apply internationally.

These standards are extremely comprehensive, highly detailed, and often very technical. Designers are not known to study these standards extensively and are usually unfamiliar with the basic included content. Consequently, designers commonly incorporate specification requirements that are redundant with and frequently in conflict with referenced standards.

For example, with cast-in-place concrete, a designer often applies the requirements of ASTM Standard C33. This standard defines the quality requirements for coarse and fine aggregates in the concrete mix, including the grading of the aggregates. The standard, as with most all standards of this sort, results from scientific research and testing. For example, application of the standard would reduce the likelihood that aggregate impurities might stain or discolor the concrete. Most importantly, application of the standard ensures the minimum physical and structural performance of the aggregates within the concrete pavement or structure.

Potential conflicts arise when the landscape architect specifies aggregates or aggregate properties that differ from requirements of ASTM C33. This scenario might take place when the landscape architect finds an aggregate that he likes aesthetically, as noted earlier. In this case, the specified aggregate may not conform to the standard.

There is some discussion within the industry (for example, at the American Institute of Architects [AIA]) to determine which information governs in the case of duplicate or multiple references and associated inconsistencies. No universal guideline has yet been established to resolve which reference would take priority. The AIA Document A201: *General Conditions of the Contract for Construction* establishes no contractual requirements for sorting through multiple references in multiple locations within the documents. The AIA Supplementary Conditions suggests that the most expensive option be used in the bidding process and that, if necessary, credit can be given to the owed party once everything is sorted out by the consultant team. (Many designers favor a contract provision that establishes priority of drawings over specifications. Ultimately, the architect is responsible for making a fair and logical conclusion, basing his decision on the best interests of the project and client. Changes to the contract amount can then be made.)

DRAWINGS ARE GENERIC, SPECIFICATIONS ARE SPECIFIC

Within the architectural design industries, the Contract Documents are composed of the Owner-Contractor Contract and all of its subcomponents, the General and Supplementary Conditions, drawings, specifications, addenda, and any contract modifications. Collectively these documents become legally enforceable requirements and represent components of the contract when the agreement is signed.

Within the industry there is considerable confusion about the relationship between drawings and specifications. That uncertainty is multifaceted and is not discussed here comprehensively. One common problem relates to the utilization of specification information within the drawing set. The problem is especially acute within landscape architecture Construction Documents. The landscape architectural documents are usually less voluminous than those prepared by architectural and associated building-design disciplines. Consequently, the landscape architecture set is sometimes perceived as a simpler set of documents. As a result, some landscape architects pursue additional simplicity by incorporating specification information within the drawing set. They believe that the practice results in a more direct and consolidated communication, offering a level of convenience and reinforcement.

Problems result from this practice. Within the industry, it is understood that drawings should *generically* represent forms and shapes, locations, and relationships between elements and systems. Drawings define materials generically. Specifications *specifically* define proprietary products, attributes, sizes, and performance criteria. Specifications also define processes for executing the work. By establishing a clear distinction between the function and content of each contract document, the contractor can readily find and retrieve specification information according to uniform classification systems developed by the Construction Specifications Institute (CSI). When specification information is not included within the specification but rather on drawings, the contractor may have difficulty locating the information, and an incomplete or inaccurate bid may result.

The example that follows illustrates the distinctions between generic drawing references and specific specification references.

Materials

Drawing Reference:

- Stone Pavement, Type 1

Specification Reference:

- Stone Pavement, Type 1
- Material: Carnelian Granite
- Size: 30" Square, 2" Thick
- Finish: Flamed
- Edge: Standard Blunt
- Quarry: Yang-Shi, Fudong Provence, China
- Supplier/Fabrictor/Manufacturer: Architectural Stone Products, Fort Collins, Colorado

THREE-DIMENSIONAL DESIGN AND DOCUMENTATION—NOTHING TO HIDE

While design is inherently a three-dimensional exercise, landscape architects rely heavily upon two-dimensional documents—the plan and sectional drawings—to communicate design and construction intent. These drawings do not always tell the "whole story" and can leave room for varied contractor interpretations.

Section drawings illustrate a typical segment of a component or element but neglect to show end conditions, corner conditions, external views, and any unique, nontypical conditions. Plan drawings work well to define ground plane materials and locations but provide little information beyond that. A plan- and section-only document set will likely result in missing, incomplete or unresolved conditions.

In order to most effectively communicate design and construction intent, three-dimensional documentation should be better utilized by landscape architects. Design Development is the most important three-dimensional design phase. All spaces and components should be studied and documented three-dimensionally. A digital model should be built of the entire space or spaces. All typical components within that space should also be modeled.

These models can be analyzed from multiple physical perspectives and with interdisciplinary attention. Key components and assemblies should be further developed and documented during the Construction Document phase. These models can be used to develop associated plan and sectional drawings, through semi-automated processes. Building Information Management (BIM) software is used to create virtual models that can store data. Interactive models can even be provided to contractors for further clarification and for use in developing shop drawings. Three-dimensional drawings should be used more extensively in Construction Documents. Historically, they have been underutilized due to inefficiencies and inaccuracies associated with their production.

Software programs such as Sketch-Up provide an easy, efficient, and intuitive environment for completing three-dimensional modeling. Additional, more sophisticated three-dimensional drawing software exists, but not all software is equally well suited for both illustration and documentation. Some software is designed for modeling and other software for rendering. Rendering and visualization programs are known as "engines" and can be variously integrated with modeling applications. Additionally, each collaborating discipline utilizes preferred software to suit their specialized needs.

COMPOSITE DOCUMENTATION—DEFINING KEY RELATIONSHIPS

Composite documentation refers to drawings that display an amalgamation of intra- and interdisciplinary systems and components. Composite drawings depict a set of relationships that are not readily available in isolated detail drawings. Composite drawings are intended to be used for reference rather than to provide detailed instructions for constructing individual elements. While "subject element" emphasis on individual components represents an important principle, composite drawings play an important role in the design and documentation process. These drawings include an emphasis on no particular subject elements but instead are carefully selected to study and depict key relationships.

The landscape architect is well positioned to orchestrate and assemble the interdisciplinary elements required within these drawings. Landscape and site literally and figuratively represent the fabric that holds these systems and elements together. Building architecture, structural systems, civil and infrastructural systems, lighting, and landscape architecture are not typically studied and documented in combination by any one discipline. However, without such drawings, the relationships among these systems cannot be known.

Composite documentation is routinely practiced within allied design fields. Industrial engineers use exploded composite drawings to depict relationships between closely associated elements. Semiconductor designers rely closely upon the composite drawing, utilizing ASTM Reference F127–84 to define it as "a large-scale drawing that comprises all geometric forms, arranged in their proper relative positions, required for a single device. Within that industry the composite drawing is also referred to as a *composite pattern, design drawing, engineering drawing, layout and master drawing*."[2]

Architects typically develop composite building sections to define relationships between architectural and structural systems. These sections typically include HVAC, mechanical, and electrical systems, thus requiring effective coordination between disciplines. It can be challenging to fully complete composite building sections until well into the construction document process because such a large number of decisions are necessary. Details, however, are not especially important within the composite architectural-section drawing. Systems and component associations, locations, and scale relationships define the role of these drawings, allowing for the simultaneous development of architectural sections and architectural details.

The most common and widely used types of composite drawings are sections and elevations. Sections are most instructive in that they display "X-ray" and sub-grade content. X-ray or sectional drawings are most effective in showing connections between systems and components.

[2] SEMATECH Dictionary of Semiconductor Terms. www.sematech.org/publications/dictionary/ci_to_com.htm.

While composite section drawings are described in more detail elsewhere in this book, the primary purpose of the drawing is to define relationships: form relationships, technical relationships, material relationships, scale relationships, spatial relationships, and interdisciplinary relationships.

Landscape architectural composite documentation follows a number of protocols and principles found within the design industry:

- These drawings are best used as a design and coordination tool, not explicitly as a construction document. When included in the Construction Documents, they can be cited as Reference Drawings or related details
- These drawings are not static and should be revised in an ongoing process to reflect evolving design studies. At the Construction Document stage, they should reflect all decisions made at Design Development.
- Scale and form accuracy are necessary to properly evaluate relationships.
- By necessity, they are developed as an interdisciplinary exercise, showing relationships between systems and components.

TELL THE MOST WITH THE LEAST GRAPHIC INFORMATION

As each phase of the design process serves a unique purpose, each phase utilizes a distinctly different graphic approach. Schematic Design documents are intended to communicate a compelling vision of proposed spaces, illustratively rich with textures, colors, people, and activity. Design Development documentation represents a transition from illustrative to technical purposes and is meant to convey detailed character, systems, and design elements. Construction Documentation is illustratively spare, using graphics solely to communicate contractual building requirements.

Landscape architectural drawings often include a large amount of diverse information and can be graphically complex. They can also be graphically abstract since they use nonrepresentational symbols, which can be tricky to interpret. Compounding the challenge, graphic techniques often vary from drawing to drawing and between disciplines. Each discipline within the document set may represent the same material or element with a different symbol. It is difficult to establish uniform graphic practices within a multidisciplinary design team because each firm individually establishes its own standards which generally do not vary by project.

These difficulties require the landscape architect to think carefully about how to graphically present information in order to best convey intent. A primary objective is to communicate all necessary requirements with the least amount of graphic information. That does not imply that drawings should not be rich with information, but rather suggests that all information be pertinent and strategically organized.

Edward Tufte, the famed statistician, has dedicated his teaching and research career at Yale to the study of the "visual display of quantitative information." He is most well-known for his books on information design. He has developed and teaches a principle-based philosophy on the subject. Tufte suggests that "visualization excellence is that which gives to the viewer the greatest number of ideas in the shortest time with the least ink in the smallest space."[3] While Tufte's work is not specifically focused on design and Construction Documentation, selected principles are drawn from and integrated in the recommendations that follow.

Subprinciples[4] are presented to reinforce the primary principle, which suggests "telling the most with the least graphic information."

1. Focus on (Spotlight) the Purpose of the Drawing

Only by first clarifying and working to serve the primary purpose of the drawing can one determine the best graphic strategies to communicate intent. Tufte suggests that the "[graphic] design should be content-driven; the focus should be on the content of the data, not the visualization technique. This leads to design transparency and allows the design or technical message to read most clearly as opposed to subsidiary information or the graphics themselves."[5]

For example, if the stated purpose of a DD Grading Plan is to "establish primary design intent for the three-dimensional site organization, storm-water management and water-quality measures," then these several components should "jump off the page" visually. The plan should somehow convey three-dimensionality. Graphic emphasis on level changes, water routing, flood control, and water-cleansing devices should prevail over pavement patterns, furnishings, or other noncontributing elements. In the opinion of some landscape architects the drawing should be stripped to a minimum graphic display of these essential elements. Other elements should recede or not be shown.

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[3] "Tufte, Edward R. *The Visual Display of Quantitative Information*. Cheshire, CT: Graphics Press; May 2001. 2nd Edition.
[4] Globus, Al. "Principles of Information Display for Visualization Practitioners." NASA Contract NAS 2-12961, 1994. www2.cs.uregina.ca/~rbm/cs100/notes/spreadsheets/tufte_paper.html.
[5] Tufte, Edward R. *The Visual Display of Quantitative Information*. Cheshire, CT: Graphics Press, 1983.

In making decisions concerning graphic content, the landscape architect will need to consider relationships between elements that are not always apparent, as highlighted in the discussion below. For example, on Grading Plans, it may be important to include selected paving joints if grade breaks are designed to occur at these joints.

2. Highlight Key Relationships

Most architectural drawings entail important relationships between various elements and systems. Some would suggest that the most well-resolved design is that which rigorously focuses on these relationships. Tufte suggests that the most instructive graphics illustrate relationships between "multivariate data,"[6] that is, where several variables are combined to show relational, rather than merely descriptive, visualizations. Landscape architectural documentation can be criticized for its emphasis on independent descriptions (e.g., utilities separate from planting separate from grading systems).

Numerous examples point to detailed but important relationships that are not always communicated effectively within landscape architectural documents:

- Pavement jointing (horizontal) and wall jointing (vertical)
- Pavement grade breaks (creases in pavements) and pavement jointing
- Landscape grading and plant positions
- Erosion control on slopes and plant positions
- Drain locations and integral pavement jointing
- Streetscape furniture and street infrastructure (e.g., signs and manholes)
- Wall jointing and wall lighting
- Wall cap jointing and railing post locations
- Building finished floor elevations and landscape grading

While this publication promotes and itemizes a neatly independent set of drawing requirements, the content of these drawings has been prescribed in order to highlight key relationships such as those examples noted earlier. The landscape architect is encouraged to seek out additional relationships in establishing documentation strategies. Drawing content may be maneuvered or combined in unique ways to provide relational benefits.The landscape architect should select simplest and most effective combination of drawings to highlight these relationships. That may require using plan, axonometric, and section/elevation drawing combinations.

3. Establish Informational Hierarchy

Design documentation is sometimes represented monolithically, that is, without hierarchical definition. That approach suggests that all information is equally important and can be applied in an arbitrary sequence. For example, Site Layout Plans are often composed to read as a collection of dimensions rather than a sequence of interdependent relationships. That is not smart, as construction processes are not organized randomly or without priority. Drawings are not useful simply as a mass of information.

Contractors require guidance in the sequenced application of voluminous contract requirements. Contractors sometimes need to know where to start, and that is not always clear. Contractors are usually interested to know what issues or intentions are most critical, and these are not always highlighted or otherwise apparent. Contractors may have difficulty managing conflicting requirements, especially when it is not clear which requirement takes priority.

The principle does not suggest the use of wildly divergent graphics, for example, exaggerated font size gradation or hyper-graphics, but rather the strategic integration of graphic information and annotation to communicate hierarchal intent.

Representative Informational Hierarchy strategies are defined:

Site Layout Plan

Utilize hierarchical layout system:

1. Define where to begin, for example, baseline, point of beginning, building grid.
2. Identify primary dimensions and critical relationships.
3. Identify subsidiary relationships.

Tree and Plant Protection and Removal Plan

Identify most valuable trees to protect:

1. Establish and specify criteria to define relative value; for example, location, size, species, and quality of existing trees to be protected.
2. Utilize graphic hierarchy to distinguish large mature trees from small trees.

[6] Tufte, Edward R. The Visual Display of Quantitative Information. Cheshire, CT: Graphics Press, 1983.

4. Communicate, Don't Beautify

Graphics should be used to communicate design and construction intent rather than principally make beautiful drawings. That principle suggests that the landscape architect devise the simplest means to define and readily distinguish materials and components.

The transition from Schematic Design to Design Development includes a leap from illustrative graphics to symbolic graphics designed to communicate intent. "Illustrative" is defined as that quality which simulates or "illustrates" the intended quality or character of the proposed design. The purpose of illustrative graphics is, in part, to gain the favor of the audience in supporting the design proposal. Symbolic graphics communicate intent via abstract rather than representational means. Symbolic graphics utilize a set of symbols or patterns that are selected to figuratively distinguish materials and components.

Coordinated relationships between graphics that represent different elements are important. Symbols should not be selected independently but rather as an ensemble, in association with one another. Symbolic graphics may represent an abstract or metaphorical relationship with actual material or component. Industry standard graphics have been developed based upon this principle. For example, concrete is textured with stipples, triangles, and small circles to represent aggregates and air pockets. Stone is textured with stipples to highlight compositional attributes, but supplemented with intermittent diagonal lines to distinguish it from concrete. Wood, of course, is "grained." Metals are generally illustrated without texture and with diagonal lines to reference machined qualities.

Design graphics communicate ideas, messages or instructions. In this way, they are distinguished from pure art.

5. Eliminate Clutter

"Good information design is clear thinking made visible."[7] Clear communication generally shuns extraneous information. Clutter in architectural drawings can be defined as any extraneous graphic information that bears no relevance to the intended ideas, messages, or instructions. Clutter is problematic primarily because it distracts from and potentially dilutes communication of the primary message.

[7] Tufte, Edward R. The Visual Display of Quantitative Information. Cheshire, CT: Graphics Press, 1983.

Tufte vocalized such a critique with the term "chartjunk," referring to "all visual elements in [graphics] that are not necessary to comprehend the information represented on the graph[ic], or that distract the viewer from this information."[8]

In architectural drawings, clutter may include unnecessary patterns, color gradients, symbols, text, shading icons, or ornamental fonts. Clutter may also include any extraneous content, such as excess or irrelevant detail. Specific examples within landscape architectural drawings are highlighted:

- Excessively detailed building footprints (generally need only exterior wall definition, with ground-floor doors and windows)
- Detailed pavement patterns on plans where patterns are not relevant, for example, Layout Plans, Grading Plans, and Planting Plans
- Plans with exhaustively comprehensive detail keynote references on every applicable instance, rather than use of "typical" references
- Details that show elements that are not integral to the subject element
- Graphics that serve to beautify rather than symbolize and distinguish components and materials

The landscape architect is reminded that, as each phase of the design process serves a unique purpose, each phase utilizes a distinctly different graphic approach. While plans used in Schematic Design and Design Development may be developed as illustratively rich documents, they too benefit from the strategic and disciplined application of graphic control—telling the most with just the right graphic information.

INTERDISCIPLINARY COORDINATION—EARLY AND OFTEN

If interdisciplinary alignment refers to support for a common set of objectives, ideas and practices that result in a well-executed built outcome, then interdisciplinary coordination represents a means of accomplishing it. Interdisciplinary coordination in the architectural design industry is onerous and time-consuming. The complexities and evolving nature of landscape architectural design solutions suggest a need for methodical and regular coordination.

[8] Tufte, Edward R. The Visual Display of Quantitative Information. Cheshire, CT: Graphics Press, 1983.

That attitude is not fully adopted in the profession. Some firms utilize a process whereby design and documentation coordination takes place in more isolated instances, such as at the end of Design Development or in the early stages of Construction Documentation. While ongoing coordination processes require time and effort, significantly higher costs result from infrequent or underdeveloped coordination processes. These costs include fees associated with remedial and corrective documentation work and construction-related conflicts and errors.

Methodical and regular coordination should start at the transition from Schematic Design into Design Development. A successful set of alignment exercises at Schematic Design should result in a design direction that defines basic forms, program and performance intentions. Schematic-level coordination focuses more on design, whereas Design Development coordination includes design, technical and documentation coordination.

As Design Development is initiated, the multidisciplinary design team will determine the key coordination needs between disciplines. These needs will vary depending upon the project's needs and consultant composition. Artists, environmentalists, cost estimators, wildlife and habitat experts, soil scientists, and wetland designers represent a number of consultants who are intermittently included on projects. Architects, civil engineers, and structural engineers are more regular team members.

Depending upon the project, a detailed and comprehensive set of coordination needs and issues should be identified and addressed in meetings that are dedicated solely to coordination. These meetings should occur at the same weekly or biweekly time during the heart of the DD and CD process. These meetings should be facilitated by the prime design consultant; he should be responsible for organizing agendas and taking meeting minutes. Coordination meeting agendas should be organized to address topics identified at the outset of the project, with additional issues added as necessary over time.

CROSS-REFERENCING CAUTIONS: A METHOD TO THE MADNESS

In architectural and engineering disciplines, cross-referencing is used to define specific relationships between drawings, and in selective instances, between drawings and specifications. For example, one may find notes on plans directing the reader to other plans for additional information, such as references to civil drainage plans made on landscape Grading Plans. Some practices, such as this example are largely unnecessary, as these references are implicit and self-evident in Construction Documentation. Other cross-referencing practices are integral to a well-organized and complete set of landscape architecture documents.

Cross-referencing should generally be used to note specific and key relationships that are necessary to accomplish construction requirements. These references are made with the use of Keynotes. Cross-referencing should be used on a very limited basis within specifications, and between drawings and specifications.

Several types of commonly used cross-references are noted here, together with recommendations on their use.

On Drawings

Keynotes: Keynotes are used to reference details, adjoining systems, or components associated with subject plans or details. Keynote references should be used exhaustively to define a comprehensive set of relationships between plans and details, or other associated drawings.

Section and Plan Enlargement References: Use comprehensively with specific delineation of detail number and sheet location.

General References to Work by Others: Use of the words "by others" in Construction Documents technically means that the work is not required in the current contract. Landscape architects, however, often use the words "by others" to refer to "another discipline" within that contract, for example, the civil engineer.

If it is necessary to reference work prepared by others, do not reference specific drawings, as they are subject to change. Use notes such as "Refer to structural drawings for reinforcement information" or "Refer to civil drawings for drain connections to storm drainage system." Confirm that referenced information has been provided.

Specific Interdisciplinary References: All components, materials, and systems shown graphically on landscape architecture drawings, including work by collaborating disciplines should be identified. These references should match annotation prepared by associated disciplines, for example, "drain inlet" should not be used generically to reference "catch basin." Specific detail numbers should not be referenced, as detail references are subject to change.

Specification Information on Drawings: Do not include specification information in drawing notes, for example, "Subgrade compacted to 95 percent proctor."

Generic Specification Reference: Do not include the generic note "Refer to Specifications." That is implicit, unnecessary, and extraneous.

Within Specifications

Specification Cross-References: Do not cross-reference items specified elsewhere in the specifications. Only do so when referring to a relationship that would not ordinarily apply.

Specific Specification Section Reference: Do not refer to numerically identified specification sections. For example, use "Refer to EXCAVATION in the EARTHWORKS section" instead of "Refer to clause 4.12.2."

Work by Others: Using the words "by others" in specifications technically means that it is not required in the current contract. Landscape architects often use the words "by others" to refer to "another discipline" within that contract, for example, by the civil engineer, not the landscape architect. This practice should be avoided.

TWO OBJECTS CANNOT OCCUPY THE SAME PLACE: INTERFERENCE CHECKING

Documentation coordination and quality assurance/control processes are becoming more intelligent with the use of Building Information Modeling (BIM) systems. Systems such as Autodesk Revit Architecture incorporate all model information in a single, coordinated database. There has been rapid growth in the application of BIM in the architecture, engineering, and construction industries. These systems are used to organize, quantify, and manage building systems and performance data. BIM is also used for three-dimensional visualization and to readily produce sections, details, and plans from a single drawing source.

Importantly, these models are also set up to coordinate the interface between disciplines, including checking for physical conflicts. This is known as "interference checking." The system relies upon all disciplines working from the same model or database, with regular automated updates whereby "a change anywhere is a change everywhere."[9] The Revit system includes a feature known as *bidirectional associativity* and is aimed at reducing conflicts, errors, and omissions, ensuring that information in two or more places matches. The system also helps to avoid two built elements occupying the same location.[10]

BIM and related systems are not used regularly by landscape architects. BIM software has not yet been customized to the specific needs of landscape architecture. In addition, there is little expertise amongst landscape architects using BIM. Discussions concerning the role of BIM in landscape architecture, however, are on the rise.

While BIM is not yet used extensively by landscape architects, the fundamental intent behind its development should be applied with currently available tools. Interference checking should be conducted through strict and methodical digital processes. In landscape architecture, a range of potential conflicts can occur between landscape architectural elements and architectural, structural, civil, mechanical, irrigation, and existing conditions elements.

Plan Interference Checking

Landscape architectural plans should be digitally overlaid on the plans noted below to check for conflicts and undesirable relationships. Note that interference checking processes are most effective when all elements are drawn accurately and to scale, that is, there is risk in unscaled, diagrammatic symbols.

Existing Conditions/Demolition: Check for conflicts between proposed landscape architecture and existing conditions to remain.

Irrigation: Check for conflicts between all interdisciplinary site work and irrigation equipment such as backflow preventers, meters, valves, and piping infrastructure.

Planting: Check for conflicts between major plantings such as tree root balls and all other site work, especially above- and below-grade elements such as utility infrastructure.

Civil Infrastructure: Check for conflicts between landscape architecture and site utilities, including above- and below-grade structures such as manholes, vaults, drains, and piping infrastructure. Include signs, utility poles, site lighting, and other similar free-standing elements that may conflict with pedestrian circulation areas, including accessibility ramps and driveways.

[9] "Revit." Autodesk. January 1, 2012. http://www.autodesk.com/products/revit-family/features/software-for-bim/all/gallery-view#channels_Core Features.

[10] "Revit." Autodesk. January 1, 2012. http://www.autodesk.com/products/revit-family/features/software-for-bim/all/gallery-view#channels_Core Features.

Architectural and Structural Systems: Check for conflicts between all site work and structural/architectural elements, including below-grade systems where landscape architecture occurs over structure. Check relationships to architectural elements such as roof overhangs, columns, gutters and downspouts, and façade-mounted elements requiring access.

Three-Dimensional Interference Checking

Three-dimensionality is the essence of information modeling. Landscape-architectural elements noted here should be studied three-dimensionally to check for conflicts and undesirable relationships. These models should include all interdisciplinary systems and components.

Site Architecture: For example, trellises, pavilions, rest rooms, gate houses, and other structures designed by the landscape architect

Fountains, Pools, and Water Features: Include mechanical, electrical, lighting, finishes, and connections to adjoining systems

Building-Site Relationships: For example, windows, doors, and other façade relationships to finished grade

Over-Structure Construction: Includes structural, civil, mechanical, electrical, lighting, hardscape, and softscape

Elements within Sight Lines: For example, streetscape elements at street intersections and driveways that may conflict with sight distance triangles

ARRIVING AT RESOLUTION

A primary objective of the design and Construction Documentation process is to clearly define intent. Ultimately, clear intent correlates with well-resolved design. Well-resolved design defines all requirements, avoiding unanswered questions or varied interpretations. This is a challenging undertaking and is not often completely successful.

Addressing Resolution: Key Questions

- Are all physical intentions unambiguously defined?
- Has the design been comprehensively and explicitly resolved?
- Have all systems, materials, components, and conditions been comprehensively defined?
- Does the contractor know all that he needs to know to build each component or system?
- Would the project be built identically by different contractors?
- Are there drawing-specification references for each system, material, and component?
- Does the design comply with all governing codes or jurisdictional regulations?

Addressing Resolution: Key Issues

- **Three-Dimensionality:** Have all elements been fully defined three-dimensionally?
- **Interfaces:** Have relationships between all systems that interface been defined, for example, between different pavements, walls to pavements, vertical (wall) jointing and horizontal (pavement jointing), railing posts and flatwork jointing, and existing and proposed conditions?
- **Interdisciplinary Relationships:** Have relationships between landscape architecture and contiguous systems been defined, for example, manhole–pavement relationships?
- **Unique, Nontypical Conditions:** Have unique conditions been assigned and detailed?
- **Hidden Conditions, for Example, Corners, End Conditions, "Bottoms" and "Backs":** Have these conditions been defined for all elements such as walls, planters, furniture, signage, and other conditions?
- **Unscaled, Diagrammatic Component Symbols:** Do these abstract symbols make it difficult for relationships to adjoining systems from being understood?
- **Implicit but Undefined Intentions:** Are implicit graphic intentions supported by appropriate annotations, for example, layout relationships that are shown graphically and keynoted "Align site wall with face of building"?

SECTION 2

Phases Overview

Pre-Design

Concept Design

Schematic Design

Design Development

Construction Documentation

Each of the five primary phases of the landscape-architectural design and documentation process is overviewed below. These include Pre-Design, Concept Design, Schematic Design, Design Development, and Construction Documentation. The purpose of each phase is first presented, followed by a brief characterization of the documents that comprise that phase. Key coordination needs are also noted. For the Design Development and Construction Documentation phases, key best practices are presented. Finally, each of the documentation components required for each phase are highlighted. Detailed descriptions of these components are included within Section Three of this publication.

Each phase of the design process is distinctly organized to accomplish unique purposes. While firms vary in how they explicitly define and execute each phase of the design process, a number of fundamental attributes are shared somewhat universally in the industry. These attributes are significant in their simplicity and resolve: Pre-Design must establish parameters that will influence the design and the design process. Concept Design must result in sound design frameworks that can be evaluated and further developed. Schematic Design must esablish clear and comprehensive intent that is both verbally and graphically descriptive. Design Development represents detailed design solutions to address that intent, and Construction Documentation establishes the contractual requirements for constructing those solutions.

4 PRE-DESIGN: ESTABLISHING THE PARAMETERS

PURPOSE

The purpose of the Pre-Design phase in landscape architecture is to establish the primary requirements and influences on the project, including budget, schedule, program, consultant work scope, necessary approvals, and site conditions. While design is a process of continually gathering new information and perspective on the project, purposeful design must begin with a comprehensive understanding of parameters. Parameters are not permanently fixed but reflect current considerations at a particular point in the design process.

If design is inherently a problem-solving exercise, parameters can be defined as those factors which the design team draws on to define the key dilemmas faced by the project. In later stages of design, the most critical project dilemma(s) can be formulated and subsequently addressed in developing a thesis position for the project. The thesis position represents the primary proposition and associated logic for the project, generally framed as a response to the key dilemmas. These determinations are extremely important to a strong and responsive design solution, and the outcome is less likely to be successful without a penetrating initial diagnosis.

Pre-Design parameters can also be used as a framework to guide the design and documentation process, helping to structure and judge the merits of alternative design directions. Many Pre-Design parameters, such as soil conditions and building code requirements will need to be revisited throughout the design and documentation process. Accordingly, it is important that Pre-Design components are well documented and readily accessible to the design team.

Inasmuch as possible, the Pre-Design phase should also be used to establish a vision of the intended outcome of the project, as represented in delivered documentation. A depiction or "mock-up" of the intended documentation deliverables should be graphically completed. That mock-up is most useful when completed as part of the project proposal phase, in order to determine necessary fees and schedule implications. The mock-up should be revisited during documentation phases to verify initial assumptions and address current project needs.

DOCUMENTATION CHARACTERIZATION

Pre-Design documentation should be clear, precise, and methodically organized. Missing or incomplete information can result in a project direction that veers off course or is otherwise misguided.

Several additional attributes characterize Pre-Design documentation:

Objective (Impartial)

Pre-Design documentation is principally factual or data-based, as opposed to loosely creative and subjective. For example, site analyses are mostly based upon technical criteria; site construction budgets are rationally calculated based upon intended quality and program, and code reviews

are methodically reviewed for relevance and key impacts. That is not to suggest, however, that there is no benefit in the creative definition of project objectives, such as the desire to increase community interaction or the role of art in raising environmental awareness. Objectives are further developed at the Concept Design phase. The key point here is that the imaginative exploration of design solutions should not precede the comprehensive definition of project parameters.

Pre-Design documentation is analogous to preparing for a long expedition, where the purpose of the trip, research about the locale, itinerary, route, and travel modes are well organized, but the weather, people you will meet, places you will discover, challenges you will encounter, and knowledge you will gain are largely unknown. Pre-Design documentation for landscape architecture can be viewed as an itinerary for the design process, including a roster of fellow collaborators and their responsibilities, schedule, where the team seeks to innovate, and what they hope to learn and accomplish. While the outcome of the journey cannot be known, the preparation necessary to make the project rewarding can be accomplished.

Inquiring

Much of the Pre-Design documentation will need to be elicited from client intelligence and can only be completed properly and comprehensively by asking the right questions. The right questions are those that uncover any and all significant influences, in order to guide a necessarily responsive design approach. Answers to these questions should be depicted in a format that advances both the client's and team's understanding of the project as a whole. An analytical dissection of the responses helps to further develop and elevate their understanding. For example, a lump-sum site construction budget can be analyzed on a square-foot basis and, ultimately, be defined in visual quality terms. Here, image documentation is especially useful and can readily be conducted as a Pre-Design exercise.

Exploratory

Furthermore, it is not premature to use the Pre-Design discussion to begin to sort through factual data to define potential conflicts, challenges, and opportunities. While documentation of these conditions should be precise, they can also be defined in "brainstorm" fashion, where fear of making mistakes or poor judgments is played down. Where some may see opportunity, others may see liability. At this point in the process, open and potentially conflicting thinking is much more beneficial than it is problematic. "To be creative [first] requires divergent thinking (generating many unique [perspectives]) and then convergent thinking (combining those ideas into the best result)."[1]

Eventually, an important, albeit introductory, search for analytical convergences will allow the design team to begin to understand potentially beneficial relationships between identified conditions. These determinations are most readily achieved by consolidating a strategic picture of the project with enlightening graphic or other diagnostic means. The selection of data to combine and how to illustrate these data can yield sometimes unexpected discoveries. For instance, view conditions and solar aspect may suggest desirable site destinations. Community needs, environmental sensitivities, and the cultural history of the site may eventually result in a programmatic logic for site development. Or, a water conservation budget, geotechnical analysis, existing habitat conditions, and the local landscape ordinance may somehow converge as a landscape framework for further design exploration.

PRE-DESIGN COMPONENTS

Key components of the Pre-Design phase are highlighted below in a logical sequence, although the precise order is generally flexible. This outline should not be used as an exhaustively comprehensive depiction of the Pre-Design process, as each firm will define its requirements individually. For example, a firm might require that a particular approach to research be defined or that a specialized type of needs assessment be conducted, complementing the programmatic and analytical studies noted here.

These components are defined in much greater detail in *Section Three, Guidelines and Best Practices.*

- Conduct an extensive **client interview** in order to identify key issues, objectives, programmatic interests, and critical success factors.
- Execute a Consultant–Owner Contract and include a **detailed work scope** for the landscape architect and its subconsultants. Determine cost of services and the method contemplated for award of construction contract.
- Establish a project **work plan** and present it for review and coordination at a strategic kickoff meeting. Include a detailed project schedule, work tasks and associated fees, consultant team and individual roles and responsibilities, a *communication plan*, a *quality management plan*, work product/deliverables and, if determined necessary, a *risk mitigation plan.*

[1] Bronson, Po, and Ashley Merryman. "The Creativity Crisis." *Newsweek*, July 10, 2010.

- Prepare a detailed site **base plan** derived from a well-prepared land survey, including elements such as existing topography, rights of way, property lines, existing structures, easement areas, utilities, existing vegetation, floodplain, and wetland designations. Field verify the survey, including limits of existing improvements, existing trees and if possible, property line, and right of way dimensions and bearings. Verify utilities on site and check for easement restrictions.
- Conduct a **soils and geotechnical analysis** with a Soils Engineer to determine structural design implications, water percolation and runoff rates, erosion susceptibilities, and other issues that may affect site planning and design, including topsoil reuse or soil amendment for proposed planting.
- Conduct an initial site visit in order to prepare a **site investigation** which comprehensively summarizes design influences, including opportunities and constraints. Evaluate site conditions, including slopes, wetlands, soils, vegetation, climate, cultural conditions, legal site constraints, current site utilization, infrastructure, and surrounding land uses. The site investigation will be used as the basis of the site assessment; a more diagnostic analysis of the site's potential to accommodate design intervention.
- Conduct **user interviews** with those familiar with the site, including if appropriate community representatives, maintenance personnel, and government officials. Summarize and combine with precedential issues and parameters and with site investigation.
- Complete a **code review** by first identifying relevant laws, rules, codes, and regulations governing the site and proposed uses. Graphically summarize applicable zoning requirements and development ordinances, deed restrictions, building and construction regulations, barrier-free requirements, site coverage requirements, open-space requirements, landscape/planting requirements, building and parking setbacks, parking requirements, buffers, easements, rights of way, sign ordinances, fire-lane requirements, and other site constraints. Identify lighting codes that govern maximum energy use and maximum or minimum illumination levels, as well as light pollution ordinances that address "dark sky" or control light "trespass" onto adjacent properties.[2]
- Determine necessary **processes for review and approval** of proposed design and associated documentation.
- Establish a **preliminary program** to frame a Pre-Design point of departure for further development at Concept and Schematic Design.
- Obtain (from the client) or develop a site development **construction budget** or cost model, itemized at a minimum in broad categories such as site remediation, civil infrastructure, landscape, and art. Confirm that the budget is assigned and confirmed relative to site size, on a square-foot or acreage basis.
- Frame the most **precedential issues and parameters** for further use in developing design exploration, based upon all that has been gleaned from data assembled above.
- Brainstorm and define **key questions** that need to be addressed in order to advance the team's understanding of design opportunities, challenges, and potential processes.
- Identify the key **research needs and opportunities to innovate**, based upon the client's objectives and interests, the site conditions, precedential issues, and key dilemmas inherent in the project, in order to produce a superior performing design outcome.

These needs and opportunities should include metrics or principles to guide and measure the success of the design or compliance with LEED®, Sustainable Sites®, or other national or internationally accredited environment and energy conservation program with strategies to obtain certification credits and a sustainable design approach.

Key Coordination Needs

The Pre-Design phase requires the full complement of client and multidisciplinary team members to participate in the determination of issues, parameters, and preliminary intentions. The client's role in Pre-Design is critical to establishing a sound and complete Pre-Design foundation. The client may combine his initial perspective on the project with what he learns from initial consultant analyses and findings in order to further develop his point of view.

A potentially diverse set of viewpoints will need to be coordinated. Initially, individual consultants will conduct independent studies and analyses, some of which are noted above. From there, the landscape architect will facilitate integration and shared discussion of the data.

While the landscape architect may have primary responsibility for each of the tasks that follow, he or she will need to collaborate and coordinate this work with those consultants listed. The defined coordination needs are provided as examples and are not intended to represent a comprehensive set of responsibilities.

Typical Pre-Design Coordination Needs (Partial List)

Listed here are selected typical issues to be coordinated during the Pre-Design phase.

[2] Patrick Quigley, Patrick B Quigley and Associates.

Detailed Work Scope

The landscape architect must understand relationships between his contractual work scope and that of collaborating disciplines. These work scope relationships may include overlaps, redundancies, and potential conflicts.

Closest work scope relationships often occur between the landscape architect and the civil engineer, in the realm of grading and drainage, pavement design, and circulation system layout. Work scope coordination with the lighting designer must be made clear, as both the landscape architect and lighting designer may have site lighting design and documentation responsibility. Work scope coordination with the architect may require clarification concerning detailing responsibilities, for example, for those elements such as walls that may extend from building architecture.

It is expected that the landscape architect will lead the team and facilitate coordination necessary to satisfactorily complete the work.

Site Analysis

- Soils analysis with geotechnical engineer
- Soils analysis with an agricultural soil expert
- Habitat and wildlife with ecological specialist
- Tree conditions with an existing tree survey and arborist
- Site hydrology with a hydrologist
- Natural history of the site with a geologist or paleobiologist
- Utility infrastructure with civil engineer
- Site cultural artifacts with an archeologist or anthropologist
- Community context with neighborhood representatives, including adjacent land uses, access and other relationships

Preliminary Program (Primary Spaces, Functions, Features, or Activities)

- Program necessary to accomplish client's objectives, with client
- Program elements prepared by others retained by the client, for example, architecture and engineering improvements, with collaborating disciplines
- Program required by governments to meet requirements, with reviewing agencies

Code Review

- Building-related requirements with architect
- Stormwater management program with civil engineer and opportunities for innovation with governing agency
- Access and parking requirements with civil engineer
- Lighting requirements with lighting designer, as well as with the electrical engineer and explore opportunities to innovate with governing agencies[3]
- Documentation requirements, including submission requirements, formatting of drawings and specifications, and content requirements

Research Needs and Opportunities to Innovate

- The landscape architect acts as a steward of the land and should look for every opportunity to improve current best practices in his or her design. Project-specific research is often the best opportunity to effect change in the industry, as this work can be compensated in the pursuit of client objectives and interest in innovative outcomes.
- Much of what the landscape architect does is made better via interdisciplinary support. Many problems are complex enough that improved solutions can only be attained with interdisciplinary study.
- A vast array of collaborative opportunities to innovate are available to the landscape architect and his or her collaborative team. These opportunities should be prioritized in order to address key project challenges. Example research topics requiring coordination are:
    - Sustainable stormwater management, coordinated with civil engineers
    - Energy efficiency and conservation, coordinated with electrical engineers
    - Water efficiency and conservation, coordinated with mechanical engineers and irrigation system consultants
    - Environmental quality and preservation; coordinated with various environmental scientists
    - Material performance, coordinated with various engineers
    - Public health and safety, coordinated with community representatives
    - Public policy and development legislation, coordinated with municipal representatives
    - Product selection and manufacturing materials and processes with consultant team

There will likely be additional topics requiring coordination that should be defined by the landscape architect to suit specific project needs.

[3] Patrick Quigley, Patrick B Quigley and Associates.

5 CONCEPT DESIGN: DEVELOPING THE FRAMEWORK

PURPOSE

Having acquired a preliminary understanding of the project site and having established broad parameters for design at the Pre-Design phase, Concept Design is organized to explore a preliminary design framework. A design framework is the primary and essential organizing structure for the design. Frameworks are the basis for what becomes an emerging vision and detailed intent to be developed at the Schematic Design phase. The emerging concept should be a direct response to requirements established at the Pre-Design phase.

Design frameworks are both derived from and are used to help develop a preliminary mission, vision, program, principles, performance metrics, and thesis position. Concept Design is used to organize and prioritize the programmatic scope and establish preliminary relationships among the primary project components. A primary objective is to explore varied approaches that can be evaluated against stated goals and objectives. While alternative schemes should generally be feasible they should not be overly constrained by nullifying criteria. Innovative and creative thinking should be encouraged. The effort should be aimed at defining what is possible based upon the most aspiring ambition for the project.

Emphasis should be placed on arriving at a transformative "big idea," a solution that addresses stated intent and addresses the central project predicaments in the most compelling fashion.

DOCUMENTATION CHARACTERIZATION

Concept Design documentation is inherently exploratory, diagrammatic, and distilled, organized to highlight fundamental intent. While various formats may be used to document Concept Design, these documents should be developed with the knowledge that Schematic Design will yield a more detailed set of intentions and outcomes. In that sense, Concept Design is strategically organized as a high-level exercise and should be documented to convey key messages and big ideas.

CONCEPT DESIGN COMPONENTS

The Concept Design phase is a fluid and flexible process that evolves with the accruing requirements of the project. There is, however, a set of baseline components that should be provided in order to adequately convey and substantiate the emerging conceptual direction. In landscape architecture and allied design industries, distinctions between Concept and Schematic Design vary. In some cases, these distinctions may be fuzzy and potentially overlapping. This is not problematic if the basic tenets and logic of the process are used to inform design outcomes, regardless of where they occur.

Note that in some cases, Concept Design may be combined with Schematic Design, conducted as a single Schematic Design phase. That approach may result from schedule pressures or a desire to simplify and consolidate the design process.

A brief summary of key Concept Design components is described here. These components are defined in much greater detail in *Section Three:* ***Guidelines and Best Practices.***

Assimilate the **site analysis and evaluation,** including baseline site data collection and contextual inventory, highlighting the site's opportunities and constraints, assessing baseline data that correlate with proposed design solutions.

Further develop the **preliminary project program**, as initiated with the client at the Pre-Design phase, depicting proposed site elements and associated characteristics.

Further develop **design intent**, consolidating materials assembled during the Pre-Design phase, including client mission, vision, critical success factors, SMART (Specific, Measurable, Assignable, Realistic, and Time-Related) goals and objectives, and performance metrics.

Consider consolidating program, design intent and other project requirements as a narrative **design brief**.

Initiate statements of **dilemma and thesis** position for the project. The dilemma is a carefully considered but brief description of the primary challenge(s) that

need to be overcome to accomplish the project mission. The written thesis is a proposition, supported by an argument, which will drive the project outcome. Note that dilemma and thesis statements may be initiated at the Pre-Design phase, if sufficient information is available to inform this perspective.

Establish **performance metrics** (measurable objectives) for primary categories such as art, environment, community, and economics. Metrics can be used both to evaluate design alternatives and, ultimately, the success of the final proposal. Metrics can be documented in narrative or graphic format.

Initiate **design principles**. Design principles are generally regarded as beliefs or assumptions that guide design decision making. Clarify, test, and communicate these principles with the project team. Consider accompanying principles with historic and contemporary **design precedents** to reinforce principles and display issues and lessons learned from similar work.

Evaluate alternative conceptual **design frameworks**, or diagrams that respond to established design intent. Focus on the design **parti**, or big idea rationale, a diagrammatic depiction of the most fundamental organizing philosophy of the proposal. The parti announces the driving force behind the emerging schematic idea, in a simple yet compelling fashion. "The parti is the widest yet most profound description possible of [the] act of making."[1] Frameworks may be developed to address key topics such as community, environment, economics, and art.

Utilize **design studies** to explore and evaluate conceptual relationships among programmatic elements, highlighting the application of principles to serve the project mission and vision. Studies can be represented in any graphic form, including plans, sections, elevations, and three-dimensional drawings and models. Design studies should be clearly connected to site conditions and built from design frameworks.

[1] Bermudez, Julio. "On the Architectural Design Parti." University of Utah—College of Architecture Planning, 2006.

Begin to explore options for **design character**, physical characteristics of the emerging proposal, setting a course for more detailed studies at Schematic Design.

Complete a conceptual-level **estimate of probable construction costs** to establish the initial order of magnitude costs or to quantify the cost for alternative concept directions. This may help the client to make design decisions and work toward a "preferred alternative" for further development in the Schematic Design phase.

Organize a preliminary **phasing plan**, if necessary to divide the project into sequenced construction zones.

KEY COORDINATION NEEDS

Because Conceptual Design is primarily focused on generating the initial project approach, coordination efforts should be collaboratively focused on alignment of multi-disciplinary intent.

TYPICAL CONCEPT DESIGN COORDINATION NEEDS (PARTIAL LIST)

- **Preliminary Project Program:** Relationships between interdisciplinary design program elements
- **Design Intent:** Overall alignment and integration of project mission, vision, SMART (Specific, Measurable, Achievable, Realistic, and Time-Related) goals, and objectives and performance metrics
- **Design Character:** Unified perspective on physical characteristics, materials, scale, and spatial organization

6 SCHEMATIC DESIGN: ESTABLISHING CONTENT

PURPOSE

Having established parameters in Pre-Design and a conceptual design framework at the Conceptual Design phase, Schematic Design can be initiated with a basis to begin formulating detailed design intent. Intent defines the essence of Schematic Design. Intentions come in the form of principles, performance metrics, a mission, a thesis, and form and character studies. It is also important to recognize that like Conceptual Design, this is still an analytical phase, a response to the conditions established in Pre-Design, the evolution of the design framed in Conceptual Design, and the intent established at the outset of Schematic Design. To conceive of a coherently whole design direction that encompasses the myriad objectives, parameters, and constraints is the primary challenge of Schematic Design.

Schematic Design refines the programmatic scope, spatial and scalar organization, and relationships among the primary components of the project initially developed in the Conceptual Design phase. "The primary objective is to arrive at a clearly defined and feasible scheme after exploring the most promising alternative design solutions."[1] The selected scheme is that which best fulfills defined intent.

As an extension of the vision-seeking Concept Design phase, the Schematic Design process should not be constrained by the laborious study of individual details. Collectively defined detail systems, however, are important as they serve the mission of the project. Systems generally define the performance basis of the landscape and, therefore, are critical in determining the measurable success of the proposed Schematic Design. Stormwater management and groundwater recharge, water and energy use, heat island mitigation, noise mitigation, and accident reduction represent a few of the large number of potential performance metrics.

DOCUMENTATION CHARACTERIZATION

Like Concept Design, Schematic Design documentation is inherently diagrammatic, illustrative, three-dimensional, and accompanied by well-defined narrative intent, yet more refined to comply with the technical analysis of the site. While alternative studies, iterative exploration, and evaluation represent the critical procedures of this phase, associated work products are not always overtly or comprehensively documented. That may not be problematic, as long as alternatives are defined tangibly enough to be given due consideration. It is important, however, that the logic and reasoning of the preferred schematic proposal is well documented.

At its essence, Schematic Design is a problem-solving exercise, an exercise that relies upon coherent reasoning—"making decisions, expressing ideas, verifying and evaluating proposals, and ultimately, taking action."[2]

Several additional attributes characterize Schematic Design documentation; these are discussed next.

Measurable

Metrics are methods of measuring intent, or the results obtained from this intent. If "what gets measured gets done," selected components of the Schematic Design documentation must be explicitly measurable, as they relate to accomplishing stated objectives or performance intentions. "Measurable" suggests that stated metrics can be practicably quantified and evaluated as part of the design alternatives selection process. Environmental and economic performance are most readily measured, such as water conservation and associated operational cost savings, groundwater recharge and infrastructure savings, or quantity of re-used or recycled materials.

Social and community development metrics are often less easily tangibly measured and, thus, require careful consideration. For example, a park design team interested in attracting a diverse group of park users might define an age- and ethnic-based recreation program to establish a wide community draw. That program could be informed by demographers, who might first determine population subgroups living around the park, then determine characteristics and interests of these subgroups. These data could be linked to the park program to determine underserved or neglected groups. The results of the exercise could be summarized and evaluated by quantifying projected park users and associated demographics.

[1] "Schematic Design Phase." Charles Levin Architects. January 1, 2006. www.charleslevinarchitects.com/whatwedo/schematicdesign/schematicdesign.html

[2] Do, E. and M. D. Gross, "Drawing as a Means to Design Reasoning," Artificial Intelligence in Design '96 Workshop on Visual Representation, Reasoning and Interaction in Design, Palo Alto, CA, 1996

Aligned

While Design Development documents and Construction Documentation are appropriately produced as independent packages by collaborating disciplines, Schematic Design documentation benefits from a more seamless integration of interdisciplinary intent. That suggests graphic amalgamation of design proposals, whereby issues of alignment or conflict may be identified. Relationships between disciplinary content should be clearly assimilated before they can be documented discretely.

A number of interdisciplinary examples illustrate the role of integrated, well-aligned Schematic Design documentation:

- Architectural and site relationships are highlighted by showing interior uses, spatial organization and associated site relationships.
- Preserved habitat areas are portrayed relative to mitigated impacts from proposed site development. For example, it should be clear how alterations to site drainage patterns affect these areas.
- The organization of sustainable stormwater management infrastructure is formally and graphically integrated with the landscape architecture program.
- Site art is integrally depicted as it serves the schematic mission of the project and supports its storyline.
- Measurable lighting metrics such as minimum safety and task illumination levels and contrast ratios are recorded on the graphic representation of the project's "Nighttime Choreography Plan" and reflects the use of light and the absence of light to create a sequence of visual events that informs, directs, entertains, and pleases the eye. Narrative complements the graphics of the plan to explain the choreographic sequences, project wayfinding, and how the lighting scheme supports the landscape architect's design concepts at night.[3]

On Message

By definition a true "schematic" is a drawing that is graphically conceived to communicate simplified, often distilled messages. Abstraction and even unrealistic graphic symbols are used to convey selective content. Subway maps are a good example, where largely inaccurate maps are remarkably effective in guiding travelers to destinations. These maps are effective because they are strictly conceived with selective purpose, without the addition of extraneous information that does not serve that purpose. These maps are not graphically diluted with land uses, street names, or other destinations. Station points and relative directional relationships between stations are presented, rather than actual routing configurations and scaled relationships. That is all the traveler needs to know, and sometimes, all that he or she has time to digest.

In landscape architecture, each schematic document must be carefully devised with an acute understanding of the key points that should be communicated. Some documents should be keenly focused on the most relevant information to convey intent, even in exaggerated fashion. A *parti diagram* manifests this principle, whereby the viewer gleans the most fundamental message at a glance. A *contextual framework plan* should be equally vivid in its display of information. Rather than read as an inventory of collected data, framework plans should convey either a hierarchy of conclusions or define a set of key relationships. Even ostensibly complex and multifaceted drawings, such as perspective renderings, should be composed and distilled to highlight the primary mission of the project.

Emotive

Schematic landscape architectural design documentation should instill a strong set of intended emotions in the viewer. These emotions may coincide with the intended response of actual users of the proposed built environment, aligned with the mission of the project. Every landscape serves a unique purpose. Drawing medium, content, and vantage point should be selected to portray that intent. A conservation landscape will be rendered differently than a community park or an environmental remediation. Nuanced qualities that can be graphically interpreted by the viewers will help them understand the essence of the project.

Landscape architectural drawings are not made beautiful exclusively for beauty's sake. Beautiful drawings should allow the viewer to embrace the proposed design. While a stunning drawing may initially allure an audience, immersion in the experience of the depicted space is the ultimate objective. Cool and tranquil? Meditative? Ephemeral? What epitomizes the space? And how is the drawing formulated to characterize that epitome?

Note that not all schematic documents are characterized with emotional responsibilities. Diagrams, analytical investigations, and spatial and form studies address other objectives that help build logic that leads to an expressive outcome.

[3] Patrick Quigley, Patrick B Quigley and Associates.

SCHEMATIC DESIGN COMPONENTS

The following components of the Schematic Design documentation package comprise a comprehensive, logically ordered set of deliverables. While the list should be viewed as a complete and necessary set of processes and documents, some project circumstances may suggest the consolidation or abbreviation of components. For example, *design principles* and *character images* may be combined to establish relationships between the two elements. Or, *character images* and a *cost model* may be integrated to illustrate proposed built quality.

These components are defined in much greater detail in *Section Three: Guidelines and Best Practices.*

- Establish a **Cover Sheet** for the documents that minimally announces the project and illustrates a compelling and characteristic view of the schematic design proposal.
- Develop a **contextual framework** plan that makes analytical conclusions about issues such as adjoining circulation systems, land-use patterns, open space and drainage systems, the site's historical context, and relationships to project considerations.
- Complete a larger-scaled, more detailed **site assessment** that depicts any unique challenges or opportunities as they relate to the mission and intended project program.
- Reaffirm an iterated **dilemma and thesis** position for the project that was developed during Conceptual Design. The dilemma is a carefully considered but brief description of the primary challenge(s) that need to be overcome to accomplish the project mission. The written thesis is a proposition, supported by an argument, which will drive the project outcome.
- Reaffirm **performance metrics** (measurable objectives) that were developed during Conceptual Design for primary categories such as art, environment, community, and economics. Metrics can be used both to evaluate design alternatives and, ultimately, the success of the final proposal. Metrics can be documented in narrative or graphic format.
- Reaffirm and further develop **design principles**. Clarify, test, and communicate principles developed at the Concept Design phase.
- Reaffirm and further develop **design precedents** to reinforce principles.
- Further develop and articulate the Pre-Design **program**, documenting all known attributes such as size, function, character, materials, and relationships or affinities between spaces and elements. Frame the role of art in serving the program.
- Finalize the design framework **parti,** or big idea rationale, a diagrammatic depiction of the most fundamental organizing philosophy of the proposal.
- Develop a construction **cost model** to potentially define a range of quality scenarios for programmatic and site material systems. Further develop that cost model to reflect the preferred plan.
- Accompany the cost model with **character images** to exemplify intended spaces, quality and components.
- Prepare **design alternatives** and conduct design reviews to evaluate these options relative to principles and performance metrics.
- Utilize physical and electronic **study models** to examine spatial intent, scale and three-dimensional form.
- Select and further develop a **preferred plan**. Include materials, plant massing, limit of irrigation, site furniture, special paving, structures, lighting, parking, roads, and conceptual grading.
- Prepare **illustrative elevations**, **composite sections**, and **three-dimensional drawings** to communicate character, scale, and spatial intent.
- Develop **sketch details** to illustrate the key component and material personality of the built environment.
- Define a **materials** and **components palette** for landscaping, paving, walls, lighting, signage, and site furniture. Assemble materials options, with associated costs. Include primary intentions for art.
- Evaluate and test the preferred alternative for compliance with all requirements, for example, program, legal, code, and client requirements. Document key **compliance issues** and shortcomings.
- Prepare a schematic construction **phasing** diagram, if phasing is necessary.
- Conduct introductory level **coordination** with consultants to determine feasibility of proposed design. Coordinate selected alternative with off-site systems, including circulation, stormwater management, and utility systems.

- Prepare **preliminary project descriptions** (PPDs) to convey pre-specification intent. These pre-specification descriptions define the components and systems proposed for the project and are an industry protocol, with formatting recommendations established by the Construction Specifications Institute, based on the UniFormat ™ system.
- Utilizing the Schematic-level drawings and PPDs, prepare a schematic-level **estimate of probable construction costs** to verify design intent is aligned with the client's budget. Value engineering should be incorporated, if necessary, prior to proceeding to the Design Development phase to ensure design intent meets the prescribed budget.

KEY COORDINATION NEEDS

If Schematic Design is primarily about establishing well-informed intent, it is most effectively accomplished from a diverse multidisciplinary perspective. That approach helps to ensure a comprehensive and well-coordinated foundation of possibilities. Key elements of the Schematic Design process are best accomplished as a set of workshops, charrettes, or other venues where face-to-face interaction both deepens and expedites the exploration. Basic coordination is inherently built into these sessions.

Open, inclusive and transparent discussions raise the level of trust between team members and usually result in more productive and far-reaching outcomes, especially when contrasted with work completed independently. A search for synergies is an important feature of this process, whereby designed relationships between disciplines drive the most sustainable solutions. Sustainability as a concept is most fundamentally associated with relationships among economy, environment, community, and the arts. When any of these elements are conceived independently, for example, environmental practices that neglect financial return, they are often less successful over the long term.

As noted, Schematic Design documentation benefits from a seamless integration of high-level, interdisciplinary intent. Schematic components such as Performance Metrics, Principles, and Program should be developed as multidisciplinary work products, rather than independently oriented exercises.

While the landscape architect may have primary responsibility for each of the tasks itemized below, he or she will need to collaborate and coordinate this work with those consultants listed. The defined coordination needs are provided as examples and are not intended to represent a comprehensive set of responsibilities.

TYPICAL SCHEMATIC DESIGN COORDINATION NEEDS (PARTIAL LIST)

Performance Metrics

- Varied and widespread coordination needs with all consultants

Program

- Access, circulation, and parking needs with building architect and civil engineer
- Stormwater management program with civil engineer
- Building-related spaces with architect
- Recreation spaces with city and community
- Safety, security, and wayfinding lighting, as well as interface between architectural façade and landscape lighting, with lighting designer; power distribution with electrical engineer[4]

Documentation

- Drawing content and format requirements with reviewing and approval agency or jurisdiction
- PPD format and content with consultant team

Illustrative Elevations, Composite Sections and Three-Dimensional Drawings

- Three-dimensional character and materialization with all design disciplines
- Preliminary feasibility of site structures with structural engineer
- Primary drainage intent and sustainable water management with civil engineer

Cost Model

- Cost relationships between site disciplines, for example, civil, irrigation and environmental systems
- Itemized cost program and unit pricing with professional estimator or general contractor
- Relationship of site work budget to overall project budget, with prime consultant

[4] Patrick Quigley, Patrick B Quigley and Associates.

7 DESIGN DEVELOPMENT—DESIGN SOLUTIONS

PURPOSE

If Schematic Design is used to frame clear and comprehensive design intent, Design Development (DD) must give substance to that intent, resolving all design decisions. During the Design Development phase, the proposed scheme is advanced and further developed to become the final design. In previous phases, the focus has been on the project as a whole. During Design Development, it becomes important to give individual attention to each system, each space, each component, and each detail of the project.

The "development" of detailed design solutions requires exhaustive and comprehensive studies and documentation, in order to resolve all design decisions. Conclusions must be made relative to program, plan, and three-dimensional forms, materials, and relationships between interdisciplinary systems and components. A critical aspect of Design Development relative to Schematic Design and Construction Documentation is the need to investigate the physical relationships and interface between every element, material, and system of the project. This makes it the most important phase from a design perspective.

While the Design Development phase represents a period of exploration and discovery, it must conclude with a set of design decisions, each of which results in a cost implication and coordination responsibility. In finalizing the "development" of any and all design ideas, the Design Development documents serve as a record of these decisions. In that sense, the Design Development documents should be well organized as a catalog of design decisions, structured as the initial foundation of the Construction Document set.

Key Issues

While a multitude of issues need to be addressed during the Design Development phase, several general issues must be affirmed in order to successfully complete the DD phase. While specific details associated with each project will vary, these questions apply somewhat universally to the work of landscape architects.

Some basic questions to ask at this stage include:

- In its current level of documentation, is the design proposal *coordinated*?
- Will the proposed design *perform* as intended?
- Is the design fully *resolved*?

These questions can be elaborated to more specifically fit each unique project. Some typical subquestions might include:

1. RIGOROUS INTERDISCIPLINARY COORDINATION: ARE FEASIBILITY LEVEL ISSUES LARGELY RESOLVED?

- Do site-building relationships work, that is, are they programmatically supportive, physically integrated, and materially coordinated?
- Do the proposed site structures work? Has preliminary structural design been completed for landscape architectural elements, for example, bridges, site architecture, site walls, stairs, and pavements?
- Does the civil-landscape interface support mutual objectives? Have physical systems been coordinated?
- Has the irrigation system been designed to reflect specified plant watering needs, soil infiltration, and water-conservation objectives?
- Does the proposed design fit the allocated budget as evaluated by a professional cost estimator or contractor?
- Have environmental and habitat impacts been measured by and proven to be satisfactory?
- Has the constructability of proposed systems been judged reasonable by contractors or other construction experts?

2. PERFORMANCE MEASURES CONFIRMED: DOES IT WORK AS INTENDED?

- Have the financial conditions and purported benefits of the proposal been quantified to meet intentions?
- Have community objectives been accomplished via program development and other improvements?
- Has the performance of proposed environmental systems such as sustainable water management been quantified to meet objectives?
- Does public art serve its purpose as part of the larger design mission?

- Have illumination calculations been performed at key locations to insure program light levels are met? [1]
  (Performance measures noted above are representative and could be greatly expanded by design teams.)

3. THREE-DIMENSIONAL DESIGN RESOLUTION: IS IT FULLY CRAFTED?

- Has an overall design language been established that serves the project mission and guides the development of form?
- Have alternative options been modeled and evaluated for each space and component?
- Has each final space, component, material, and system been thoroughly studied three-dimensionally in order to resolve all aesthetic, technical, and durability issues?
- Have specialized material systems such as metal work and precast concrete been reviewed by trade contractors for design and technical quality control?
- Have full-scale mock-ups been completed for all unique design components and systems in order to verify scale, form, connections, and material finishes? Have these mock-ups been reviewed with product and material representatives?
- Has the durability of proposed systems and components been evaluated by quality control experts or trade specialists?

KEY DISTINCTIONS BETWEEN DESIGN DEVELOPMENT AND CONSTRUCTION DOCUMENT PHASES

For many designers, it is not always obvious just how far to go with Design Development. Frankly, there is widespread discrepancy, if not confusion, concerning Design Development thresholds. There are legitimate and useful distinctions between Design Development *design* decisions and *implementation* decisions made during the Construction Documentation phase. These distinctions are not always clear and can improperly result in either carrying over Design Development work into Construction Documentation or pursuing Construction Documentation decisions during the Design Development phase.

Design Development decisions include shape, size, materials, quantities, connections, and setting systems which allow the project to be visualized, coordinated, and estimated but—due to the absence of enough detailed, technical and proprietary information—not constructed.

Construction Documentation includes additional information which allows the project to be precisely bid and built, including full three-dimensional layout, complete quantification and the proprietary identification of materials, components, and systems.

For example, a Design Development site wall should be documented to include the approximate size and shape, the material and finish, and a generic description of the proposed structural, drainage, and setting systems. As the wall becomes a construction document detail, specific layout, reinforcement, material, and finish information is provided.

Several comparative illustrations are offered to further distinguish Design Development documents from Construction Documents and to reinforce the importance of completing Design Development decisions.

DD: Final forms illustrated, with key dimensions
CD: Final forms illustrated and fully dimensioned

DD: Primary three-dimensional intent (grading) defined
CD: Exhaustively comprehensive three-dimensional requirements (grading) defined

DD: Material and component choices made, with condensed and potentially generic descriptions
CD: Material and component choices made, with full and proprietary descriptions

DD: Emphasis on composite, three-dimensional drawings to illustrate relationships between systems and components
CD: Emphasis on focused and independent documentation of individual systems and components, itemized methodically (see "Subject Elements" in *Chapter Three: Operational Principles)*

DD: Connections and setting systems generically defined and illustrated
CD: Connections and setting systems specifically defined and illustrated

DD: Feasibility level consultant coordination conducted
CD: Detailed consultant coordination conducted

DD: Focused design reviews and comprehensive quality control red-line reviews conducted
CD: Comprehensive quality control red-line reviews conducted

[1] Patrick Quigley, Patrick B Quigley and Associates.

An excerpt from Chapter 3 below reinforces some basic distinctions between DD and CD Details:

DD DETAILS:

Show preliminary materials and finishes, forms and relationships to adjoining systems

Put emphasis on three-dimensional resolution and composite relationships

Show key dimensions only

Show generic structural intent, but not specific structural detail, for example, "rebar reinforcement to be determined"

CD DETAILS:

Show final materials, patterns, forms, and relationships to adjoining systems

Show all dimensions

Define specific structural requirements and interdisciplinary needs

DOCUMENTATION CHARACTERIZATION

Design Development documents are oriented to multiple audiences. More than any other phase, these deliverables should address diverse perspectives, and objectives. Part illustrative and part technical, the DD documents should allow the viewer to see into the life of the proposed space but also understand how it will be constructed. These drawings should be organized at a larger scale and with more detail than Schematic Design documentation. That will allow the designer to understand and resolve the detailed appearance and integration of materials, both visually and technically. Scale references such as people, plants and other entourage are useful devices in evaluating size and spatial relationships.

Several additional attributes characterize Design Development documentation.

Explicit

Where Schematic Design documentation representation can be abstractly conceptual and Construction Documentations can be diagrammatically representational, Design Development representation is often most useful when drawn to scale and with enough realism to be envisioned as a tangible proposal. That calls for three-dimensional representation, including above- and below-grade elements and interior views of detailed components. It is especially important that plan components are represented accurately and to scale, in order to address relationships and potential conflicts with adjoining systems.

Explicitness results most readily from enlarged scale of study, where detail, precision, and level of resolution are both evident and unavoidable. Large-scale plan and detail studies serve the landscape architect well in his or her efforts to achieve design decisions.

Amalgamated

At the Design Development phase the landscape architect can take a lead role in assembling and depicting multidisciplinary relationships. That role suggests the need for composite drawings that display integrated relationships between disciplines. Design Development documentation is inherently layered, complex, and multifaceted. As the transition to Construction Documentation takes place, these drawings are sorted as components and systems and are independently documented for clarity and quick detection within the documents.

Transitional

As transitional documents, the DD documents carry both illustrative and technical responsibilities. In that sense, they are a hybrid undertaking, with both design and documentation attributes. As such, Design Development should be organized as an early version of the Construction Documentation set. That suggests that the DD set be organized to match or closely resemble the organization and content of the CD set. Even if content has not yet been fully developed for each sheet, the DD set should include a placeholder version of that sheet to be further developed at the CD phase. In addition, all plan scale and extent decisions should be made at the DD phase and maintained through the CD phase.

Design Development Best Practices

A best practice is a technique, method, process, activity, incentive, or reward that is believed to be more effective at delivering a particular outcome than any other technique, method, or process when applied to a particular condition or circumstance. The idea suggests that with proper processes, checks, and testing, a desired outcome can be delivered with fewer problems and unforeseen complications. Best practices can also be defined as the most efficient (least amount of effort) and effective (best results) way of

accomplishing a task, based on repeatable procedures that have proven themselves over time for large numbers of people.[2]

Best practices are especially useful in complex and potentially wandering processes where outcomes are dependent upon sound decision making. Landscape architectural outcomes are almost fully reliant upon effective processes, rather than simply strokes of genius. Consequently, the landscape architectural design and documentation process can benefit from the application of best practices. As suggested as a principle throughout this book, the likelihood of a superior design solution is dependent upon effective relationships between design and documentation practices. Best practices also serve efficiency objectives, supporting the landscape architect's need to complete work on time and within the allocated fee.

Key best practices are presented to facilitate the Design Development design and documentation process.

Organizational Discipline

The Design Development phase is significantly more complex and voluminous than the Schematic Design phase. If Schematic Design is about vision and intent, Design Development is about delivering that vision with a high level of rigor and thoroughness. While detailed design and documentation can take place once Schematic Design requirements have been completed, these efforts should not begin in earnest without first establishing a clear organizational structure for producing the documents.

Numerous organizational and start-up issues should be addressed prior to engaging the design team. These issues should be addressed routinely and methodically at the outset of each Design Development exercise, but they should be broadly organized to address both the Design Development and Construction Documentation phases. The integral and immediately sequential relationship between the two phases suggests a need to organize content and production requirements jointly. Focused and well-organized team kick-off meetings are recommended to address these topics.

In order to ensure comprehensiveness, design firms should develop a detailed agenda to facilitate the DD kick-off meeting. Associated work products should be developed to present preliminarily at the meeting. The meeting may be organized in two sessions; one dedicated to organizational issues and the other to design and associated content issues. Following the organizational meeting, a separate meeting should address design content in order to dedicate necessary collaborative energies to the topic. For projects where the landscape architect is the prime design consultant or otherwise leading a team of subconsultants, the landscape architect should preside over these meetings.

Typical agendas are presented for these meetings:

DD ORGANIZATIONAL KICK-OFF MEETING TOPICS

Team Members' Roles and Responsibilities

Document Set Organization/Index of Drawings

Key Interdisciplinary Coordination Needs

Plan Sheet(s) Layout

Scale of Drawings

Drawing Organization (including content and format requirements)

Specification Format and Organization (including Division 01 and procurement documents, if applicable)

Project Manual Preparation (including General Conditions)

CAD Protocols (including file sharing)

Municipal Approval Drawing Requirements (including number and types of submittals)

Standard Symbols and Abbreviations

Production Schedule and Key Deadlines

Quality Control and Coordination Processes

Cost Estimating Process

DD DESIGN KICK-OFF MEETING TOPICS

Schematic Design Conclusions

Mission, Dilemma and Thesis Review

Current Client Comments (Schematic)

Team Design Review

Current Issues and Challenges

Performance Metrics Review

Form (Composition) Review

Construction Budget Status

Municipal Approvals Status

[2] Best Practice." Wikipedia. http://en.wikipedia.org/wiki/Best_practice.

DOCUMENT SET MOCK-UP

A graphic mock-up set of the projected document set should be produced in order to understand and organize the content, number and position of sheets and plan sheet layout. Note that an initial mock-up set should be established at the contract proposal stage in order to estimate fees, understand the general order of magnitude of the project, and assign consultant responsibilities. The DD mock-up set should be further developed as a more refined version of the original mock-up and include a "storyboard" of the proposed project design systems and components. A companion outline may be developed to itemize personnel responsibilities associated with each sheet.

Sheet and Document Set Mock-Up: All sheets within the proposed document set should be accurately defined. This mock-up includes all sheets, including the Cover Sheet, General Information series, plan sheets, detail sheets, and subconsultant sheets.

The mock-up set may be produced on reduced, rather than full-sized sheets. However, plans should be evaluated at full size to ensure the proper scale is identified for the plan sheets and will adequately describe the design for review and implementation. Graphically, the mock-up may either be produced informally as a set of sketch "thumbnail" drawings for each sheet or as a digitally organized depiction. Digital mock-ups can be drawn to scale with actual plan base information and, accordingly, will allow the project team to proceed efficiently into the development of actual documents.

Detail Systems Mock-Up: The most fully developed mock-up sets include the designation of all proposed detail systems, including sections and plan enlargements. This process is initiated with the establishment of the Site Detail Keynote List of "systems." A system is a proposed landscape architecture improvement, component, or assembly of integral components. It is defined by details and specifications and organized according to distinct site improvement categories, for example, pavements, ramps, and curbs; jointing; and steps, organized within the Detail Keynote system described within this publication.

Each "system" should correlate with the appropriate systems heading, for example, "pavements" may be assigned a keynote identifier, such as 1.1, 1.2, 1.3, and have a general title, such as Concrete Paving Type 1, Expansion Joint, or Stone Veneer Retaining Wall Type 1, to describe the proposed system. A brief description in parenthesis may follow to further differentiate it, if necessary, but is not required, for example, Concrete Paving Type 1—(4" Thick, Broom Finish), Stone Paving Type 3—(Irregular Stones, Random Pattern, On Concrete Sub-Slab with Snow Melt System), or Trellis Type 1—(Mfg. Std. Wood).

Upon establishment of all the "systems," a sketch detail should be prepared for each keynote. Note that sketch details should be initiated at the Schematic Design phase. Sketch details should graphically depict typical details for each system. They may be hand drawn or digitally drafted, and should generally be drawn to scale with dimensional accuracy. Additional details may be drawn for each system but may be considered supplemental as they depict unique project conditions. The typical detail may be generalized, that is, not precisely fit the site conditions, but they should still convey the design intent, character, quality, and scale of the element. This detail is often represented as a section but may also include enlargement plans, elevations, and axonometric or three-dimensional views.

As the details are being developed for each system, associated keynotes should be delineated on the current plan to ensure a complete and comprehensive mock-up. Additional detail references should be identified with a section, elevation, or enlargement plan call out.

Specifications Mock-Up: An important step in the storyboarding process is the identification of required specification sections. These sections are typically organized in compliance with the Construction Specification Institute (CSI) standard sections, Master Format 2004 edition, but they may also comply with federal, state, or local jurisdiction standards governing the project.

The CSI standard utilizes a six-digit reference number for each specification section, for example, 033000, 323216, 329230, which should be identified for each system.

In order to facilitate the preparation of outline specifications (and technical specifications in the Construction Documentation phase), a checklist has been developed to organize the base information required to develop specifications for each system. A line item for each keynote should include the necessary information to describe the proposed element, for example, manufacturer, product number, sizes and finish should be provided. This will assist the landscape architect in editing the baseline technical text and reduce the labor burden typically associated with the preparation of Specifications.

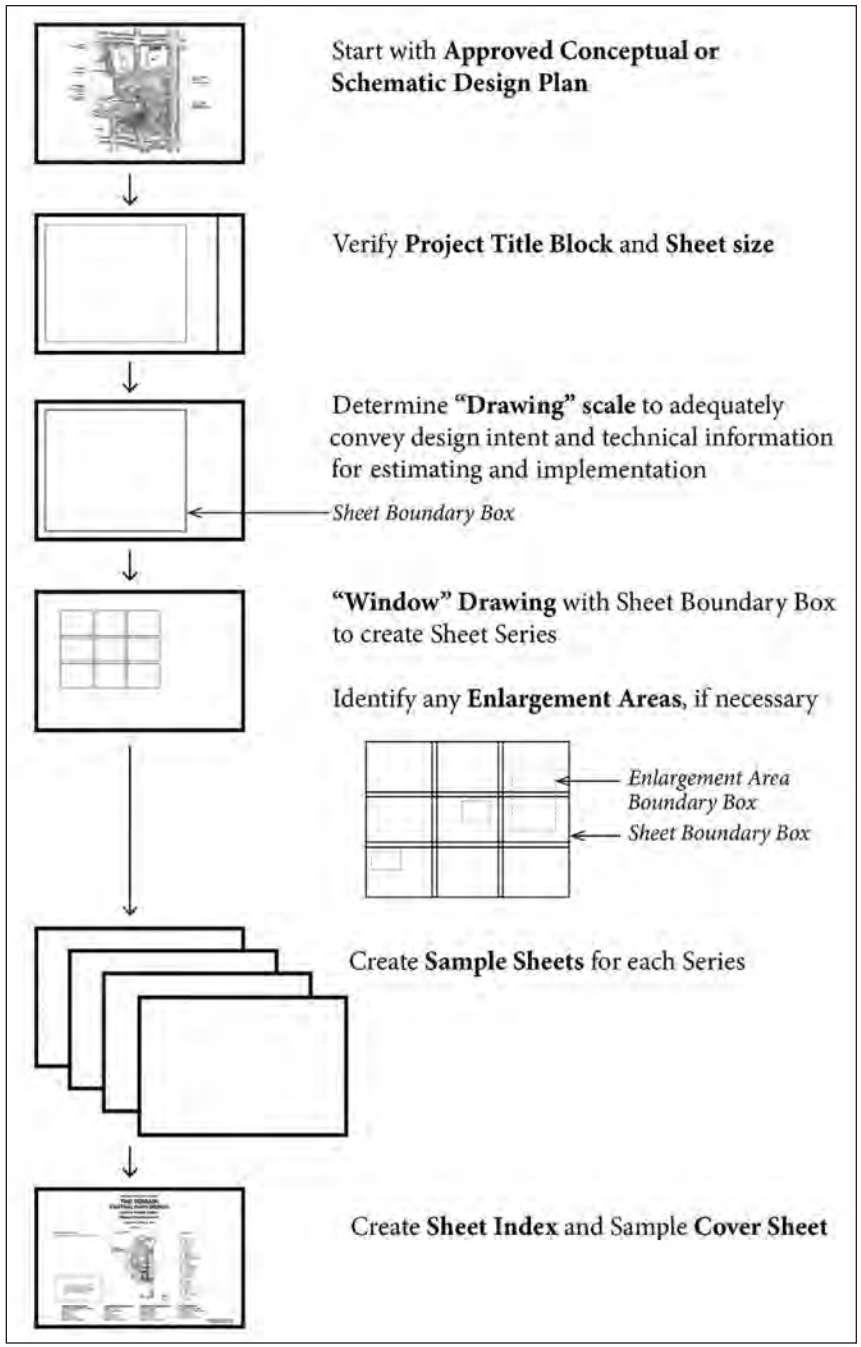


Diagram of the plan document set mock-up

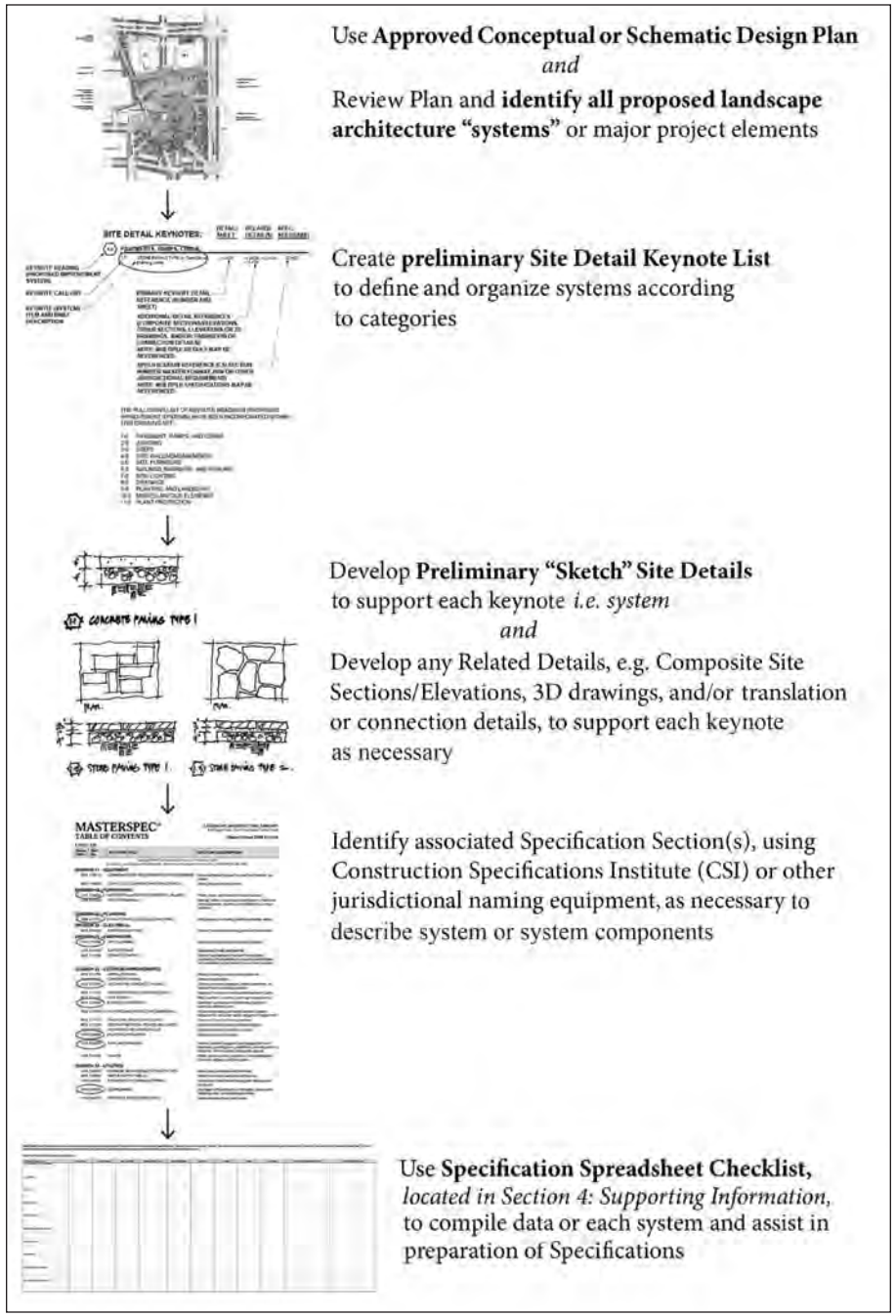


Diagram of the storyboard process for developing the design character

Three-Dimensional Emphasis

Design Development emphasis should be placed on three-dimensional study, depiction, and evaluation. Three-dimensional studies are more important than simply resolving the plan, as space, volume, form, and scale cannot be well understood two dimensionally. Plan, section, and elevation drawings alone leave design largely unresolved. An impressive and growing variety of tools and processes are available to the landscape architect in his or her pursuit of well-resolved three-dimensional design.

Study Models: Physical study models should first be used during the Schematic Design phase in order to study alternative spatial configurations. These models should generally be unfixed and flexible enough to accommodate a series of ongoing revisions. As alternative configurations are physically modeled, they can be photographed and digitally recorded for further comparative consideration as new alternatives are studied. "Study" is the key attribute of the Schematic Design modeling process. Presentation-quality detail and finish are generally not considered important at this stage.

Design Development modeling focuses on the development of the selected schematic alternative. These models are generally more refined than their schematic predecessors, as the emphasis shifts from space and scale to forms, materials, and relationships between elements. While materialization of the model can be depicted at various levels of detail, colors, patterns, and textures should approximate actual proposed characteristics. Components within the landscape architectural space should now be fashioned with attention to form. That will allow the design team to make integrated design decisions. Individual components can subsequently be modeled at a larger scale and with more detail.

Digital Models: Digital models also offer spatial and component modeling and, depending upon the software, can allow efficient revisions to be made. Prior to selecting a software program, the purpose of the model should be made clear, as proprietary software can serve somewhat different purposes. For example, distinction should be made between the roles of the model as a design study tool and as a presentation tool. Some software is fast and easy to use but comes with some graphic limitations. Examples include Sketch-Up and Rhino. Other software requires meticulous attention to detail and generally takes more time to model and subsequently render. Examples include 3D Studio VIZ, and Maya. Some programs, such as Form Z, are designed to address a range of needs, from basic modeling to advanced rendering and animation.

The landscape architect should understand distinctions between design-oriented programs that focus on general-purpose modeling and programs that focus on photorealistic rendering and animation.

Digital animations and fly-throughs establish a sequential perspective on the project, simulating an experiential view through the spaces as a pedestrian. These animations can generally be completed on most software such as those noted earlier. It is sometimes preferable to utilize live navigation capabilities within the model in order to explore freely, rather than follow a scripted animation sequence.

Construction Mock-Ups: At the Design Development phase, it is enormously instructive to depict and evaluate actual designed elements as full-scale modeled conditions, otherwise known as construction mock-ups. Most systems and components designed by the landscape architect can be modeled to scale with genuine materials and finishes. Pavement systems, wall surfaces, metal work, furniture, lighting, and a range of other elements should be considered, but the landscape architect should determine which elements deserve priority review as part of the mock-up process. Priority elements might include those which are prevalent in the project or unique conditions that present significant design challenges. A number of specialized components cannot be designed or built properly without the use of full-scale performance mock-ups. These include fountains and water features, custom lighting, art elements, and custom furniture. The performance of a water feature such as a water wall, for example, can never be fully understood without a design mock-up.

The mock-up approach is underutilized in the landscape architecture profession and should be elevated as an integral component of the design and documentation process. In other design disciplines, a mock-up practice is central to the design process. In fashion design, the mock-up begins with exercises in draping fabric on mannequins and culminates as a "sample garment." The sample garment is indispensable to the process of making decisions about form, dimensions, pattern, and texture. In industrial design, the mock-up is omnipresent in the design and documentation process as various forms of prototyping. Architects heavily rely upon full-scale building façade mock-ups in order to review workmanship and to make final decisions concerning details, finishes, and colors.

Material and component mock-ups can be constructed by contractors and trade specialists. While these firms will not likely be contracted with the designer or owner at the Design Development stage, they may offer their services for a discounted fee or even without charge in order to

position their firm for the full project contract. Ultimately, construction mock-up requirements should be defined within the construction documents, depicted both in the drawings and specifications. Drawings should depict requirements for layout and detailing of the mock-up, depictions that cannot normally be communicated adequately in specifications alone.

On-site mock-ups and flagging of proposed site layout can also be used to depict and evaluate form and scale relationships. While these decisions may appear sound on paper, the perspective of the designer is often influenced by the on-site layout. The primary premise suggests that all design can be improved through a process of exhaustive three-dimensional study.

Regardless of the nature of the Design Development models, their primary role in the Design Development phase is to aid in the decision-making process. Recall the primary purpose of the phase is to resolve all design decisions.

3-D Printing: With that purpose in mind, accuracy and refinement are necessary in the advanced stages of studying form, texture, and color. In these cases, a relatively new and inexpensive modeling process known as 3-D printing is available to designers. 3-D printing machines are really not printers as they are not known for printing paper but they rather create models by stacking plastic or, in some cases, metal topographically. The technology has advanced significantly in the last decade and costs to purchase and operate the equipment have declined. The greatest cost advantage comes with the reduced time and labor costs required to produce the models.

Decision-Making Accountability

It is at this stage of the project that every design decision is made. At the end of Design Development there should be no additional time spent on significant design study; emphasis instead should be placed on focused production of the Construction Documents.

Decisions encompass the full range of form-giving, materialization, and detailing exercises. Formalization includes plan forms and three-dimensional forms. All materials and finishes should be selected, and the interfaces between various components and systems should be studied and resolved. Limits of all materials should be precisely defined with plan and elevation drawings. Components such as site furniture, lighting, drainage and utility elements, signs, art, and prefabricated systems such as fences and railings should all be selected. Technical systems, such as those for irrigation, storm drainage, and renewable energy should be determined and specified.

Most importantly, the logic of Design Development decision-making should be linked to specific and measurable design intent. Many decisions should be made objectively, with use of evaluative metrics to guide and justify these decisions. Sustainability and LEED® criteria may be developed and used, in part, to guide decision making. Sustainability criteria can influence program determinations, material selection, and construction detailing. For example, site furniture might be selected based upon minimum requirements for recycled content and VOC content (volatile organic compounds).

Additional criteria such as durability, aesthetics, comfort, and cost should be considered. Cost should be evaluated both in terms of initial costs and, more importantly, life cycle cost. Life-cycle cost refers to the cost of the component, or asset, over its lifetime.[3] An initially more expensive but longer-lasting product costs less over time because it does not need to be replaced. Furthermore, a long-lasting built environment would likely fulfill the most basic sustainability principles: reduce waste, reduce consumption, and endure for future generations.

The logic of these decisions should be explicitly documented. Various graphic techniques may be used to communicate the basis of these decisions. Narrative summaries or matrix tools may be developed to clearly define the logic for primary decisions as responses to defined metrics or performance objectives, such as energy use, water conservation, or didactic intent.

Ultimately, decision-making accountability requires processes whereby design can be comprehensively and methodically evaluated against stated performance objectives. Currently, many designers largely rely upon an intuitive decision-making process, albeit with an "eye" to accomplishing the broad intent. Landscape architects will benefit from improved decision-making models, where alternatives choices can be evaluated with data-driven analyses. The role of metrics is gaining recognition as part of the design evaluation and decision-making process. While documented evidence is integral to such processes, this subject is not explored in great detail within this publication.

The DD-CD Continuum

In many ways, Design Development documents resemble in-progress Construction Documents. That is not by chance, nor is it inconsequential.

[3] Life-cycle cost is also used to describe and quantify the environmental impacts of a product over its lifetime, from the time of fabrication to disposal.

Strategically, Design Development documents represent the foundational step of the construction documentation process and, accordingly, require commitment to a shared set of organizational systems. If the DD documents are not structured to smoothly transition to Construction Documents, they will likely suffer in terms of content and quality. This logic suggests that organizational and content continuity allows emphasis to be placed on iteration, quality control, and coordination.

A number of examples illustrate the transitional and dependent nature of the DD-CD interface.

- DD and CD sets should follow identical document set organization (organization of sheets).
- DD and CD sets should follow identical sheet organization and content, e.g., plan scale, layout, and sheet-matching protocols.
- DD and CD sets should utilize the same set of organizational systems, for example, graphic symbols, keynotes, and general notes.
- DD and CD sets should include virtually the same set of design and construction details.

Each of the DD documents, if structured properly during the Design Development phase, can be used directly in the production of the CDs, resulting in a more efficient and economical process.

The DD-CD continuum principle does not suggest, however that each of the DD documents should be developed at an exhaustive level of content detail. Level of Design Development detail will vary per sheet type, as communicated in Section Three: *Guidelines and Best Practices.* The landscape architect should avoid premature and excessive development of DD overlay information such as layout and detailed grading until the base design plan is confirmed and finalized. For example, a DD site layout plan should not include a complete and comprehensive set of dimensions. A DD grading plan should not include a complete and comprehensive set of elevations. A DD materials plan, however, should include a comprehensive set of material identifications.

Ultimately, a well-built landscape depends upon well-executed Construction Documents—and well-executed Construction Documents are largely dependent upon highly resolved Design Development documents. These relationships place large responsibility on the foundational role of the Design Development documents. It is difficult to repair the damage of a poorly completed DD set through the construction documentation process.

Design to Budget

As noted, the Schematic Design documents should be used to develop or confirm an estimate of probable construction costs. This estimate should be evaluated and broken down as a departure point for proceeding into the Design Development phase. For example, the estimate may be compared to the allocated budget on a square foot basis. A composite square-foot cost should be assigned for each of the primary landscape types or areas on the project. Plan and detail documents should be carefully filed to record their role in estimating determinations, so that they can be revisited as the design to budget exercise is advanced.

The landscape architect should lead a process whereby budget expenditures are prioritized. Strategic application of the client's budget is an important and implicit service provided by the design professional. These decisions should generally be made to serve the project mission and objectives defined at Schematic Design.

The ongoing process of ensuring that a project is designed, bid, and built to meet the allocated budget begins with the owner's or client's obligation to provide a construction budget. This budget must be itemized in sufficient detail to be usable by the landscape architect in managing the design and estimating the work under his contract, the landscape architecture program. For example, the budget should distinguish between landscape architecture and civil engineering improvements.

The DD construction cost estimate should approximate the CD-level cost estimate organizationally and in level of detail, itemized to reflect all systems and components included within the keynoted Site Materials Plan. The estimate should be completed by or coordinated with a general contractor, specialized subcontractors, or a professional estimator to validate the completeness and accuracy of the estimate. Completeness refers to the identification of all potential costs associated with the contract, including materials, labor, supervision, overhead, profit, bonding, contingencies, and even price escalations. In order to ensure completeness, standard formats and templates should be used to reflect all potential costs. Formats such as the Work Breakdown Structure (WBS) are used by various disciplines to organize and confirm work scope. These formats serve as checklists for categorizing costs.

Accuracy refers primarily to quantity takeoffs and unit costs, with unit costs effected by detailed drawings and associated work descriptions. Adequate descriptions of proposed systems and materials play a role in

the overall accuracy of the estimate. Plan and detail drawings should be graphically demarcated as a record of quality, quantity, and work-limit decisions. These determinations should be subject to review and editing. Unit cost assignments are potentially derived from diverse sources and are subject to varied opinions. Specific recommendations for completing sound cost estimating are outside the scope of this publication and deserve the consideration of professionally trained specialists.

Designing to budget requires both an early and ongoing set of commitments by the client and design team. The further one proceeds in the design process without rectifying the budget, the more challenging that effort will likely be. "Challenging" refers to redesign, documentation rework, coordination, review, and approvals, all of which come with significant cost, timeline, and consultant fee implications. Consultants are not always paid by clients for redesign and rework derived from work that is designed over budget.

The budget is most readily influenced at Schematic Design, where primary decisions regarding scale, program and quality can be addressed. During Design Development, scale, program, and material quality are largely resolved and well documented. Design Development decisions concerning materials and finishes can, however, be made without major impact to the plan and detail documents. An estimating exercise should be conducted midway through the DD phase in order to affect the changes necessary to complete the DD documents on budget. At this stage, "add" and "deduct alternates" can be defined preliminarily for use in rectifying the design to budget during the CD and bid phases. These alternates work best when they are stand-alone components such as fountains, shade structures, or art elements.

Assuring Design and Documentation Quality

A growing body of literature speaks to the overall role of quality management in establishing, utilizing, and improving processes to achieve satisfactory outcomes. Quality management includes a number of subtopics, including quality control and quality assurance. Quality control generally refers to the collection of ongoing efforts aimed at achieving these outcomes, while quality assurance refers to the specific and systematic actions used to guarantee quality outcomes.

Two fundamental actions are recommended as essential quality-assurance practices for the landscape architect:

Design Reviews and Document Reviews: Design reviews and document reviews play an integral and complementary role in the design and documentation process. Design reviews are typically organized to facilitate face-to-face exchange between people and occur more prevalently in the formative stages of design process, during the Schematic Design and Design Development phases. Document review processes are often centered, at least in part, on reviewing the documented design for deficiencies, with most emphasis on Design Development and Construction Documentation phases. Document reviews are part of a larger set of quality-assurance activities that include planning, coordinating, and verifying, as discussed here.

Design reviews are cherished in the industry as opportunities for in-progress work to be presented, critiqued, and improved. These sessions are otherwise known as "pin-ups," "crits" (short for "critiques"), "creative reviews" or, somewhat ominously, "juries." They are organized around the premise that diverse (rather than single-minded) thinking is instrumental to achieving the best solution. That premise is derived from the notion that "to be creative requires divergent thinking (generating many unique ideas) and then convergent thinking (combining those ideas into the best result)."[4] Divergent thinking is best realized by people of varying backgrounds, skills, and interests. A homogenous group of Western-educated landscape architects is unlikely to generate the range of thought that a group of culturally, intellectually, and disciplinary diverse people might. People who think from a similar perspective sometimes operate as if they have shared values to protect.

Open, transparent, and inclusive processes drive the work of the idea-based design studio, and design reviews are a hallmark of this type of practice. While the outcomes of these sessions vary widely, there is always benefit in broadening perspective on any project. Some design reviews may result in creative breakthroughs, others may result in course corrections, and yet others may confirm the general design direction and result in recommendations for building upon its strongest virtues.

Regardless of intent or outcome, the most effective design reviews follow several protocols: (1) they encourage open and uninhibited participation, (2) they are well focused on the key current dilemma(s) faced by the team, and (3) they result in clear, well-documented conclusions.

[4] Bronson, Po, and Ashley Merryman. "The Creativity Crisis." *Newsweek*, July 10, 2010.

1. *Open participation* refers to an atmosphere of camaraderie where people of various backgrounds and experience levels are encouraged to offer perspective. When dialogue is established, ideas are explored, tested, challenged, and, ultimately, made better or discarded. The most fertile environments are those where individuals trust that all ideas will be respected and given due consideration.
2. At any point in the development of a design proposal, a specific set of challenges or *dilemmas* are faced by the design team. The design review should be used as a medium for addressing these challenges. Those responsible for facilitating the design review should prioritize these challenges and determine how to organize and present current documentation to shed light on the most applicable issues.

Design reviews are intended to solicit constructive feedback and recommendations. They should not be organized as informational presentations that focus on the virtues and proud accomplishments of the team. In order to make the process effective, skilled meeting facilitators can guide the discussion, to help the participants evaluate competing views and stay focused on the key current dilemmas faced by the team.

3. Facilitators should also be responsible for distilling, summarizing, and *documenting the primary conclusions* of the design review. These determinations require attentiveness and judgment. Documented conclusions must be made visible to the design review audience at the meeting in order to ensure clarity, consensus, and buy-in. These records will also be important in guiding the team ahead as part of its short-term action plan. The design review record will also need to be revisited at subsequent design reviews as an indication of where the team left off.

Design reviews should take place on multiple occasions during the life of a project and can be called informally at any time and/or scheduled strategically at key points in the development of the design. While open, widespread staff participation presents benefits to both the project and participants, participant attendance should be given strategic consideration relative to current project needs and challenges.

Document review refers to those activities that are used to review, analyze, critique, coordinate, direct, and otherwise ensure that documents produced for a particular project meet minimum standards of quality. The distinction between design reviews and document reviews can be overlapping. While document reviews are generally conducted upon the executed design, document review processes should be trained on both design quality and technical quality. While both processes are integral to the quality-management program, they represent components of a larger quality assurance program, as discussed within this publication.

Quality Management can be considered to have four main components: quality planning, quality control, quality assurance, and quality improvement.[5] Quality management is focused not only on product/service quality, but also the means to achieve it. Quality management, therefore, uses quality assurance and control of processes as well as products to achieve more consistent quality.

Quality Planning refers to processes that guide the translation of quality intentions into specific requirements and protocols, including specific steps for achieving these requirements .

Quality Improvement can be distinguished from quality control in that quality improvement is the purposeful *change of a process* to improve the reliability of achieving an outcome.

Quality Control is the *ongoing effort* to maintain the integrity of a process to maintain the reliability of achieving an outcome.

Quality Assurance represents the planned or *systematic actions* necessary to provide enough confidence that a product or service will satisfy the given requirements.

DOCUMENT REVIEW PROCESS

Several fundamental but often underutilized best practices are recommended as part of the document review process.

Planning

Quality Control processes are often poorly performed because they are improperly utilized near the end of the design and documentation process when fees have largely been exhausted. That may result from poorly planned quality control processes.

A ***Quality Assurance*** *Plan* should be established for each project, including a coordinated list of all project deliverables and the quality control activities associated with them. The plan should also designate reviewers, the review schedule, review processes, and protocols. The purpose of this plan is to ensure the delivery of high-quality products. The most experienced staff

[5] Rose, Kenneth H. *Project Quality Management: Why, What and How*. Fort Lauderdale, FL: J. Ross Publishing, 2005. P 41

should be assigned as reviewers of selected documents. These people should actively participate in team strategy meetings and project planning sessions, especially as they relate to design and documentation quality.

Initially, quality control activities and design reviews must be included in the contractual scope of work, itemized by task and fee. Collectively, these fees will be substantial, upward of 10 percent of total fees. If time and fees are not allocated for these activities, they cannot be managed effectively.

Reviewing

Quality control must be conducted with formal and methodical processes in order to ensure a consistent level of rigor and achieve an unfailing set of expectations. Document reviews, more than any other activity, rely upon thoroughness and probing examination. Checklists are one of a number of simple yet effective tools that landscape architects can use to assure that the requirements are clear and managed effectively.

A series of several basic steps are recommended for reviewing documents. These actions are described in abbreviated form here as an overview.

1. *Familiarization:* Initially, the reviewer will need to become familiar with the current design and associated documents. The reviewer and the landscape architectural design team should initiate the review process by discussing design intent, general document status, and key issues. The team should first present project intent with some combination of mission statement, goals, objectives, metrics, or principles. Subsequently the group should walk through each sheet in the set in enough detail to highlight these issues. For example, in looking at the Site Demolition Plan, the team might share with the reviewer the client's interest in preserving historically and culturally valuable construction while removing inconsequential and deteriorating conditions.

2. *Document Assembly:* Prior to initiating the review, the reviewer must be provided with all pertinent documents and resources. These typically include project objectives and metrics; the full set of landscape architectural documents; the complete project manual, including multidisciplinary specifications; drawings by other associated disciplines, such as architecture, civil engineering, structural engineering, and so forth; product and materials cut sheets; applicable building codes; and summary calculations for performance systems such as water features, drainage systems, and structural elements.

3. *Review:* The document reviewer should evaluate the documents with attention to level of design resolution as well as aesthetic and technical quality, accuracy, completeness, and coordination. Coordination review is especially important and includes coordination between drawings, between drawings and specifications, and between landscape architectural documents and work by associated disciplines. Coordination between landscape architecture documents and approval agency requirements is also essential to review.

Obtaining client, agency, or jurisdictional approval as part of the design and documentation process is critical to the ultimate success of the project. It may be important to schedule regular reviews with these groups during the Design Development phase to collect feedback and/or preliminary approval prior to finalizing documents. These reviews should include both drawings and specifications.

Responding

The document review process is only as good as the responsiveness of the design team in addressing the reviewer's comments. That means that a formal process for addressing and verifying that the comments have been addressed satisfactorily is necessary. International quality standards such as those prepared by the International Organization for Standardization (ISO) refer to the process of checking that quality reviews have been successfully implemented as the document revision control system. More specifically, the process of reviewing the review is known as "evidence of conformity."

Note that those addressing comments will need to determine how best to respond to the questions, recommendations, or issues identified by the reviewer. While this process is commonly known as "picking up red lines," the process requires more deliberation than the phrase suggests. The responsibility for making these determinations should be with senior team members rather than drafting professionals.

Explicit processes for recording how reviewer's comments have been addressed should be developed by individual firms. Graphic processes can be developed to record these determinations. For example, the landscape architect may use color-coded highlighters over the redlined items, marks, and/or comments to distinguish between the following types of actions. Note that specific marker colors are presented as an example; each firm may select their own graphic approach to record responses to the document review.

- Green Highlighter: Comment acknowledged and fully addressed (edits or changes made).
- Yellow Highlighter: Comment requires interpretation or discussion (edits or changes not yet made).
- Not Highlighted: Comment subject to alternative point of view, i.e. project team does not agree to recommended revsions (edits or changes not made).
- Blue Highlighter: Used on yellow highlighted comments once clarified to turn them green and acknowledge that they have been fully addressed.

For some projects, these responses can be made directly on the documents themselves. For other projects, there may be reasons to itemize both the comments and responses in a separate document such as a spreadsheet or memorandum. Separating the responses may be justified in cases where the client requires such documentation or where multiple parties require abbreviated and immediate access to these comments.

KEY COORDINATION NEEDS

While the landscape architect may have primary responsibility for each of the tasks that follow, he or she will need to collaborate and coordinate this work with those consultants listed. The defined coordination needs are provided as examples and are not intended to represent a comprehensive set of responsibilities.

Typical Design Development Coordination Needs (Partial List)

GENERAL DESIGN

- Interdisciplinary design reviews are most important at the Design Development phase. As discussed, these venues are the primary opportunities for comprehensive project-wide dialogue and general design coordination.
- Client, other agency, or jurisdictional review at regular intervals to ensure compliance with project's objectives, design aesthetics, technical requirements, and budget are being met.

SPECIFIC DESIGN AND TECHNICAL

- Specific, agenda-driven coordination work sessions should be facilitated by the landscape architect or prime design consultant. These sessions should be organized to methodically review and coordinate in-progress DD documents. Issues should be itemized individually in notes with a description of the issue, the necessary action(s), and the responsible party.

DOCUMENTATION

- Coordinate graphic format of drawings, sheet order, organization, and content with consultants, including building and sheet orientation, for example, providing same orientation from site sheets to architectural sheets.

PERFORMANCE METRICS

- Detailed and rigorous coordination with collaborating consultants, for example, calculating water conservation thresholds, noise abatement, or energy use.

PROGRAM

- Access, circulation, and parking needs with building architect and civil engineer
- Stormwater management program with civil engineer
- Building-related spaces with architect
- Recreation spaces with city and community

ILLUSTRATIVE ELEVATIONS, SECTIONS, AND THREE-DIMENSIONAL DRAWINGS

- Three-dimensional character and materialization with all design disciplines
- Final feasibility and detailed design of site structures with structural engineer
- Drainage design, sustainable water management, and detailed infrastructure design with civil engineer

COST ESTIMATE

- Cost relationships between site disciplines such as civil, irrigation, and environmental systems
- Itemized cost program and unit pricing with professional estimator or general contractor
- Relationship of site work budget to overall project budget, with prime consultant

MUNICIPAL AND OTHER GOVERNMENTAL APPROVAL AGENCIES

- Code review and compliance verification
- Certification of completion and compliance with associated reviews and official letter or stamping/signature of approval on drawings and specifications

ADDITIONAL COORDINATION

- Submittal and review of DD set with owner; identification of any additional or special requirements
- Notification of owner, design review committee, or other review and approval agency, by letter, of completion of and compliance with requirements for Design Development and progression into Construction Documentation
- Work limit lines, coordinated with civil engineer, architect, and client
- Definition of all materials, components, and systems. Coordinate material properties and availability with suppliers.

DESIGN DEVELOPMENT COMPONENTS

The following components of the Design Development documentation package comprise a comprehensive, sequentially ordered set of deliverables. While the list should be viewed as a complete and necessary set of processes and documents, some project circumstances—such as size and level of complexity—may suggest the consolidation of selected sheets. For example, on sites that require significant demolition but minor tree protection, tree protection requirements may be shown on the Site Demolition Plan.

These components are defined in much greater detail in *Section Three, Guidelines and Best Practices.*

- Establish a **Cover Sheet** for the documents that communicates the project name and consultant team and that illustrates a well-defined view of the design development proposal.
- Develop an annotated **Site Reference Plan** to illustrate the overall project and its immediate context, with a sheet dedicated to hardscape improvements and another sheet dedicated to softscape improvements.
- Develop a **Site Key Plan** to illustrate sheet series layout.
- Develop a **General Information Sheet** to provide a preview of general project construction parameters expected within the Construction Documents.
- Collaborate with the civil engineer to determine and illustrate temporary and permanent measures to protect against soil erosion and sedimentation on the **Erosion and Sedimentation Control Plan**.
- Determine the primary work limits and measures to save and protect existing landscapes on the **Plant Protection and Removal Plan** and identify those plants which are to be removed or transplanted.
- Graphically itemize on the **Site Demolition Plan** the disposition of all existing elements to remain, be removed, or be salvaged.
- Use Construction Document –level plan symbols and hatches to illustrate all proposed materials and components on the **Site Materials Plan.**
- Define the intended Construction Document layout intent and the key dimensional considerations on the **Site Layout Plan**.
- Develop **Enlargement Plans** of typical and unique plan areas that require more elaboration at a minimum scale of 1" = 10'. Finalize decisions on material choices, drainage patterns and locations of drain inlets, light fixtures, and interfaces with other elements.
- Establish the primary elevations, slopes, and level changes. Show associated walls, steps, embankments, and drainage structures on the **Landscape or Site Grading and Drainage Plan**. Define sustainable water management practices.
- Illustrate key or specialized grading intentions with selective **Grading Sections**.
- Collaborate with a lighting designer to determine the locations of all site lighting components on the **Site or Landscape Lighting Plan**. Include a description of the design intent and intended illumination levels.
- Develop interdisciplinary **Composite Sections** of all representative areas showing material and component interfaces, and preliminary detailing, including below-grade conditions.
- Complete **Elevations** of all wall faces for an understanding of jointing patterns, cap relationships, top-of-wall elevations, railings and guardrails, wall lights, and finish grades. Develop elevations for other typical or unique conditions.
- Create a first pass set of **Site Details** for every proposed component and system, as the foundation for the construction document details to be further developed. Generically define all forms, materials, finishes, and structural needs for future specific definition at Construction Documentation.
- Prepare a **Planting Plan** that defines locations and species of all trees, shrubs, groundcovers, perennials, and grasses with a system of symbols and annotation to be used for the construction documents. Confirm plant material availability by contacting nurseries in the project area.

- Prepare a **Site Soils Plan** to identify preliminary locations of soil types in planting areas, including soils for trees, shrubs, and groundcovers.
- Prepare **Planting Details** that illustrate the specific planting intent, derived from an understanding of the site soil and regional climatic conditions.
- Prepare or coordinate an **Irrigation Plan** to define basic irrigation infrastructure requirements, locations and sizes for primary components, and general intentions for zone systems, for example, drip, spray, or rotary heads. Include key **irrigation details**.
- Prepare a **Site Furnishings Plan**, if necessary that uses a collection of symbols—drawn to scale—to dimensionally locate fixed components such as benches, trash receptacles, landscape pots, and ash urns.
- Prepare or coordinate **coordination drawings** for elements such as fountains, pools, lakes, spas, and water features, including the physical requirements for the basins, walls, mechanical and electrical requirements and spaces for these, and the water effects for transmittal to and further development by consultants.
- Conduct comprehensive interdisciplinary coordination with full consultant team and prepare an **Unresolved issues** list for final resolution during Construction Documentation.
- Evaluate the Design Development proposal for compliance with all requirements, such as program, soils, legal, code, and client requirements. Itemize key **compliance actions** as an unresolved issues list.
- Prepare **Outline Specifications** that communicate all materials, systems, and key execution requirements. Proprietary information and interdisciplinary coordination may take place at Construction Documentation.
- Work with a professional cost estimator or contractor to prepare a DD-level **construction cost estimate** for site work, separating civil improvements from work by the landscape architect.
- Coordinate the preparation of **subconsultant drawings and specifications** to describe work prepared by others retained by the landscape architect.

8 CONSTRUCTION DOCUMENTATION— THE IMPLEMENTATION CONTRACT

PURPOSE AND OVERVIEW

Defining the Documents

The primary purpose of landscape architectural Construction Documents is to provide a clear, concise, and complete description of the contractual work scope between the owner and contractor. The contractual work scope includes all information necessary to organize and construct the work to precise standards of quality and workmanship. These are legal stipulations and, as such, those preparing them must avoid conflicting or ambiguous requirements.

The contractor is generally known as the general contractor, a legal, business organization (or entity) that contracts with another organization or individual (the owner) to construct the proposed improvements. Note that agreements between the owner and subcontractors do not usually exist. Agreements are normally arranged between the contractor and subcontractors. A subcontractor is an individual or business that signs a contract to perform part or all of the obligations of another's contract.[1]

Note that the Construction Documents include both drawings and specifications, and that these documents are components of a larger collection of documents known as the Contract Documents. Drawings show size and shape, quantities, locations, and relationships of physical elements to one another. Drawings should not describe building products or quality standards; this information is included in specifications. The Project Manual is one component of the Construction Documents. Specifications are one component of the Project Manual. The Project Manual is often erroneously referred to as the specifications. In addition to specifications, the Project Manual includes introductory information, procurement requirements, and contracting requirements.

[1] "Contractor." Wikipedia. December 20, 2013. http://en.wikipedia.org/wiki/Contractor.

The Contract Documents also include the contractual agreement between the owner and the contractor or, in alternative arrangements, between the owner and construction manager, or owner and design-builder, or owner and vendor for furniture, furnishings, and equipment. In some cases there may be a need for an agreement between a design-builder and contractor.

Procurement Requirements typically include the bid solicitation, instructions to bidders, available information, and bid forms. The Contracting Requirements section typically includes contracting forms, project forms, and Conditions of the Contract. These components are not the focus of this book and are well documented in the industry, particularly by the Construction Specifications Institute (CSI). The American Institute of Architects (AIA) also provides standard forms and a host of other contractually-related documents.

Purpose and Intent

If Design Development is about design decisions, then Construction Documentation is about communicating, coordinating, and confirming those decisions in a comprehensive fashion.

At this stage of the landscape architectural design and documentation process, the focus shifts from design to communicating all information necessary for bidding and construction.

Drawings, together with specifications, illustrate and verbally define exactly how construction should be executed. That requires an exhaustively accurate definition of the designed work scope, together with an itemization of all associated construction standards. Consequently, these documents should not be diagrammatic, abstract, or vague. Every requirement in the Construction Documents should be clear. "Clear" can be defined as measurable, quantifiable, or defined in a manner that can be evaluated objectively. The following examples distinguish satisfactory (clear) directives from unsatisfactory (unclear) directives.

Unclear Directive: Provide slope on tread.

Clear Directive: Slope tread at ¼" per foot.

Unclear Directive: Ensure that tree pits drain.

Clear Directive: Planting Percolation Test. A minimum of one test per development site is required. Additional tests may be needed as required by landscape architect or city arborist. Fill planting hole with water; provide drainage that is greater than 2-inches per hour. If percolation is less, one or more of the following mitigation measures must be implemented for tree planting (see Division 32, Soil Preparation).

Unclear Directive: Weld as necessary.

Clear Directive: Provide tee joint and continuous fillet weld as shown; grind smooth. Provide mock-up for review.

Preparation of the Construction Documents is an additive process, whereby more explicit information is overlaid to the Design Development base documents. The Design Development documents should depict final design forms and materials, over which implementation requirements are defined in the Construction Documents. Implementation requirements include dimensional precision, structural and other performance requirements, and interdisciplinary coordination.

This should be purely a production phase. A primary objective of the Construction Documentation phase is organizational clarity and completeness. The most successful documents are those that require little interpretation and are well understood. A comprehensive description of all project details allows equitably competitive bidding to take place, where no risky assumptions need to be made.

Common Shortcomings

Several primary shortcomings are common within landscape architectural Construction Documents. These problems generally result from a lack of commitment to or consistent application of principles, rather than from technical deficiencies. These particular deficiencies can lead to construction cost overruns and poorly built work that result from unclear or conflicting directives. These shortcomings are distinguished from errors, omissions, and insufficient information, widely reported as the most problematic concern.

Redundancy: When information is communicated in more than one location throughout the documents several potential problems arise. Finding information can be difficult if it is not located in a single predictable location. Making changes to the same information where it exists in multiple locations is both inefficient and subject to oversight. And, most problematic, when information is positioned in different locations, content often varies from location to location.

This issue may be the most difficult to consistently address and consequently is mishandled on the most widespread basis. It is often assumed that more information is better and that redundancy beneficially ensures that the reader will be able to readily locate information when it is available in multiple locations.

Notes on drawings are commonly repeated, for instance, from detail to detail. For example, when developing a subject detail such as a site furnishing, the landscape architect will sometimes provide detailed information concerning adjoining systems such as pavements. That is an inappropriate approach—the pavement system information should be communicated only in the pavement detail. A keynote reference for the pavement detail is adequate on the site furnishing detail. Other types of information are often repeated by the landscape architect. For example, spot elevations are sometimes shown on the landscape architects Grading Plan, wall elevations, and civil documents. This information should be shown in a single location, namely the Grading Plan, not on wall elevations also.

The most effective documents minimize redundancies and consequently may be graphically spare. Some critics suggest that the content of most document sets could potentially be reduced by 50 percent. The discipline required to communicate construction requirements without redundancy is much more challenging than the surplus information scenario. Economy of information begets economy of production and leads to lower design and possibly construction costs.

Discrepancy: In many cases, the same graphic content may be shown in multiple locations within the documents, as necessitated by interdisciplinary needs and composite drawing protocols. Discrepancies occur when designed elements must be included in multiple locations but are defined differently. This problem is most prevalent between disciplines and is largely derived from insufficient coordination between consultants.

For example, at over-structure conditions, a number of disciplines are likely to be involved with closely related improvements. Structural engineers, civil engineers, waterproofing consultants, and the landscape architect may all complete Construction Documentation within the same physical environment. Unfortunately, each of these four consultants may define these

conditions differently, with inconsistencies between the structure, topping slab, waterproofing, protection, drainage, pavement setting systems, and finish course. In this case, it may be difficult for the contractor to determine which documents to follow. These conditions may result in bidding errors.

As inconsistencies between interdisciplinary drawings are problematic, discrepancies between drawings and specifications are similarly challenging. Discrepancies may occur where inaccurate references are made. Specifications often direct the contractor to information that should be included on the drawings, or drawings often refer to information that should be included in the specifications. These references are often incorrect or nonexistent. Similar discrepancies occur between drawings, specifications, and stated code or agency requirements.

Verbosity: Loading drawings with extraneous notes or using more language than necessary to define intent and associated requirements can result in confusion, misinterpretation, or lead to errors.. As a rule, notes on drawings should be used to identify materials or components, not describe them. Descriptions belong in specifications. Lengthy notes that address issues of quality, performance, or process should not be included on drawings but should be included in specifications.

Both graphically and verbally, "saying the most with the least amount of information" is a key principle in the Construction Documentation process (See Chapter 2, *Documentation Principles*).

Verbosity often results when specification language is applied on drawings. The Construction Specifications Institute addresses this issue in their *Project Resource Manual*. Note the recommendation for both concise and generic wording, as exemplified in the use of "unit pavers" rather than "brick pavers."

> A particular material or component may appear many times throughout the drawings but is specified in only one location. In order to simplify and coordinate the documentation process, only generic notes should be used on the drawings to identify, but not describe, a material or component. Overly detailed notes may obscure the drawings and increase the possibility of inconsistencies and duplications. Detailed written information should be reserved for the specifications so that minor changes during development of the documents can be accommodated by revising only the specifications. For example, if the drawings have been noted to include concrete pavers, a design decision changing to brick pavers would necessitate finding and changing several drawing notes as well as the specifications. However, if the drawings had indicated only unit pavers, those notes would be unaffected by the change, and only the specifications would have to be modified. Minimizing the number of required changes to written information on the drawings diminishes the opportunities for discrepancies among the various drawings and between the drawings and specifications.[2]

DOCUMENTATION CHARACTERIZATION

Construction Documents are oriented almost solely to a single audience, the contractor(s) who will bid and build the project from the information contained within the documents. Secondarily, Construction Documents may be organized and oriented toward governmental or institutional approval agencies. More than any other phase, these deliverables should be simple, clear, precise, and not subject to multiple interpretations. Graphically rendered only to distinguish elements and materials, these documents are technical in nature, providing the reader with an unadorned depiction of what will be constructed.

These CD drawings should be organized with more explicit construction detail than Design Development documentation. That is the primary distinction between Design Development and Construction Documentation drawings. While the DD drawings are significantly technical in nature, they do not provide adequate information to construct the proposed landscape.

Several additional attributes characterize Construction Documentation.

Precise and Explicit

As described earlier, every requirement in the Construction Documents should be clear. "Clear" is characterized as measurable, quantifiable, or defined in a manner that can be evaluated objectively, precisely, and explicitly.

Distilled

Construction Documents must be distilled to their essence, ruthlessly concise, and to the point. All extraneous information must be eliminated.

[2] "Module 5 Construction Documents." In *The Project Resource Manual — CSI Manual of Practice*, P. 118. Vol. 5. New York City: McGraw-Hill Companies, 2005.

Iterated
Construction Documents can never be completed satisfactorily on the first or even second pass. The process of cycling through the issuance, review, coordination, and revising of documents is fundamental to their improvement.

Coherent
"Coherent" refers to the logical and consistent organization of information. Information is located in predictable locations prevalent in design and construction industry standards.

CONSTRUCTION DOCUMENTATION BEST PRACTICES

Key best practices are presented to facilitate the Construction Documentation process.

Best Practice: Standardized Formatting

Formatting Construction Documents is both a fundamental and essential exercise and, more than any other aspect of the documentation process, benefits immensely from standardized protocols. Formatting establishes organizational and operational clarity for the design team, enhancing documentation and coordination efficiencies and facilitating quality control. Predictable and consistent formatting, especially when derived from industry standards, also improves the likelihood that documents will be well understood by bidding contractors.

It is desirable to implement standardized formatting for project documentation. Formatting includes drawing sheet and set organization, drafting conventions, schedules, symbols, abbreviations, notation, and code conventions. Formatting standards also include guidelines for drawing plotting, which is inherently connected to the organization and formatting of the drawings themselves.

Reference Standards

The U.S. National CAD Standard serves as the best current standard for architectural document formatting. Landscape architects are encouraged to either apply these standards to their work or adapt the standards as part of an office or firm set of standards. Note that similar standards exist internationally, for example, in Australia, Britain, and elsewhere.

> The National CAD Standard (NCS) is a consensus standard incorporating industry publications. It is comprised of interrelated standards, guidelines and tools for uniformly organizing and presenting facility drawing information. It is the only comprehensive standard for facility planning, design, construction, and operation drawings. NCS v4.0 is comprised of the National Institute of Building Sciences' Foreword, Administration and Plotting Guidelines modules, the American Institute of Architect's CAD Layer Guidelines module, and the Construction Specification Institute's Uniform Drawing System modules. [3]

New NCS versions are released periodically. A description of each component within the standard follows, as reported by The National Institute of Building Sciences.[4]

AIA CAD Layer Guidelines

These guidelines discuss layer name format, and provide exhaustive layer lists for over 20 types of layers. The layer module includes new layer lists for survey/mapping, geotechnical, civil, landscape, structural, fire protection, electrical, plumbing, mechanical, process, and telecommunications.[5]

Uniform Drawing System

"The Uniform Drawing System (UDS) is a standardized system for organizing and presenting building design information. This flexible resource is used to organize and manage construction drawings for virtually any project and project delivery method for the entire lifecycle of a facility." [6] Elements of this system are highlighted below from the UDS.

> *Drawing Set Organization*
> Drawing set organization establishes set content and order, sheet identification, and file naming for a set of construction drawings.
>
> *Sheet Organization*
> Sheet organization provides the format for sheets—includes drawing, title block, and production reference areas and their content. It also includes a coordinate-based location system and preferred sheet sizes.
>
> *Schedules*
> Sets consistency in format, terminology and content. Additional guidelines include how to "build" a project-specific schedule and an organizational system for identifying and filing schedules.

[3] United States National CAD Standard (NCS). www.nationalcadstandard.org/ncs6/.
[4] National Institute of Building Sciences. www.nibs.org
[5] National Institute of Building Sciences. www.nibs.org
[6] National Institute of Building Sciences. www.nibs.org

Drafting Conventions
Addresses standard conventions used in drawings: drawing orientation, layout, symbols, material indications, line types, dimensions, drawing scale, diagrams, notation, and cross-referencing.

Terms and Abbreviations
Provides standard terms and standard abbreviations used in Construction Documents and specifications. It provides consistent spelling and terminology, standardizes abbreviations, and notes common usage.

Symbols
Addresses commonly used standard symbols, classifications, graphic representation, and organization for creating, understanding and fulfilling the intent of Construction Documents. The symbols are categorized using MasterFormat™ 2004 numbers and titles for easy referencing. A product of a joint effort with the CADD/GIS Technology Center.

Notations
This area provides guidelines for notation classification, format, components, and location; use of notes; terminology; and linking to specifications.

Code Conventions
Identifies types of general regulatory information that should appear on drawings, locates code-related information in a set of drawings and provides standard graphic conventions. This tool can be used to expedite code review by designers and plan review authorities.

Plotting Guidelines
Provides grayscale, color, and line width and line type tables.
Voluntary adoption of the standards across the industry will improve the efficiency of building design, construction and management throughout the lifecycle of facilities. Adoption will benefit architects, engineers, contractors and building owners by establishing a common language for the building design and documentation process. Implementation of the NCS eliminates overhead costs that many organizations now incur trying to maintain proprietary office standards, training new staff in their use and coordinating proprietary office formats among various design consultants.[7]

NCS v4.0 provides the following improvements:[8]

- Expanded and reorganized *CAD Layer Guidelines* includes a new appendix with all groups and fields alphabetized into one easy to read list.
- Updated *Uniform Drawing System* includes new and revised symbols for geotechnical, security, fire suppression, masonry, plaster, and other areas.
- Completely rewritten *Plotting Guidelines* includes new tables—grayscale, color, and line width tables.

AIA CAD LAYER GUIDELINES

"These guidelines discuss layer name format, and provide exhaustive layer lists for over 20 types of layers. The Layer module includes layer lists for survey/mapping, geotechnical, civil, landscape, structural, fire protection, electrical, plumbing, mechanical, process and telecommunications."[9]

Organizational Protocols

Determine the appropriate level of documentation necessary for the project. Revise and supplement the overall organization of Design Development drawings as necessary. Coordinate the use of standard symbols.

Sheet organization, format, and composition will be important factors in achieving clear and complete documents. Consistent graphic symbols and text placement should be based upon the landscape architect's CAD Standards.

Identify and evaluate matched sheet organization. Maintain identical site orientation and scale for each matched sheet. Determine potential relationships to sub-consultants sheets such as civil and irrigation.

BEST PRACTICE: CONFORMANCE REVIEW

Conformance generally refers to the complying with a fixed standard, regulation or requirement. Ultimately, conformance is measured and monitored on the built site, together with building performance.
A process known as commissioning "provides documented confirmation that building systems function according to criteria set forth in the project documents to satisfy the owner's operational needs. Commissioning existing systems may require developing new functional criteria to address the owner's current requirements for system performance."[10]

[7] National Institute of Building Sciences. www.nibs.org
[8] National Institute of Building Sciences. www.nibs.org.
[9] National Institute of Building Sciences. www.nibs.org
[10] Building Commission Association. www.bcxa.org/.

In the *Whole Building Design Guide*, the National Institute of Building Sciences discusses document compliance and acceptance, suggesting that

> [C]ommissioning is all about good project documentation. The purpose of the commissioning documenting is to record the standards of performance for building systems and to verify that was is designed and is constructed meets those standards. Commissioning is a team effort to document the continuity of the project as it moves from one project phase to the next. In the planning and development phase of a project, planning and programming documents begin to define the owner's requirements for. . . performance. When the entire project. . . is documented in a consistent manner an historical perspective is created that explains the iterative process of determining the agreed-to project requirements at each step of the [design] process. [11]

Restated, preconstruction conformance must be evident in the Construction Documents before it can be commissioned in built form. As has been suggested that outcome relies upon precise documentation of specific intent throughout the design process. Ideally, most design intent is established clearly and measurably at Schematic Design. Conformance with this intent must be confirmed at the Design Development phase, prior to advancing into Construction Documentation. As promoted throughout this publication, the landscape architect must ensure that major design decisions have been resolved before executing Construction Documentation.

While that philosophy is important, it should not be taken for granted; conformance to all project requirements must be rigorously pursued and verified at the Construction Document phase. That process begins with conformance to client requirements. Primary client requirements include program, budget, and performance. Some firms pursue these requirements by asking their clients to identify critical success factors—those measures that must be completed satisfactorily for the project to be successful. Other firms may identify owner's Project Requirements, as outlined by the National Institute of Building Sciences in the Whole Building Design Guide.[12]

[11] WBDG Project Management Committee & Commissioning Leadership Council. "Document Compliance and Acceptance." *Whole Building Design Guide, A Program of the National Institute of Building Sciences*. October 30, 2014. www.wbdg.org/project/doc_comp.php.
[12] WBDG Project Management Committee & Commissioning Leadership Council.

A host of important documents and resources serves a potentially useful role in the process of evaluating conformance. Conformance should also be measured against design team objectives; design review comments; regulatory requirements, including those of the local fire marshal; the soils/geotechnical report, including recommendations for pavement, walls and other structural design; and any other stated measures or requirements that encompass the basis of design.

The conformance process requires a rigorous determination and examination of all applicable codes and necessary approval agencies. Requirements of each agency and code section should be summarized in a memo distributed to the design team.

During the design and documentation process a host of issues, large and small, will be identified and addressed. Many of these issues will be derived from the review of interim document issuances. Regardless of the source of the identified issues, they must be properly recorded and managed, that is, addressed satisfactorily. Proper records include Design Review Comments, Submittal Review Comments and an Issues Log/Report.

In summary, landscape architectural documents should conform to the following requirements:

- Conformance with design intent, recorded as the basis of design
- Conformance with program requirements, including specific facilities and attributes, sizes of spaces, number of people to be accommodated, and other requirements, including required parking
- Conformance with all applicable codes and agency approval requirements
- Resolution of all identified issues, including design review comments and client submittal review comments
- Conformance with any commissioning requirements

BEST PRACTICE: FORMALIZED DRAWING–SPECIFICATION COORDINATION

Coordination between drawings and specifications is one of the most essential Construction Document exercises. As the two primary components of the Contract Documents, drawings and specifications are designed with strictly distinctive roles and are meant to work in a complementary fashion. When these roles are muddled or misapplied the potential for errors, omissions, and conflicts rises considerably. The sheer volume and

wide-ranging detail of the documents make coordination a prodigious and challenging exercise. Unfortunately, the practice sometimes receives much less attention than necessary by the landscape architect.

The coordination effort begins with a commitment to upholding key distinctions between drawings and specifications. The Construction Specifications Institute (CSI) offers a helpful set of guidelines in distinguishing the two documents:

> The drawings and the specifications are complementary and both are needed to fully describe a construction project. The drawings show size, form, quantity, relationship, generic type and graphic representation of construction materials. The specifications define the qualitative requirements for products, materials and workmanship upon which the construction contract is based. The specifications also describe administrative procedures regarding both drawings and specifications. The drawings and specifications may separately describe limits of work or construction phases.[13]

By following these guidelines and maintaining the distinct role of the two documents, the landscape architect avoids misdirecting data to an unsuitable document. It is common for specification information to be mistakenly included on drawings, often as notes on construction details. That can result in the duplication of information between specifications and drawings, which often leads to conflicts. Intrinsically, the work of distinguishing specification content from drawing content is a self-coordinating practice if the guidelines described above are maintained.

Drawings and specifications should be developed concurrently, rather than sequentially. Formal processes for coordinating this relationship should be utilized. That begins with a comprehensive itemization of the proposed landscape architecture systems, components, and materials. That inventory should be organized by system type (such as pavements, planting, and lighting) in order to be sorted readily. The guidelines within this publication recommend and delineate the use of a master keynote list to define these systems. Each system, component, and material within the list should be correlated with a specification section, as part of the keynote list itself, as illustrated within this publication.

By formally recording intended relationships between drawn systems and specification requirements, the foundation of the coordination process is established. While the keynote system is recommended to record these relationships, firms may utilize other documentation formats. A Specification Takeoff Form is used by some to define every detail, the associated specification description and the specification section reference. Like the keynote format, this takeoff form helps to assure that every detail is coordinated with specifications.

Directed relationships between drawings and specifications should be limited to and consolidated within the keynote or comparable list. Similar notes directing the contractor from plans or details to specifications are not recommended throughout the drawings. Generic use of phrases such as "See specifications" should also be avoided as they are implicit and unnecessary.

Once the drawing-specification relationships are established, the work of developing, editing, and coordinating the content begins in earnest. Again, formal processes for coordinating content development are necessary in order to systematically address and monitor the myriad issues encountered in the drawing-specification interface. Standardized drawing–specification coordination checklists are integral to this process to establish a consistent and comprehensive frame of reference. These checklists are available in the industry. ARCOM, a company which developed Master Spec., provides extensive checklists as part of their specification libraries:[14]

- **Drawing Coordination Checklist:** A checklist of items to coordinate [individual] section[s] with the drawings.
- **Specification Coordination Checklist:** Checklist of items to coordinate [individual] section[s] with other sections.

Firms may develop and utilize custom checklists to suit regional practices or lessons learned from specialized practice experiences. These checklists should be explicitly detailed, rather than generally oriented. In some cases, coordination checklists may be connected to individual specification sections. Example coordination prompts follow:

- **General Notes:** Review General Notes on drawings to correspond to and avoid conflict with Division One requirements.
- **Specified Construction Mock-Ups:** If retaining mock-up, indicate location, size, and other details of mock-ups on drawings or by inserts.
- **Specified Concrete Pavement Finishes:** Coordinate slab finishes with a finish schedule or indicate location of each on drawings.

As the Construction Documents proceed through quality control reviews and iterative development, detailed drawing–specification coordination issues will be identified. These issues should be diligently recorded, managed, and

[13] "Module 5 Construction Documents." In *The Project Resource Manual — CSI Manual of Practice*, P. 117. Vol. 5. New York City: McGraw-Hill Companies, 2005

[14] "ARCOM. www.arcomnet.com/masterspec/components.php.

resolved. Accordingly, firms should develop and utilize specification issue tracking records or forms. The forms should itemize and briefly describe each issue and associated specification section, page, and paragraph, including personnel assignments for each issue.

The role of formal tracking and recording devices such as checklists and issue tracking forms is reinforced by Mark Kalin and others in *Construction Specifications Writing: Principles and Procedures.*[15] The authors suggest that these tools should be used to ensure that:

1. Necessary items are identified appropriately in the drawings and specifications. Specified items need to be consistent with indications on the drawings.

   [For example, if sandblasted and broom finished concrete are indicated on the drawings, the specifications should not include alternative concrete finishing requirements.]

2. Specified product names and series, models, and catalog numbers are correct.
3. Drawings and specifications do not contain duplicate information and conflicting information. Specifications supplement and amplify information shown on the drawings, but they should not repeat the information. The Stone Paving specification section should describe the specific material associated with each generic type indicated on the drawings.

   [For example, the drawings may indicate different stone paving types with symbols and Keynotes, generically indicating "Stone Paving Type 1," Stone Paving Type 2," etc.]

4. Cross-references in the specifications are correct, especially for the use of section numbers and titles for related work specified in other sections. Sometimes, references are made to specification sections that do not exist.
5. Referenced standards are correct and applicable. Industry associations change document names. Standards are superseded or withdrawn.
6. Manufacturers' names are correct and contact information is correct. The business world is in constant change as are corporate names, addresses, and telephone numbers.

[15] Kalin, Mark, Harold J. Rosen, Robert S. Weygant, and John R. Regener. *Construction Specifications Writing: Principles and Procedures*. 6th ed. Hoboken, New Jersey: John Wiley and Sons, 2010.

BEST PRACTICE: GRAPHIC DILIGENCE

Construction Documents require consistency and accuracy for bidding purposes. They also require the application of a number of rules or guidelines. While Section 3 of this publication defines graphic requirements for individual sheets, additional rules of thumb are offered below.

Graphic Rules of Thumb for Design Development and Construction Documentation

Plans Size and Scale
Drawing sheet size should match those used by collaborating disciplines, for example, architects, engineers, even if drawings are not bound together in a single consolidated set.

Draw all site elements, details, and plans to exact scale. For example, if a wall cap is 24" wide, do not use an abstract wall symbol that is not scaled accurately. Select a scale that supports the type of information being communicated and allows those key elements to read graphically. For example, detailed hardscape layout plans may require architectural scales such as ¼" = 1'-0" or 1/8" = 1'-0". That will allow detail such as jointing relationships to drainage structures to read clearly. Landscape-oriented Grading Plans can be completed at engineering scales such as 1" = 20'-0" or 1" = 10'-0".

Avoid mixing engineer and architecture scales on the same drawings.

Don't use "not to scale" (NTS) in sizing drawings. The only instance when a not-to-scale drawing should be used is when it is reduced or enlarged for purposes separate from the Design Development or Construction Documentation contract. For example, a drawing may be excerpted from the Design Development documents to be used in a publication concerning a specialized technical topic.

Plans Graphics
Use the landscape architect's CAD standards, including standard sheet size, title block layout, sheet border, drawing titles, scale graphic, north arrow, and so on.

Line Weight Hierarchy: The line weight hierarchy places equal emphasis on equally important components. Most important components such as buildings and three-dimensional site improvements should be most prominent.

Proposed construction should read more prominently than existing conditions. Existing conditions should be graphically screened or half-toned. Half-toning reduces black tones to perceived gray tones by turning black lines and fields into a series of dots that vary in size or spacing to achieve the desired gray tone. Digital half-toning is derived from traditional screening, whereby physical screens or "veils" were overlaid to original art work and subsequently copied via photographic processes.

Clear symbols: Avoid excessive detail and texture with symbols. Plans and details should be as simple as possible in order to be easy to read and follow. There is a tendency to overrender technical documents. Limit use of illustrative symbols and accessory entourage such as people. Focus on clear communication of information, rather than beautification. Use clear and distinct symbols and textures per the landscape architect's CAD standards. Place emphasis on use of simple symbols to differentiate surfaces and materials, without compromising legibility of Keynotes, dimensions, or other information.

Identification: Never include a line or other graphic on the drawing that is not identified. Identification occurs both with Detail Keynotes and/or on legends.

North Arrow and Graphic Scale Bar: These elements should be consistently represented on every plan sheet prepared by the landscape architect, both graphically and locationally on the sheet. They are typically located in the lower-right corner of the drawing, outside the plan graphic itself. Alternatively, they may be located within the sheet title block or in the upper-right sheet corner.

Legends: Several methods are used to identify site elements within the Construction Documents: by legend, or by association with industry standard graphics. All elements shown in plan and details should be represented in legends. Symbols used on drawings should precisely match those symbols shown on legends. A quality control review of legends on drawings will often find inconsistencies between legend and drawing symbols.

Annotation

Labeling and Keynotes: Labels are used to identify pertinent elements on a drawing. Keynotes, rather than written notes should be used as the primary labeling system. Keynotes are described within this publication and come in two forms: Detail Keynotes and Reference Keynotes.

Phrases and References: Avoid "by others," "see specs," "see architectural drawings," and the like. Refer to particular numbers or specification sections. Verify that referenced information is provided in drawings or specifications for instance "Refer to Sheet A-2 for additional layout information at courtyard." List and confirm all drawing references to specifications.

General Notes: Use General Notes to cross-reference related drawings. Specifically enumerate related interdisciplinary drawings such as civil, architectural, mechanical, and electrical.

Notes: Limit the use of notes on drawings. Complete and clear drawings require few notes. Utilize specifications for notes except where used on drawings to refer to material or component relationships. Do not place specific product and manufacturer's names and numbers on the plans or details; for instance, use "drain mat," not "Enkamat." These notes should be located in the specifications. Apply the same principle for notes related to strengths of materials and standards, such as 3,000 psi or 95 percent compaction.

Construction Documentation Components

The following components of the Construction Document package constitute a comprehensive, sequentially ordered set of deliverables. While the list should be viewed as a complete and necessary set of processes and documents, some project circumstances such as size and level of complexity may suggest either the consolidation or removal of selected sheets.

- Establish a **Cover Sheet** for the documents that communicates key project title information, contents of the document set, the consultant team and illustrates the site location.
- Develop an annotated **Site Reference Plan** to illustrate the overall project and its immediate context, together with any important contractor issues such as phasing, staging, or access. A separate Hardscape and Softscape Reference Plan should be prepared to depict associated improvements.
- Develop a **Key Plan** to illustrate overall project and associated sheet layout when multiple sheets are required to cover the entire project site.
- Develop a **General Information Sheet** to provide a comprehensive overview of general project construction and drawing parameters expected within the Construction Documents.
- Determine the primary limits and measures to save and protect existing landscapes on the **Plant Protection and Removal Plan,** and identify those plants which are to be removed or transplanted.

- Graphically itemize on the **Site Demolition Plan** the disposition of all existing elements to remain, be removed or be salvaged.
- Use comprehensively developed detail Keynotes, plan symbols, and hatches to illustrate all proposed materials and components on the **Site Materials Plan**.
- Utilize a hierarchical and well-integrated layout system to position all proposed site improvements on the **Site Layout Plan.**
- Comprehensively define elevations for all pavements, walls, steps, ramps, embankments, and drainage structures on the **Site Grading and Drainage Plan**. Define sustainable water management practices such as infiltration basins and water-quality devices.
- Illustrate key or specialized grading intentions with selective **Grading Sections.**
- Define locations of all site lighting components on the **Site Lighting Plan**. Use Keynotes to reference all lighting construction details.
- Develop interdisciplinary **Site Composite Sections** of all representative areas showing material and component interfaces and detailing, including below-grade conditions.
- Complete **Elevations** of all wall faces, defining jointing patterns, cap relationships, top of wall elevations, railings and guardrails, wall lights, and finish grades. Develop elevations for other typical or unique conditions.
- Finalize a well-iterated set of **Site Details** for every proposed component and system. Generically define all forms, materials, finishes and structural requirements.
- Prepare a **Planting Plan** that defines locations and species of all trees, shrubs, groundcovers, perennials, and grasses with a system of symbols and annotation. Use Keynotes to reference all planting construction details.

  Planting Plans should be divided into a **Tree Planting Plan** series and **Shrub and Groundcover Planting Plan** series to depict associated improvements. For simple projects all plants can be represented within one Planting Plan.
- Prepare a **Site Soils Plan** that defines the location and types of proposed planting soils with a system of symbols and annotation. Use Keynotes to reference all proposed site soil construction details.
- Prepare **Planting Details** that illustrate the planting requirements derived from an understanding of the site soil and regional climatic conditions.
- Coordinate or Prepare an **Irrigation Plan** to comprehensively define all irrigation infrastructure requirements, locations, and sizes for all components, and plan layout for each irrigation zone, for example, drip, spray, or rotary heads. Include **irrigation details**.
- If necessary, Prepare a **Site Furnishings Plan** that uses a collection of symbols, drawn to scale, to dimensionally locate fixed components such as benches, trash receptacles, landscape pots and ash urns.
- Utilize **subconsultant drawings** for scope of services outside the landscape architect's realm, including but not limited to elements such as fountains, pools, lakes, water features, irrigation system, engineering, art or sculpture, and so on.
- Collaborate with the civil engineer to determine and illustrate temporary and permanent measures to protect against soil erosion and sedimentation on the **Erosion and Sedimentation Control Plan**.

The following items are important considerations during preparation of Construction Documents:

- Develop **Enlargement Plans** of every typical plan area at a minimum scale of 1"=10' scale, or 1:100 or 1:50 in metric scale. Finalize decisions on material choices, drainage patterns, locations of drain inlets, light fixtures, and interfaces with other elements.
- Conduct comprehensive interdisciplinary coordination with the full consultant team and prepare an **Unresolved issues** list for final resolution during Construction Documentation.
- Review the Construction Documents proposal for compliance with all requirements (such as program, accessibility, soils, legal, code, and client requirements). Itemize key **compliance actions** as an unresolved issues list.
- Prepare **final Specifications** that communicate all materials, systems and key execution requirements. Include proprietary information and conduct full interdisciplinary coordination. Specification should include the technical specifications (Divisions 02–33) and General Requirements (Division 01). The landscape architect should coordinate with the client, other agencies, or jurisdiction(s) as necessary on the preparation of the project manual, including procurement and contracting requirements.
- Work with a professional cost estimator or contractor to prepare a detailed **construction cost estimate** for all work under contract including work performed by sub-consultants.

SECTION 3

Guidelines and Best Practices

Key Documentation Practices

Composition of a Document Set

Keynoting and Reference Noting System

Graphic Symbol System

Drawing and Specification Relationships

Preliminary Design

- Pre-Design
- Conceptual Design
- Schematic Design

Design Development and Construction Documentation

Gardens on El Paseo, Palm Desert, California

9 KEY DOCUMENTATION PRACTICES

Well-prepared landscape architecture documents are foundational to well-built work. It is essential that the landscape architect understand the level of effort required to properly convey design intent at each stage of the design and documentation process. This section itemizes content recommendations for documents at each phase of the design and documentation process, from Pre-Design through Construction Documentation. These guidelines and best practices represent a baseline set of recommendations and may vary in application depending on the requirements of the project, governing jurisdiction, or unique requirements of the client. However, they represent minimum practices that should be considered on every project.

Within the documentation process, fundamental practices are used to guide the organization and communication of content. These practices are based upon the notion that Preliminary Design, which includes Pre-Design through Schematic Design, is more graphic or illustrative in nature, while Design Development and Construction Documentation are more graphically- and content-technical. Consequently, documentation requirements become more rigorous as the landscape architect advances through the design process toward construction documentation. Note that this process culminates in a legal contract between the owner and contractor, with the landscape architecture documents serving as components of this contract; hence their reference as Contract Documents.

Broad organizational and operational principles have been itemized within Chapters Two and Three. The practices defined below represent the fundamental technical foundation upon which landscape architectural documents should be developed. The topics to be discussed include the following:

- Digital Organization
- Composition of a Document Set
- Keynoting and Reference Noting System
- Graphic Symbol System
- Drawing and Specification Relationships

DIGITAL ORGANIZATION

Critical to the success of any project is efficiency in preparing documentation. By utilizing consistent organizational protocols for each project, the landscape architect can focus on design and deliver a project that meets the client's needs. These *Documentation Standards* and *Best Practices* were developed with this in mind, so consistency and expectations for content are firmly established. A summary of key digital organization elements for a typical project is offered below.

(Note: The landscape architect's *CAD Standards Manual* shall be considered a complementary manual and shall be used in conjunction with these guidelines. The *CAD Standards Manual* defines and describes the automated systems required to adequately depict the graphics for proper project documentation.)

ORGANIZATIONAL STRUCTURE

- Folder Structure
- File Naming Conventions
- Layer Naming and Organization
- Labeling
- Plotting and Plot Styles

Folder Structure

Every project should follow folder structure standards, for efficiency and consistency. To ensure proper execution, it is important for the landscape architect to engage in regular file maintenance. This effort should be considered a regular component of the project work scope and include the following practices: locating files in their proper place; using correct naming conventions; creating record copies at project milestones; and updating subconsultant "X-references." All of these practices are integral to the digital documentation process. Below is the recommended subfolder structure within the D-CAD folder within a project's overall folder structure. The subfolders are organized to differentiate between source and active status files within these headings.

00. History
01. Primary
02. Sheets
03. X-refs
04. Details
05. Studies
06. XConsult

Drawings in subfolders 00–05 are generated by the landscape architect. Drawings in subfolder 06 are generated by subconsultants or other project consultants. Drawings in subfolder 00 are a record of the project and do not represent the current design. These project records may occur at defined project milestones or prior to major project advances or revisions. This serves as a means of capturing that record in the case that it is necessary to recover any historic information. Also, when a file is no longer relevant, subfolder 00 can be used as a location to "cut" those files into. Finally, subfolders 01 – 06 are used for active files. An active file contains the latest (current) project CAD information.

Following is a brief description of each of the "active file" subfolders within D-CAD:

01. Primary

This subfolder contains "model" files, that is, linework drawings in model space that represent actual "things" in the real world, for example, furnishings, pavement, walls, topography, and plants. Labels, dimensions, and notes are not physical real world objects and, therefore, should not be located in these files. Those elements should be positioned on sheets as described in Section 02, Sheets. Each file should be graphically clean (no extraneous information) so errors are not be transferred into x-referenced files. For this reason, these files should not include information in the layout tabs.

Files should be named according to basic file-naming conventions found within the landscape architect's *CAD Standards Manual* and should convey the information contained therein. The references below illustrate example naming conventions.

LA -0000-DEMO contains linework, hatches, and/or symbols associated with site demolition

LA -0000-MAT contains linework and/or symbols associated with site materials or hardscape improvements

LA -0000-MAT-HATCH contains boundaries and/or hatches associated with the site materials or hardscape improvements

LA -0000-GRAD contains linework, hatches and/or symbols associated with site grading

LA -0000-LIGHT contains linework, hatches, and/or symbols associated with site lighting

LA -0000-TREE contains linework and/or symbols associated with tree planting

LA -0000-SHRUB contains linework, hatches, and/or symbols associated with shrub and groundcover planting

Model files are only created as necessary for each project.

02. Sheets

Every landscape architecture project should be organized as plottable sheets in a file separate from the model file. This will improve performance and avoid impacting any sheets to which a model file may be referenced. Sheet files should be named according to the basic file naming convention found within the landscape architect's *CAD Standards Manual*. The references that follow illustrate examples of naming conventions.

LA -0000-L2-Demo

LA -0000-L3-Materials

LA -0000-L4-Layout

All annotations (text, Keynotes, Reference Notes, labels, etc.) should be placed in paper space. However, all dimensions should be placed in model space. If a sheet series contains multiple sheets, separate tabs should be created for each sheet. For example, if the Site Materials Series file, LA -0000-L3-Materials, includes four sheets in the series, the following tabs would be created within dw-0000-L3-Materials: L3-01, L3-02, L3-03, and L3-04.

Sheet .dwg files are created as new files, by using the appropriate CAD template (.dwt) file and "save as" in accordance to criteria stated herein. CAD files (landscape architect-created and those provided by consultants with the landscape architect processing) are then cross-referenced into either the model space or the paper space in accordance with requirements in the landscape architect's *CAD Manual* and for that particular sheet series to depict required baseline content. Annotation, e.g., Keynotes, Reference Notes or plant callouts, as described herein, are then provided to convey final design and technical direction.

03. X-refs

These files are generally created to contain the following types of referenced information:

- Notes
- Legends
- Annotations

- Schedules
- Title Blocks
- Site Detail Keynotes List
- Site Reference Notes List
- Matchlines
- Limit of Project Scope of Work Line
- Key Maps
- Sheet Layout Boundary Boxes

Cross-reference files should be named according to the basic file-naming convention found within the landscape architect's *CAD Standards Manual*. Note that the series to which the reference pertains should be represented in capital letters after the project number so the list can be sorted by series and group pertinent files together. Files that will appear on multiple series, like matchlines, limit of project work, or keynotes, should have a '0' as the series name so they will sort to the top. For large projects that have series title blocks, "TITLE" should be provided in the series name so they are grouped together. For example:

LA-0000-0-Key Plan.dwg

LA -0000-0-Matchlines.dwg

LA -0000-DEMO-legend.dwg

LA -0000-MAT-sched.dwg

LA -0000-GRAD-supp notes.dwg

LA-0000-TITLE-tree.dwg

04. Details

Every detail should be drawn at 1:1 scale, whereby 1-unit equals 1-inch. The details folder should be composed with subfolders, organizing details according to the systems represented in the Site Detail Keynote list. Individual detail files should be identified as simply as possible and correlate to the keynote name. For example, Concrete Paving Type 1.dwg, Stone Paving Type 1.dwg, Wood Decking Section.dwg, and so on. Keynote numbers should not be part of the naming system as they may change during the project.

05. Studies

During the design process it is often necessary to complete study vignettes, quantity takeoffs, temporary drawings, or other types of drawings that do not fit within the defined folder structure. These files should be named to reflect included content but should also be brief and align with naming conventions, for example, 500 scale precedents.dwg, LA-Diagrams, housing products.dwg, quantity takeoff.dwg, and so on.

06. XCONSULT

Files generated by other disciplines should be located in this folder, whether from subconsultants or other consultants to the client, or from the client directly. However, before being positioned in this folder, every file from an external source should be first saved in the C-Source Data folder to save the original condition and then "cleaned" and renamed in accordance with the landscape architect's *CAD Standards Manual* to maximize efficiency and compatibility.

File-Naming Conventions

CAD files should be named to readily identify the source of the file, the project, and the type of information contained in the file. For example, for files created by the landscape architect, they should be labeled LA-0000-Demo.dwg, LA -0000-Materials.dwg, LA -0000-Tree Pltg.dwg, and so on. For subconsultant or consultant files, they should be labeled ABCD-0000-Survey.dwg, ABCD-0000-Util.dwg, ABCD-0000-Irrig.dwg, etc. where ABCD is a 3 or 4 letter abbreviation of the subconsultant or consultant firm name.

Layer Naming and Organization

Layers are the foundation of the CAD file structure and diligent organization and use of them is critical for maintaining an efficient drawing file. Principles and protocols described below should be applied when creating and using a CAD drawing file. The landscape architect should also consult the landscape architect's *CAD Standards Manual* for samples of typical series drawings layers.

A new layer should be created when data can be isolated or can be grouped according to one of the following criteria: type of information, for example, roads, buildings, or utilities; or a graphic representation, that is, where components of systems can be separated into multiple layers to adequately describe them. For example, instead of one layer for ROADS, multiple layers may be created for the components—asphalt paving, gutter pan, face of curb, and back of curb. Varied content or graphic information should not be located on the same layer.

Layer 0 should never be turned off, frozen, or used for linework. The layer color should always remain "white" and linetype should be "continuous."

The layer "Defpoints" should not be used by the landscape architect. It is used for background actions and information tracking, which causes it to behave

unlike any other layer. If it is necessary to create a layer for non-plot items, do so by creating specific content-named layers and utilize the on/off, frozen, and/or no-plot options within the Layer Manager dialog box.

Create a layer for cross-references. It is recommended that external reference drawings be placed on a layer titled "LA -xrefs" and reference images on a layer titled "LA -image" for consistency and ease of management.

Always use layer color, linetype, and lineweight. Overriding a layer's settings for these drawing entities should be avoided. Layer settings should always be organized "By Layer."

The following information should be displayed, in the following order, when creating layer names:

- Author/creator of the data (for landscape architect-generated files, this will be identified by a "la" in the layer name)
- Secondary data division (e.g., roads, walls, paving, etc.)
- Tertiary data division (e.g., face of curb, back of curb, pan, type, boundary, hatch, etc.)

When creating layer names, consider the following:

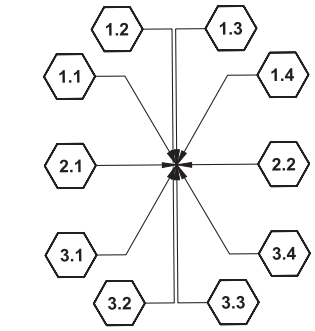
- Not all layer descriptors are necessary. Create layer names that are simple yet extensive enough to describe the content on that layer.
- Consider how the data will be used, what types of data should be grouped together, and what data is subservient to others.
- Parameters of a layer name should be separated by using the hyphen symbol, for example, LA -road-back of curb, LA -pave-edge, LA -pave-conc-htch.

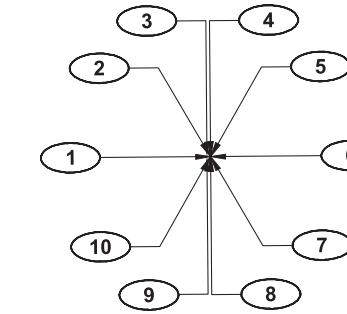
Labeling

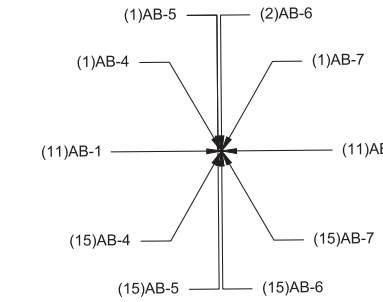
Upon successful organization of folders and files, digital organization may proceed with the placement of annotations. This is often referred to as labeling and includes both annotations and leader lines. Utilize "keep it simple" and the Construction Specification Institute's (CSI) "say it once and say it in the right location" principles for organizing sheet content. "Keep it simple" refers to a process whereby exhaustive notes and annotations are replaced by Keynotes and Reference Notes, reducing opportunities for redundancy and errors or omissions. By utilizing graphic symbols and a keynote system, drawing clarity is enhanced and annotation is found in one location only, for ease of reference and editing. Items are not exhaustively labeled. Rather they are strategically labeled so at least one graphic element for each proposed system is clearly referenced.

Where graphic elements are duplicated across a sheet, the term "TYP" is commonly added after the Keynote or Reference Note to indicate a repetitive or typical condition. Also, where labeling a string of elements, the label should be placed either at beginning or end of the string, never in the middle. Finally, labels should never cross sheet matchlines. When labeling planting plans, each tree or shrub or series of trees, shrubs, or groundcover planting beds should be labeled in accordance with the landscape architect's *CAD Standards Manual* and the guidelines provided earlier.

The leader line works integrally with the label itself. Labeling and leader-line organization should follow a consistently applied set of practices. Poorly organized labeling can be distracting and compromise the legibility of the documents. The landscape architect should utilize a consistent approach to labeling with the use of leader lines at 60-, 120-, 210-, or 330-degree angles. Ninety- and 180-degree angles can also be used but should be used sparingly, as these angles can conflict with geometries depicted in the design. When organizing labels (annotations and leaders) on a sheet, cluster and align (justify) labels where possible. This helps to focus the reader and promotes clarity in the drawing. Alignment can occur vertically, horizontally, or on an angle. Also, position labels close to the graphic, with a consistent distance for each note. Excessively extended leader lines are difficult to follow and should be avoided.





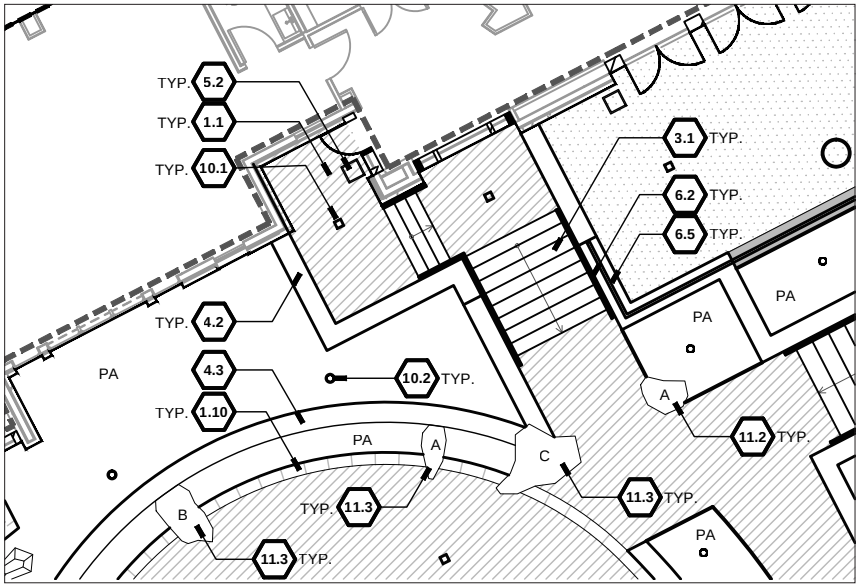


Top: Sample Site Detail Keynote Labeling at Prescribed Angles

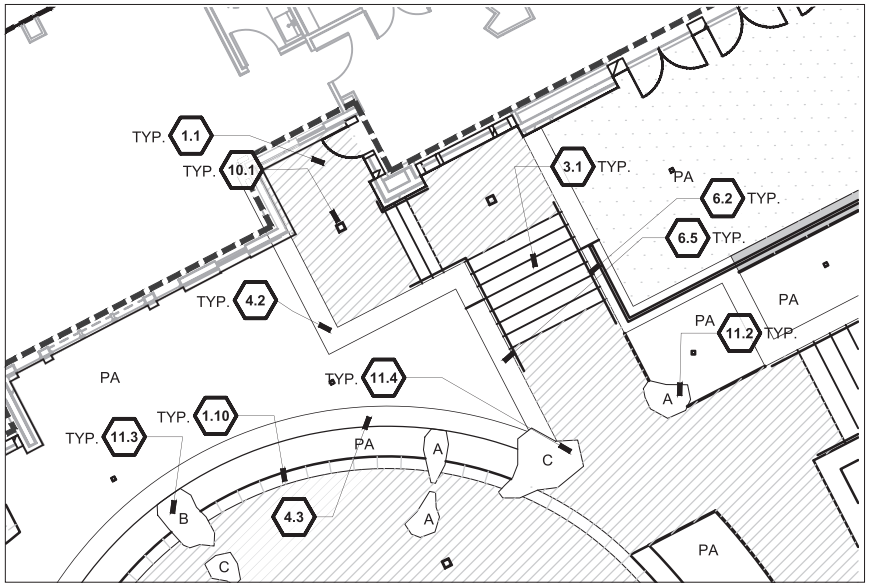
Middle: Sample Site Reference Note Labeling at Prescribed Angles

Bottom: Sample Plant Callouts Labeling at Prescribed Angles

Sample Labeling Methods with Keynotes



Example of Correct Labeling Methods



Example of Poor Labeling Methods

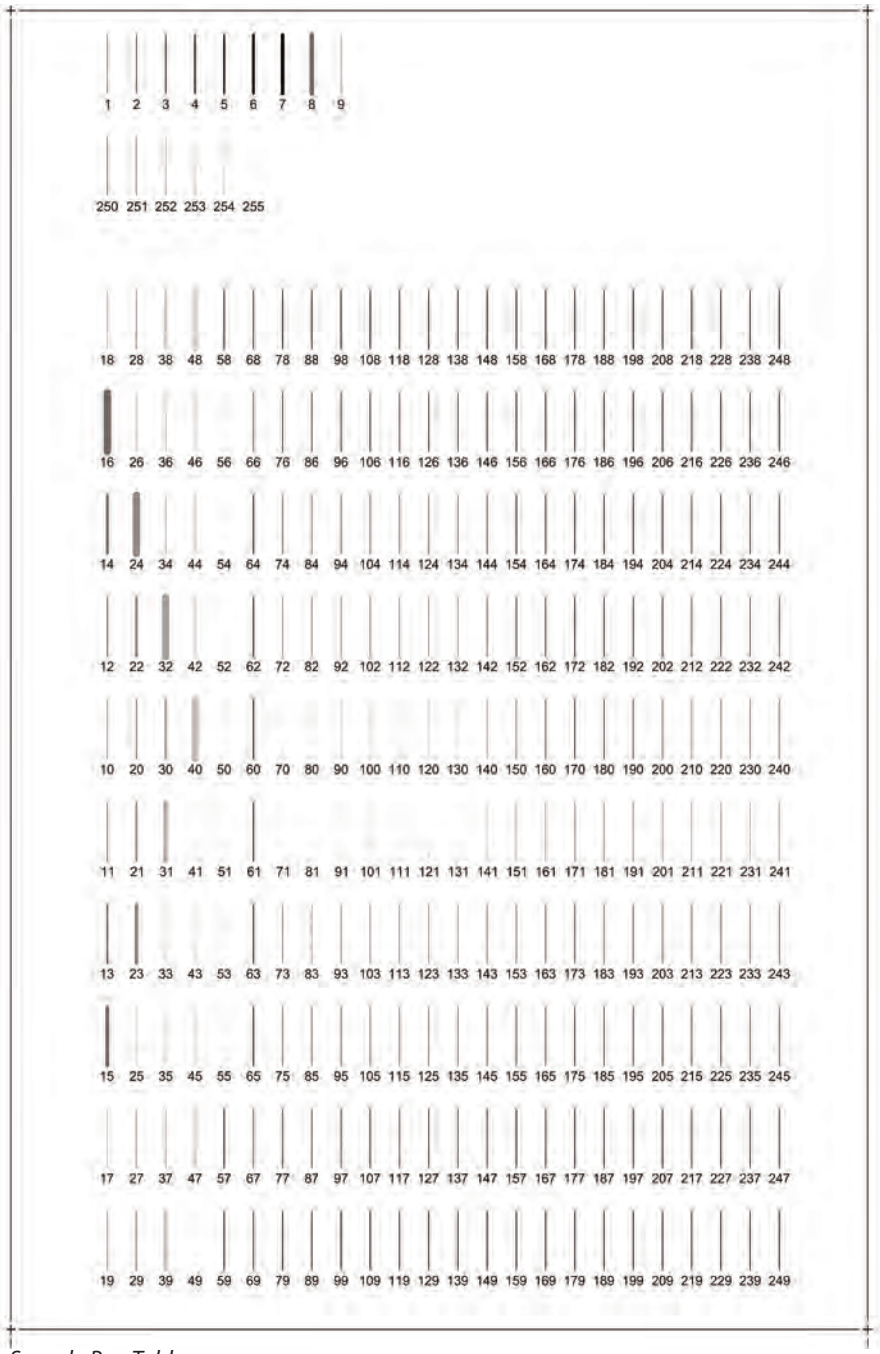
Plotting and Plot Styles

Plotting should be conducted in accordance with the protocols established in the landscape architect's *CAD Standards Manual*. Most design firms have established guidelines for printing to plotters, including .dwf files and .pdf files for the full range of architectural sheet sizes and custom sizes. These are available in the pull-down menu when utilizing the Page Setup Manager for a layout tab. When plotting, it is important to verify that the appropriate layers are turned on and "plottable" within your files, the correct combination of files is incorporated into the drawing, the Page Setup Manager has been activated and set to the appropriate settings, and the appropriate Plot Style has been selected. A Plot Style refers to a .ctb file that correlates CAD's pens (colors) with prescribed line weights (widths or thicknesses). This is commonly referred to as pen settings. CAD includes 255 available pens that can be assigned a line weight. Most design firms do not use all 255 available pens. For standard black and white printing, some firms typically use the first 15 pens and the 250 series pens for screening. Other pens print in their designated colors. Landscape architects should refer to and become familiar with the landscape architect's "CAD Standards Plot Style Reference Chart" for additional information prior to beginning any CAD assignments.

In some instances, the landscape architect may not be contracted as the lead consultant or may not lead the CAD implementation and consequently will need to utilize a subconsultant's or consultant's pen settings. In this case, it is best to request this file as soon as possible in order to understand the parameters, for example, pens that can be used and their associated line weights for creating CAD files. Some firms use all 255 pens to give their draftsmen multiple options for a .25mm or .35mm line weight instead of only one or two, as is the case with some landscape architect's settings.

COMPOSITION OF A DOCUMENT SET

Organization of sheets within Conceptual Design, Schematic Design, and Design Development and Construction Documentation sets should generally be standardized within the design firm, for consistency and to maintain established logic. Variations in sheet content and organization do occur across the profession. These variations should be derived from logic aimed at improving documentation quality, rather than merely improving preparation efficiency. The recommended sheet organization defined here is derived from surveys of senior landscape architects whose collective work represents dozens of professional design firms.



Sample Pen Table

Sheet organization within the architectural industry is often organized by "sheet series." "Sheet series" generally refers to the collection of topically associated drawings within a design discipline. For example, within landscape architecture, one can typically expect to find site materials, site details, and site planting series. Sheet-numbering protocols are an important element of the system and should be consistently applied to all projects within the design firm. The sheet series system recommended here is designed to be flexible and accommodate various project needs. For very simple projects, the landscape architect may find opportunities to combine or consolidate drawings.

The following guidelines should be used to establish project sheet series for landscape architectural documents:

Presentation Logic

Sheets are organized within the document set with most plans generally preceding details. That familiarizes the contractor or other reader with the overall organization of the design proposal before encountering details. Likewise, composite sections and elevations should precede individual details as a means of presenting information in a logical sequence. In some specialized cases, however, plans and details are separately grouped within the set, as with planting plans and planting details.

There is growing interest amongst some design disciplines in organizing various drawings in groups, focusing on a unique area or element of the proposal. Different drawing types such as plans and details are consolidated in the same area of the documents for ease of reference and to provide a complete and consolidated description of the element or system. Engineers often group different drawing types on the same sheets to illustrate elements such as garage exhaust vents or elevator systems. Relationships between elements and drawings within the same area are sometimes referred to as "families" or drawing "communities."

In the most advanced applications, these relationships are applied with building information modeling (BIM) processes, where plans, sections, elevations, material, and finish schedules are digitally linked. Changes made in one drawing type are reflected as automated changes in associated drawings. While this technology is not the focus of this discussion, the grouping of related drawings may be considered by the landscape architect in complex plan areas or for components that would benefit from consolidated depiction by different drawing types. Examples include fountains, over-structure construction, wood decks, and site architecture such as trellises and guard houses.

Construction Sequence

The landscape architecture sheet series should ideally be organized to generally coincide with a typical site construction sequence so that the contractor can responsively organize associated means and methods. For example, Plant Protection and Removal should precede Site Demolition, which should precede the proposed construction of hardscape and softscape improvements. As part of this sequence, it is also very important that each type of information be placed in a single, expected location. Duplicate information or redundancy across different sheets is especially problematic when it is inconsistent or conflicting. This industry-lauded principle is discussed elsewhere in this book, and referred to by the Construction Specifications Institute (CSI) as "say it once and say it in the right location."

Mock-Ups

Landscape architecture projects vary in scale, work scope, and level of complexity, and consequently the organization of the documents may vary somewhat. The landscape architect should determine the ideal sheet organization as it suits project needs and circumstances. Small projects may allow some consolidation and simplification as noted here.

The document set should be graphically mocked up at the client proposal stage in order to prepare the fee estimate, deliverables schedule, and to gain a preliminary understanding of the extent of work to be completed. The mock-up set should be coordinated with closely aligned collaborators such as the civil engineer and irrigation system consultant (Additional information on the Mockup is provided in Chapter 7). The mock-up should include the approximate layout of scaled plans, including "matched" plan areas from sheet to sheet. Matched refers to the joining of plans on different sheets at a common and slightly overlapping boundary line. Plan sheet matching guidelines are provided later in this Chapter.

Numbering Protocols

Sheets are organized under an alpha-numeric prefix and numeric suffix system. The alpha-numeric prefix should always begin with the letter "L" for Landscape. All like drawings should be listed under the same prefix combination. For example, all Site Materials Plan sheets should be numbered with the L3 prefix. The number three in this prefix reference denotes the position of the series within the overall collection of series. Individual sheets within the series should be numbered sequentially by a two-digit suffix identification. A dash or a dot typically separates the prefix and suffix identification, that is, L3-01, L3-02, etc. or L3.01, L3.02, etc.

Unused Series

As noted, sheet numbering protocols should be consistently applied on all projects within the firm. As a baseline protocol, if a series is unused (unnecessary), the complete series numbers should remain unchanged, rather than numerically shifted. Unnecessary sheets should be identified in the Sheet Index with either "Not Used at This Time" or "Refer to "x" Drawings," where x represents the consultant, for example, civil engineer, architect, mechanical engineer, structural engineer, electrical engineer, and so forth.

Certain projects, clients, review agencies, regulatory jurisdictions, or lead consultants may require unused series to be deleted and series numbers made consecutive. In this case, the landscape architect may adjust the baseline protocol to comply with the custom requirement for the project but should return to the organizational standards for all other projects.

Subconsultant Drawings: Site-related drawings completed by collaborating disciplines should be incorporated within the landscape architect's documents as supporting documentation after the landscape architectural sheets. These drawings should utilize the sheet series numbering conventions used on the landscape architecture drawings. Any required subconsultant drawings should follow the landscape architect's drawings.

The subconsultant drawings are generally not organized to follow a typical construction sequence, but rather are organized with a set of logical interdisciplinary relationships. For example, civil engineering and irrigation system drawings are typically located to immediately follow landscape architecture drawings; electrical engineering, mechanical engineering and water feature design and engineering drawings are closely aligned to establish potential relationships between componentry and systems, and architectural and structural engineering drawings are paired in order to readily illustrate relationships in site buildings and other structures.

Supplemental or Resource Drawings: Certified site/existing conditions surveys and geotechnical investigation reports are considered supplemental information and should not be included within the drawing set. They should be referenced in the General Notes on the General Information Sheet. Should the client or governing jurisdiction require their inclusion, ensure that the consultant providing these services provides a signed edition prepared and printed by them. Include these drawings or documents as a supplement to the package.

Sheet Series

The sheet series below represents a guideline for a typical landscape architecture scope of work. The organization is recommended when the landscape architect is contracted as the prime design consultant.

For Schematic Design, an index of sheets is defined below. Note that the index and associated drawing recommendations are subject to alternative perspectives to suit project circumstances. The recommendations below are oriented toward establishing a strong foundation for transitioning into Design Development and Construction Documentation phases.

SCHEMATIC DESIGN

- Cover
- Table of Contents
- Context Framework
- Sustainable Design Process
- Illustrative Site Plan
- Site Protection and Removal Plan
- Site Materials Plan
- Materials Palette
- Site Grading and Drainage Plan
- Planting Plan
- Planting Palette
- Illustrative Visualizations
- Preliminary Project Descriptions

Because there are a wide variety of landscape architectural project types, sizes, and complexity levels, two alternative indexes are included for organizing projects in Design Development and Construction Documentation phases—one for small projects and one for large or complex projects. The landscape architect should determine which option best suits the project.

Individual drawing series, for example, Site Materials Plan, Site Layout Plan, etc., are fully described later in this section. Recommended sheets for both "small" and "large" landscape architecture projects are outlined below.

Small Projects—DD/CD

Small projects are generally simpler in work scope, scale, and level of complexity. As a rule of thumb, if the landscape architect organizes matched plan drawings across the site and determines that the project can be geographically "covered" in six (6) or less sheets per drawing series, this can be considered a "small" project. Small project sheet series may include:

- Cover
- Hardscape Site Reference Plan
- Softscape Site Reference Plan
- Key Plan
- General Information Sheet(s)
- Plant Protection and Removal Plan(s)*
- Site Demolition Plan(s) **
- Site Materials Plan(s)
- Site Layout Plan
- Site Grading and Drainage Plan(s) **
- Site Lighting Plan(s) ***
- Site Details (including Site Composite Sections/Elevations)
- Tree Planting Plan(s) #
- Shrub and Groundcover Planting Plan(s) #
- Site Soils Plan(s)
- Planting Details

Large Projects—DD/CD

Large projects are typically more significant in work scope, scale and level of complexity. As a rule of thumb, if the landscape architect organizes matched plan drawings across the site and determines that the project requires seven (7) or more sheets per drawing series to geographically "cover" the site, this can generally be considered a "large" project. Large project sheet series may include:

- Cover
- Hardscape Site Reference Plan
- Softscape Site Reference Plan
- General Information Sheet(s)
- Plant Protection and Removal Key Plan and General Information Sheet *

- Plant Protection and Removal Plan(s) *
- Site Demolition Key Plan and General Information Sheet **
- Site Demolition Plan(s) **
- Site Materials Key Plan and General Information Sheet
- Site Material Plan(s)
- Site Layout Key Plan and General Information Sheet
- Site Layout and Dimensioning Plan(s)
- Site Grading and Drainage Key Plan and General Information Sheet **
- Site Grading and Drainage Plan(s) **
- Site Lighting Key Plan and General Information Sheet ***
- Site Lighting Plan(s) ***
- Site Details (including Site Composite Sections/Elevations)
- Tree Planting Key Plan and General Information Sheet #
- Tree Planting Plan(s) #
- Shrub and Groundcover Key Plan and General Information Sheet #
- Shrub and Groundcover Planting Plan(s) #
- Site Soils Key Plan and General Information Sheet
- Site Soils Plan(s)
- Planting Details

Notes:

* Denotes plans that may be combined with Site Demolition Series Drawings.

** Denotes plans that may be prepared by civil engineer.

*** Denotes plans that may be prepared by lighting designer or electrical engineer.

# Denotes plans that may be combined to create one series titled "Planting Plans."

Additional Drawings That May Be Required

The following drawings may be required for the project but are not currently in the recommended series list for either small projects or large projects. They are described in detail with graphic examples in Chapter 4*: Pre-Design*.

- Summary of Quantities Sheet(s)
- Site Materials Schedule(s)
- Site Preparation Plan(s)
- Erosion and Sedimentation Control Plan(s)
- Site Furnishings Plan(s)
- Signage and Wayfinding Plans

Any additional sheets series should be added at the end of the primary series, where necessary. These include drawings completed by other subconsultants not listed below.

Subconsultant Drawings

Regardless of the size of the landscape architecture project, all subconsultant series drawings will follow the landscape architecture series drawings. Subconsultants listed below are often subcontracted to the landscape architect, but not in all cases.

While a specific subconsultant drawing order is not proposed, there may be some logical ordering relationships within a project, for example, water feature design and engineering drawings may be positioned to immediately precede mechanical engineering drawings that define water feature mechanical systems.

Listed here is a logical subconsultant drawing order for most landscape architecture projects:

- Civil Engineering Drawings (civil engineering for roads and parking, site grading and drainage systems, site utilities, and erosion and sedimentation control)
- Irrigation System Drawings (landscape irrigation)
- Lighting and Electrical Engineering Drawings (site lighting and electrical power for site lighting, landscape architecture improvements, irrigation, and any other site system requiring electricity)
- Mechanical Engineering Drawings (snowmelt systems and mechanical systems associated with pools or water feature)
- Water Feature Design and Engineering Drawings
- Swimming Pool Design and Engineering Drawings
- Architectural Drawings (site architecture, for example, shelters, trellises, restrooms)
- Structural Engineering Drawings (structural engineering of site structures, for example, walls, stairs, foundations/footings, and reinforcement)
- Other Specialty Design and Engineering Drawings

Supplemental (Resource) Documents

Supplemental documents should be referenced and not included in the drawings. These are typically prepared under a separate contract between the owner and applicable consultant and provided to the landscape architect for his or her use in developing landscape architecture drawings. These include existing conditions surveys and geotechnical investigations and are typically included as Available Information within the Bid/ Procurement Requirements.

Landscape Architect as Subconsultant

Note that on many projects, such as for a building or highway interchange, a larger and more diverse consultant team may be contracted by the client. These consultants will not likely report to the landscape architect, as they may not have a role in site development. These consultants are often contracted to an architect or engineer, serving as the prime consultant.

In this case, the prime design consultant will orchestrate and coordinate the overall organization of drawing sheets within the entire set, for all subconsultants, including the landscape architect. These consultants, and their subconsultants, may include a structural engineer, civil engineer, mechanical engineer, electrical engineer, and other specialists.

When the landscape architect is not contracted as the lead or prime consultant and will be providing drawings within an architect's or engineer's drawing set, the landscape architect should only provide the Series Drawings under his contractual work scope. The landscape architect may have subconsultants, and in that case, the landscape architect may organize their drawings and those of their subconsultants as defined earlier. However, the landscape architect should utilize the prime consultant's Cover Sheet.

It is the lead consultant's responsibility to prepare the drawing set and establish the naming and numbering conventions. The landscape architect should coordinate with the lead consultant as required to ensure their information is adequately conveyed and redundancies within the set are eliminated.

For projects where the landscape architect is not the lead consultant, the following depicts the traditional order of drawings, as defined by the U.S. National CAD Standards. Note that international standards may vary.

- Civil
- Landscape, including Irrigation System
- Electrical/Lighting
- Mechanical/Water Feature
- Architectural
- Structural

KEYNOTE SYSTEM—THE BACKBONE OF THE DOCUMENTS

Annotation of landscape architectural drawings has evolved as technology has improved and project complexity has grown. It has become increasingly important for drawings to adequately convey the design intent.

Drawings must be clear, concise, complete, and consistent to avoid overlap and redundancies. In order to bring clarity to the drawings and simplify where and how content is conveyed, keynoting systems are used. Keynoting shall include both Site Detail Keynotes and Site Reference Notes.

Site Detail Keynotes

This system establishes direct links between graphic information shown on the drawings and associated requirements in the specifications. Keynotes minimize the extent of text used on the drawings without restricting the content itself. Drawing notations are identified by keynote symbols. Typically, notations with their respective keynote symbols are located on each sheet in a keynote legend, while only the keynote symbols are placed on the plan or detail drawing. Each keynote may be repeated on the drawing in a number of locations in order to adequately convey and reinforce intent. However, it is preferable to identify items in only several locations per drawing sheet and add "TYP" to describe the condition as typical.

On the site details sheets, details should be organized to coincide with the master keynote list, with like details grouped as systems. Keynotes are organized according to "systems" incorporated in the project. A "system" is defined as a landscape site element and includes all of the components that make up that system as depicted on the plans, for example, concrete paving, which includes the finished paving surface and associated base and sub-base. The graphic that follows illustrates a suggested grouping of systems.

Site Detail Keynote Legend

SAMPLE KEYNOTE DRAWING CALLOUT:

3.2 TYP.

SITE DETAIL KEYNOTES:

		DETAIL/ SHEET	RELATED DETAIL(S)	SPEC. SECTION(S)
1.0	**PAVEMENTS, RAMPS, CURBS**			
1.1	STONE PAVING TYPE 1 - Sand Set w/ Planting Joints	x/ Lx-01	x/ Lx-0x, x/ Lx-0x, x/ Lx-0x	321400

KEYNOTE HEADING (PROPOSED IMPROVEMENT SYSTEM)

KEYNOTE CALL-OUT

KEYNOTE (SYSTEM) ITEM AND BRIEF DESCRIPTION

PRIMARY KEYNOTE DETAIL REFERENCE (NUMBER AND SHEET)

ADDITIONAL DETAIL REFERENCES (COMPOSITE SECTIONS/ELEVATIONS, OTHER SECTIONS, ELEVATIONS OR 3D DRAWINGS, AND/OR TRANSITION OR CONNECTION DETAILS)
NOTE: MULTIPLE DETAILS MAY BE REFERENCED

SPECIFICATION REFERENCE (CSI SECTION NUMBER MASTER FORMAT 2004 OR OTHER JURISDICTIONAL REQUIREMENT)
NOTE: MULTIPLE SPECIFICATIONS MAY BE REFERENCED

THE FOLLOWING LIST OF KEYNOTE HEADINGS (PROPOSED IMPROVEMENT SYSTEMS) HAVE BEEN INCORPORATED WITHIN THIS DRAWING SET:

1.0 PAVEMENT, RAMPS, AND CURBS
2.0 JOINTING
3.0 STEPS
4.0 SITE WALLS/EMBANKMENTS
5.0 SITE FURNITURE
6.0 RAILINGS, BARRIERS, AND FENCING
7.0 SITE LIGHTING
8.0 DRAINAGE
9.0 PLANTING AND LANDSCAPE
10.0 MISCELLANEOUS ELEMENTS
11.0 PLANT PROTECTION

NOTE: IF A KEYNOTE HEADING IS NOT INCORPORATED IN PROJECT, A "NOT USED AT THIS TIME" REFERENCE HAS BEEN PROVIDED.

Site Detail Keynote List

SITE DETAIL KEYNOTES:

		DETAIL/ SHEET	RELATED DETAILS	SPEC SECTION
1.0	**PAVEMENTS, RAMPS, CURBS**			
1.1	Stone Paving Type 1 (irregular stone on snowmelt concrete subslab)	1/L7-02	1/L7-10	096380 & 033000
1.2	Stone Paving Type 2 (irregular stone on concrete subslab)	2/L7-02	1 & 2/L7-10	096380 & 033000
1.3	Stone Paving Type 3 (rectilinear stone on snowmelt concrete subslab)	3/L7-02	3/L7-10	096380 & 033000
1.4	Stone Paving Type 4 (irregular stone on snowmelt concrete subslab for vehicular use)	4/L7-02	4/L7-10	096380 & 033000
1.5	Stone Coping	5/L7-02		096380
1.6	Concrete Type 1 (colored and snowmelted)	6/L7-02		321313
1.7	Concrete Type 2 (gray and non-snowmelted)	7/L7-02	4 & 5/L7-10	321313
1.8	Concrete Type 3 (colored and snowmelted for vehicular use)	8/L7-02		321313
1.9	Stepping Stone Type 1 (Pathway)	9/L7-02		096380
1.10	Stepping Stone Type 2 (Irregular)	1/L7-03		096380
1.11	Stone Banding	2/L7-03	1,2,3 & 4/L7-10	096380
1.12	Concrete Pavers	3/L7-03		321400
2.0	**JOINTING**			
2.1	Expansion Joint	4/L7-03		321313
2.2	Control Joint	5/L7-03		321313
3.0	**STEPS**			
3.1	Stairs Type 1 (stone slabs on snowmelt conc ftg)	9/L7-03		096380 & 033000
3.2	Stairs Type 2 (snowmelt concrete & conc footing)	10/L7-03		096380 & 033000
4.0	**SITE WALLS/ EMBANKMENTS**			
4.1	Stone Veneer Wall	1/L7-04	1/L7-10	048600 & 033000
4.2	Stone Veneer Retaining Wall Type 1	2/L7-04	2 & 3/L7-10	048600 & 033000
4.3	Stone Veneer Retaining Wall Type 2	3/L7-04	5/L7-10	048600 & 033000
4.4	Dry Stacked Stone Retaining Wall	4/L7-04		323223.10
5.0	**SITE FURNITURE**			
5.1	Bench	1/L7-05		129300
5.2	Pool Lounge Chair	2/L7-05		129300
5.3	Trash Receptacle	3/L7-05		129300
5.4	Planter Pot Type 1	4/L7-05		129300 & 329300
5.5	Planter Pot Type 2	5/L7-05		129300 & 329300
6.0	**RAILINGS, BARRIERS, FENCING**			
6.1	Split Rail Fence	1/L7-06		061063
6.2	Handrail	2/L7-06		057300
6.3	Guardrail	3/L7-06		057300
6.4	Bollards	4/L7-06		129300
7.0	**SITE LIGHTING**			
	Refer to Lighting and Electrical Series Drawings			
8.0	**DRAINAGE**			
8.1	Landscape Area Drain	1/L7-08		334600
8.2	Hardscape Area Drain	2/L7-08	2,4 & 5/L7-10	334600
8.3	Trench Drain	3/L7-08		334600
9.0	**PLANTING AND LANDSCAPE**			
	Refer to Tree and Shrub Planting Series Drawings			
10.0	**MISCELLANEOUS SITE FEATURES**		Refer to Water Design Drawings	
10.1	Infinity Edge Pool and Reflection Basin	1 & 2/WF-06		130001
10.2	Custom-Shaped Spa	3/WF-06		130001
10.3	Circular Exterior Spa	4/WF-06		130001
10.4	Serenity Oval Spa	5/WF-06		130001
10.5	Rectilinear Aspen Spa	6/WF-06		130001
10.6	Woodland Oval Spa	7/WF-06		130001
10.7	Gas Fireplace	4/L7-08		048600, 033000, 048100 & 055000
10.8	Gas Firepit Type 1	5/L7-08		048600, 033000, 048100 & 055000
10.9	Gas Firepit Type 2	1/L7-09		048600, 033000, 048100 & 055000
10.10	BBQ	2/L7-09		047200
10.11	Landscape Boulder	3/L7-09		044300.10
10.12	Sculpture Type 1	4/L7-09	1/L7-11	121400
10.13	Sculpture Type 2	5/L7-09	2/L7-11	121400

The materials description on the keynote list shall match the description used in other legends, lists, detail labels, and specifications, for consistency. Specification language should not be included on the legend or the keynote list. Finish, thickness, edge conditions, and other information should be included in specifications, and referenced to the plan legend and keynote list. For example, use the description "Stone Paving Type 1" on the graphic symbols legend and keynote list, and where warranted establish a schedule in the specifications to describe the specific properties or types referenced on the drawings.

Keynotes should be used to define generic material systems, not distinguish related materials. For example, the keynote reference 1.1 may be used to define stone paving. The graphic symbols legend should then be used to distinguish Stone Paving Type 1 from Stone Paving Type 2. It is important where a complex array of materials, setting systems and finishes are proposed that the graphic symbols legend is used to distinguish these attributes on the Drawings. The associated specification section, in this case, Section 096380 "Stone Flooring" will provide all the required written descriptions for these items, including administrative, product and installation criteria and requirements.

An excerpt from a project Site Detail Keynote List and Site Materials Legend follows so the correlation between the two can be visualized.

Keynote List and Graphic Symbols Legend Correlation Diagram

SITE DETAIL KEYNOTES:

		DETAIL / SHEET	RELATED DETAILS	SPEC. SECTION
1.0	**PAVEMENTS, RAMPS, CURBS**			
1.1	Stone Paving Type 1 (irregular)	1 / L7-02		096380
1.2	Stone Paving Type 2 (irregular on conc.)	2 / L7-02		096380&033000
1.3	Stone Paving Type 3 (12"x12" sq.) Stone	3 / L7-02		096380
1.2	Paving Type 4 (ashlar)	4 / L7-02		096380&033000

SITE MATERIALS LEGEND

- Stone Paving Type 1 (irregular)
- Stone Paving Type 2 (irregular on conc.)
- Stone Paving Type 3 (12"x12" sq.) Stone
- Paving Type 4 (ashlar)

Site Reference Notes

These notes are intended to communicate to the contractor instructional intentions that have historically been communicated as typed notes on drawings. If the Site Detail Keynotes represent the "nouns" of the plan documents, the Reference Notes represent the "verbs." Words such as "align, provide, and verify" commonly begin these statements. These Site Reference Notes should be grouped by major sheet topics such as Demolition, Layout, Grading, and Planting.

Site Reference Notes should not include references to details, specifications, construction "systems" or bid items. Construction systems should be referenced in the Site Detail Keynote list as described earlier.

Site Reference Notes are not intended to exhaustively communicate all instructions or requirements, as there are a number of sources in the Contract Documents that complement one another. Site Reference Notes should not duplicate or replicate specifications' information. In general, Site Reference Notes designate drawing-based instructions that the contractor should follow during construction. These notes are directed at specific plan areas or elements that require the noted actions. General Notes should not be used as Site Reference Notes.

Example Site Reference Notes for each series are included below. Note that these notes do not represent a comprehensive set of instructions.

Site Reference Note Legend

SAMPLE REFERENCE NOTE DRAWING CALLOUT:

5 TYP.

"x" REFERENCE NOTES

1 Final Location of Path to be Determined in Field Under Direction of Landscape Architect

NOTE CALL-OUT

SERIES SPECIFIC REFERENCE NOTE (SUPPLEMENTAL TO KEYNOTES. TYPICALLY DESCRIBES ITEMS TO BE CONSIDERED DURING CONSTRUCTION. MAY REFERENCE A DETAIL OR SPECIFICATION OR BOTH.)

NOTE: "x" Refers to Drawing Series (i.e. SITE DEMOLITION REFERENCE NOTES). THERE SHOULD BE SPECIFIC REFERENCE NOTES FOR EACH DRAWING SERIES. HOWEVER, SOME NOTES MAY APPEAR ON MULTIPLE SERIES.

PLANT PROTECTION AND REMOVAL REFERENCE NOTES

(Note: For this series, because there are either none or very few "systems" that can be proposed, the Site Reference Notes are the primary means by which the scope of work is conveyed.)

1. "Existing tree to remain. Do not disturb. Protect in place."
2. "Existing tree and stump to be removed."
3. "Existing landscape area to be removed."
4. "Existing utility box to remain. Do not disturb."
5. "Existing overhead power line to remain. Do not disturb."
6. "Strip, salvage, and stockpile topsoil."

SITE DEMOLITION REFERENCE NOTES

(Note: For this series, because there are either none or very few "systems" that can be proposed, the Site Reference Notes are the primary means by which the scope of work is conveyed.)

1. "Existing tree to remain. Do not disturb. Protect-in-place."
2. "Existing utility line to remain. Do not disturb."
3. "Existing electric line to be removed including any aggregate trenching. Coordinate with Utility Company as required."
4. "Existing concrete paving and aggregate bases to be removed and recycled."
5. "Existing stone curbing to be removed and salvaged for owner for reuse in project. Coordinate with Owner's Rep on stockpile location."

SITE MATERIALS REFERENCE NOTES

"PA = Planting Area. Refer to Planting Plans."

1. "Existing catch basin to remain. Do not disturb."
2. "Existing tree to remain. Do not disturb."
3. "Existing fire hydrant to remain. Do not disturb."
4. "Connect proposed pavement to existing pavement, as per joint details."
5. "Proposed improvements by others. N.I.C. Shown for reference only. Coordinate with Director, Public Works, as required."

SITE LAYOUT REFERENCE NOTES

1. "Final location to be determined in field under direction of landscape architect. Pathway to be staked per plan coordinates and verified by landscape architect prior to construction."
2. "Align with edge of building wall."
3. "Align with edge of existing patio paving."
4. "Center element on building column."
5. "Paving pattern to begin at threshold with full pieces and be centered on centerline of door."
6. "Paving pattern shall end with full pieces. Cut pieces shall be placed internally so as to maintain intended pattern/design intent."
7. "Baseline A is defined as the centerline of main entry door."
8. "Baseline B is defined as an extension of the Southwesterly pool building wall."

SITE GRADING AND DRAINAGE REFERENCE NOTES

1. "Existing tree to remain. Do not disturb."
2. "Existing fire hydrant to remain. Do not disturb."
3. "Tie into existing grade. Meet smoothly and evenly. Provide positive pitch to drains as required."
4. "Drainage swale. Pitch at 2 percent minimum."
5. "Blend top of slope smoothly to meet existing conditions."

SITE LIGHTING REFERENCE NOTES

1. "Existing tree to remain. Do not disturb."
2. "Approximate photometric footprint for 0.25 foot-candle of lumens."
3. "Light to be centered in wall, horizontally and vertically."
4. "Street light to align horizontally with existing street light on opposite side of street."

TREE PLANTING REFERENCE NOTES

1. "Existing tree to remain. Do not disturb."
2. "Existing overhead utility line to remain. Do not disturb. Not trees shall be planted under this line."
3. "Existing gas line to remain. Do not disturb. Trees shall be a minimum of 5' off edge of this line."
4. "Trees to align in both east–west and north–south directions."
5. "Existing utility box to remain. Do not disturb."
6. Center tree on streetscape element line.

SHRUB AND GROUNDCOVER REFERENCE NOTES

1. "Existing tree to remain. Do not disturb."
2. "Coordinate shrub layout with existing utilities. Report conflicts to landscape architect."
3. "Carefully excavate shrub pits in vicinity of existing trees, without disturbing tree roots."
4. "Proposed edge of stream course. Avoid plantings below stream edge."
5. "Proposed backflow preventer. Avoid planting within defined access zone."

SITE SOILS REFERENCE NOTES

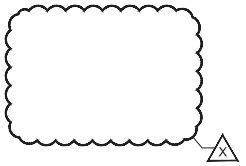
1. "Existing tree to remain. Do not disturb and do not place new planting soil within tree dripline."
2. "Finish new planting Soil Type 1 flush with adjacent hardscape paving."
3. "Align limits of planting soil with top of slope bank."
4. Limit of Soil Type 1 . Place Soil Type 2 so finish surface flush with Soil Type 1.

GRAPHIC SYMBOL SYSTEM

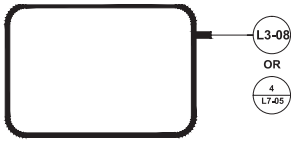
As discussed in *Digital Organization*, documentation is both a graphic and a technical endeavor. In order to properly convey design intent, it is important that the landscape architect understand the fundamental graphic symbols that are used in the documentation process. These symbols, in combination with proper line weight assignments, are critical to the successful depiction of project documents. A list of typical symbols used for most landscape architecture projects is itemized below, followed by a brief description and graphic representation of each. The symbols are classified as either graphic symbols or linetype symbols. The list is not intended to be exhaustive but rather identifies commonly used symbols.

Graphic Symbols

1. **Revision Cloud and Callout:** Used to designate/highlight changes in the project work, is typically a scalloped line drawn around the revision areas in the drawing. If a majority of the sheet is revised, the sheet number is clouded rather than the drawing, for simplicity. A revision triangle with correlating revision number accompanies the revision cloud. These are typically utilized during the bidding process to track Addenda and construction phase for either field changes or change orders.



2. **Enlargement Plan Reference:** Used to designate areas of the drawing that are defined elsewhere within the documents at a larger scale. This symbol is typically a solid, bold, black box but can be a polygonal shape to more precisely define enlargement boundaries. The symbol is typically accompanied by a detail reference symbol (described below). On the smaller scale plan, where the enlargement plan reference is depicted, no labels or annotations within the box should be provided. That information should be provided on the enlargement plan only.



3. **Detail Reference:** Used to designate proposed landscape architecture system "details." A detail is a graphic plan, section, elevation, or three-dimensional illustration (axonometric, perspective, etc.) that depicts the design and construction requirements of a proposed system, connection or transition. If the detail reference refers to a section drawing, an orientation arrow should be included and oriented toward the actual direction of sectional depiction. Detail references are typically indicated by a circle with an annotation reference to the corresponding detail number and sheet number, e.g., 1/L7-01, 3/L7-04. Stand-alone detail references are typically used in conjunction with enlargement plan references.

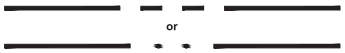
4. **Section Reference:** Used to designate either composite sections or detail cross-sections on the series plans. These references include a detail reference and a graphic line/bar with section orientation arrow, which are filled solid black. The orientation arrow must be oriented toward the actual direction of the sectional drawing. Section References are placed on plans to illustrate areas where "cut-throughs" or sections are included in the document set. Section References are necessary where relationships, transitions, or connections to multiples systems are necessary to convey.

5. **Elevation Reference:** Used to designate elevation drawings on the series plans. These references include a detail reference and a graphic line/bar with section orientation arrow, which are unfilled. The orientation arrow must be oriented toward the actual direction depicted in the elevation drawing. Elevation references are placed on plans to illustrate areas where "cut-throughs" are included in the document set. Elevation drawings typically include only content from finish grade and above, in other words, elevation drawings typically show above-grade conditions only.

6. **Matchline:** Where multiple plan sheets are required to document a project, "matchlines" are necessary to orient the viewer to where adjacent information is located. These lines are typically thick, bold, black dashed lines and located on the perimeter of the sheets where "matching" is required. Some degree of plan to plan overlap is preferred with matchlines, to help the reader orient between plan sheets.

Linetype Symbols

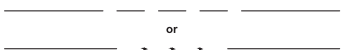
1. **Property or Right of Way Line:** Designates property boundaries and indicate limits of land ownership. This linetype is typically represented as a solid (continuous) line followed by a space, two-dashed (or dots) lines, a space, and then a solid line.



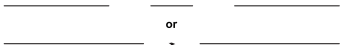
2. **Limit of Work Line:** Defines the limits of the proposed work scope and any and all contractor work, for example, plant protection, site demolition, hardscape and softscape improvements, site lighting, and grading, and drainage. *Limit of work* should only be used where "entirety" of project is understood. Entirety shall mean understanding Contractor requirements, e.g., temporary trailer, parking, loading and unloading, staging, deliveries, etc. associated with the site. This linetype is typically represented as a short dashed line, medium width and screened back slightly.

3. **Easement Lines:** Defines any easements or rights of way boundaries on a land parcel. This linetype is typically represented as a smaller dashed line, slightly larger in scale than the *limit-of-work Line*, but less than the matchline. There is no width or thickness applied to this linetype.

4. **Water Level Lines:** Defines the flowline or water level of water bodies, for example, ponds, lakes, rivers, and streams. This linetype is typically represented as a solid line followed by a space and three-dashes or dots, a space and then a solid line.

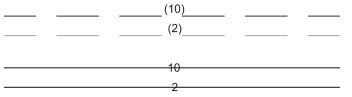


5. **Centerlines:** Defines the central axis or midpoint of a space or element, for example, a pathway, furniture, or light. This linetype is typically represented as a solid lined followed by a space, a single-dashed line or dot, a space and then a solid line.



6. **Utility Lines:** Designates existing or proposed site utilities, above or below grade. This linetype is typically represented as a solid line interrupted by a text abbreviation of the designated utility, for example, "w" for water, "st" for storm sewer, "ss" sanitary sewer. Existing utilities are typically lighter line weights (pen settings), while proposed are typically bolder, that is, heavier or thicker.

7. **Topography Lines:** Designates the three-dimensional, real-world elevations of a site. These lines graphically define the shape of the terrain/land surface. Existing and proposed topographic (contour) lines are depicted differently. Existing contours are typically represented as dashed lines whereas proposed contours are indicated by solid (continuous) lines. Contours are further defined by contour intervals. Every fifth contour line is typically referred to as an index contour. Index contours usually occur in multiples of five for 1-foot contour intervals, that is, 5, 10, 15, 20, and so on, and multiples of 10 for 2-foot contour intervals, that is, 10, 20, 30, and so forth. Existing index contours are typically displayed with a longer dashed line and proposed index contours are typically bolder solid lines. Contour labels are typically shown on the high (topographically) side of the contour line, but also may "break" the line. Contour labels for existing contours are shown within parentheses, "(x)," while proposed contour labels do not require parentheses, "x".



DRAWING AND SPECIFICATION RELATIONSHIPS

Landscape architecture project documentation includes both graphic drawings and written specifications. They are considered both complementary and integral to one another. One does not take precedence over the other and any discrepancies should be resolved by the landscape architect. The development of both drawings and specifications should be considered a standard practice for the SD, DD, and CD phases of design and should progress consistently during each phase, beginning with the Schematic Design phase. They are developed in conjunction with one another. The Construction Specifications Institute (CSI) has established industry standards for this process, particularly regarding content, format, organization, and drawing-specification relationships. Preliminary Project Descriptions (PPDs) are recommended at the SD phase, outline specifications at the DD phase, and full specifications at the CD phase. These components are described here.

Drawings

Drawings are the primary means to convey design intent, as they show forms, sizes, locations, and relationships between components and materials. They include patterns and textures that may be best described graphically, rather than narratively within specifications. Drawings include plans, elevations, sections, section-elevations, plan-sections, three-dimensional drawings, diagrams, schedules, and charts. Most drawings within the landscape architectural documents are grouped as either plans or details.

Content and graphic requirements for each drawing series are defined within these guidelines. Clarity and simplicity are key principles associated with the graphic standards. Further graphic detail is provided in the landscape architect's CAD and Graphic Standards Manual(s). The evolution of drawing and documentation characteristics is evident in these guidelines, as schematic drawings are more illustrative in their role to convey design intent and character. Design Development documents represent the transition from illustrative to technical drawings. In the CD phase, drawings are purely technical and black and white. As legal documents, they represent the graphic component of the contract between an owner and a contractor.

Specifications

Written specifications are developed concurrently to complement the drawings and describe the non-graphic requirements, including quality and performance, products, and materials, and execution of the design as it develops. The written documents emerge as Preliminary Project Descriptions during the Schematic Design phase, transition to outline specifications during the Design Development phase and conclude as either short form or full-length specifications during the Construction Documentation phase. The organization of Specifications is governed by CSI's UniFormat™ for PPDs and MasterFormat® for Outline Specifications and Full Specifications. An overview of PPDs is provided in Chapter 6, *Schematic Design,* as these are integral to the Schematic Design package. Outline and full specifications are summarized here. Specifications are typically issued in a broader document known as the Project Manual. Specifications are legal documents and represent the written technical components of the contract between an owner and a contractor.

Key definitions should be understood in organizing specifications:

Preliminary Project Descriptions, or PPDs, are narrative descriptions of proposed systems, assemblies, components, and materials and are organized in accordance with CSI UniFormat™, to correlate with prevailing industry methods for cost estimating for the applicable phase. PPDs include all disciplines but for landscape architecture projects they should focus on site construction elements and associated administrative controls.

Outline Specifications initially describe, in abbreviated format, the main systems and elements depicted on the drawings. They are typically organized in single page format for each system, with key requirements provided under the headings General, Products, and Execution. Detail level is oriented toward providing the contractor or estimator with sufficient information to develop a cost estimate for the current phase of design.

Specifications are organized in accordance with the current CSI MasterFormat® edition, which currently includes 49 Industry Standard Divisions for organizing and describing proposed systems and their components. Division 01 is typically referred to as the "General Requirements," while Divisions 02-49 are typically referred to as the "Technical Specifications." The landscape architect should become familiar with preparing both General Requirements and Technical Specifications, as they are both essential to the successful built outcome. General Requirements include administrative requirements for the contractor, for example, project meetings and submittals; while the Technical Specifications include requirements for the proposed construction systems, for example, strength of materials..

Specifications are the most explicitly defined requirements for the proposed improvements. All proposed systems, assemblies, components, and materials are thoroughly studied, reviewed, coordinated, and precisely defined to adequately convey contractual requirements. These requirements are reflected in each of the three Parts of a Specification (Part 1—General, Part 2—Products, and Part 3—Execution).

A **Project Manual** is a compilation of the written requirements for the Project. It typically contains the "Procurement" or "Bidding Requirements" bonding requirements and "Contracting Requirements," including any "Supplementary Conditions to the Contract" and "Specifications," which include the "General Requirements" (Division 01) and "Technical Specifications" (Divisions 02-49). When issued in conjunction with the drawings, they represent the binding, legal documents in a contract between an owner and a contractor. These are collectively known as the *Contract Documents***.**

The following section overviews key specification components. The overview does not represent an exhaustive tutorial on specification preparation. Instead it introduces the landscape architect to fundamental specification organizing principles.

Specifications: Principles and Practices[1]

SPECIFICATION WRITING—KEY PRINCIPLES

- Written specifications are integral to design quality.
- Design and product/material selections go hand in hand, and should be conducted concurrently.
- The specifications writer is most successful when he or she makes use of all necessary resources and dedicates time to studying and evaluating product, material, and system choices.
- Good specifications preparation practice is a skill that must be developed and represents an accumulated body of knowledge. Selected individuals should be responsible for specification preparation.

SPECIFICATION WRITING—OBJECTIVES

- Define the construction administration requirements.
- Describe product types and installation methods.
- Define the qualitative requirements for proposed systems, products, materials and workmanship.
- Describe quantity and extent of materials.
- Describe method and criteria for determining quality of materials and workmanship.

[1] Primary Specifications content derived from CSI, Construction Specifications Institute.

Basic Organization of the Contract Documents

The Project Manual

- The Project Manual includes the following elements:
  - The Procurement or Bidding Documents
    - Legal Advertisement or Invitation to Bid
    - Instructions to Bidders
    - Bid Forms
    - Available Information/Resource Drawings
    - Addenda (as applicable to bid)
  - Contract and Project Forms
    - The Agreement
    - Performance and Payment Bonds, and Certificates
  - Contract Conditions
    - General Conditions
    - Supplementary Conditions
  - Specifications
    - General Requirements (Division 01)
    - Technical Specifications (Division 02-49)

Each specification section includes the following three parts and associated content.

The Three-Part Section Format

PART 1—General

Work Included (optional)
Related Work
System Description
Quality Assurance
References
Submittals
Delivery, Storage, and Handling
Project/Site Conditions
Sequencing/Scheduling
Alternates/Alternatives
Allowances
Unit Prices
Warranty

PART 2—Products

Acceptable Manufacturers
Materials
Equipment
Mixes
Fabrication

PART 3—Execution

Inspection
Preparation
Installation/Application/Erection
Field Quality Control
Adjusting and Cleaning

MasterFormat® [2]

MasterFormat® is a specification-writing convention established by the Construction Specifications Institute (CSI) and widely accepted within the design and construction industry. MasterFormat® standardizes the titles and section numbers in order to organize design requirements, product selections, and execution during construction.

MasterFormat® 2004 was designed to provide a simpler and more descriptive numbering and naming system, relative to earlier versions. The new numbering system includes a total of 49 divisions.

The following are sections within Division 32 that landscape architects should become familiar with, as these are the most frequently used sections on landscape architecture projects.

Division 32—Exterior Improvements

- 32 12 16 Asphalt Paving
- 32 13 13 Concrete Paving
- 32 13 16 Decorative Concrete Paving
- 32 13 73 Concrete Paving Joint Sealants
- 32 14 00 Unit Paving
- 32 14 43 Porous Unit Paving
- 32 17 23 Pavement Markings
- 32 17 26 Tactile Warning Surfacing
- 32 18 16.13 Playground Protective Surfacing
- 32 31 13 Chain Link Fences and Gates
- 32 31 19 Decorative Metal Fences and Gates
- 32 31 29 Wood Fences and Gates
- 32 32 23 Segmental Retaining Walls
- 32 84 00 Planting Irrigation
- 32 91 13 Soil Preparation
- 32 92 00 Turf and Grasses
- 32 93 00 Plants
- 32 96 00 Transplanting

Divisions

Definitions and Characteristics

- Divisions are basic groupings of related construction information.
- The 49 divisions are fixed in both number and title regardless of project type or location.
- A division is a group of related sections.
- If there are no sections of work within a division, then that division is listed as "Not used" in the table of contents of the Project Manual. Subsequent divisions are not renumbered.
- The 2004 format has a six-digit numbering system consisting of three pairs with spaces in between.

Preparing Specification Content

The following are recommended best practices for compiling information within the Specifications:

Three pairs of numbers indicate the first three levels of a specification. A fourth level of detail, if needed, is represented as a decimal point and another pair of digits, as in the format example that follows:

- Level 1: Division Number 31 00 00 Earthwork
- Level 2: Broad Scope 31 22 00 Grading
- Level 3: Medium Scope 31 22 19 Finish Grading
- Level 4: Narrow Scope 31 22 19.13 Spreading and Grading Topsoil

[2] *MasterFormat 2014*. Alexandria, Virginia: Construction Specifications Institute, 2013.

Best Practices

Preparing Specification Section Content[3]

The following practices are recommended for compiling information to include within the specifications:

1. Gather information:
   - Assemble applicable master specification section, unaltered from its original format. Review for applicability to project needs.
   - Review but don't replicate specifications from similar work, as requirements for current project may have been previously removed (edited) from the copied specification.
   - Review manufacturer's product data for candidate products.
   - Use Outline Specification sections as a checklist for material decisions.
   - Work with manufacturers as resources to inform product decisions.
   - Utilize Arcom MASTERSPEC supporting documents to assist in understanding technical aspects of components/items within specifications.
2. Select products to address project objectives, including any LEED requirements.
   - Determine needs of the project, including any LEED requirement.
   - Evaluate product types meeting owner's requirements.
   - Coordinate product type selections with team.
   - Find sources for product types.
   - Evaluate product and make preliminary selection.
   - Utilize landscape architect's specification spreadsheet to record manufacturers' product information for ease of retrieval.
3. Evaluate manufacturer's qualifications relative to established criteria:
   - Accuracy and completeness of information
   - Timely delivery of service
   - Reputation for problem resolution
   - Services provided during design and after sale
   - Warranty value and financial standing
4. Evaluate product installer's qualifications:
   - Are reliable subcontractors available?
   - Are skilled workers available?
   - Are manufacturers/industry certifications required?
   - Do provided installation instructions adequately address project conditions?
   - Are the preparatory and finishing requirements realistic and will they provide the desired outcomes?
5. Evaluate Product Selection Costs:
   - Initial cost
   - Warranty cost
   - Operations costs
   - Maintenance costs
   - Renewal costs
   - Recycling costs
   - Are selected products within the budget established by the client?
6. Select appropriate grades of materials:
   - Are they suitable for the project and its application?
   - What are the actual requirements that are critical to this project and will the materials perform as intended?
   - Avoid elaborate and expensive where not required.
7. Evaluate Industry conditions:
   - Ensure awareness of construction trades structure.
   - What is the availability of the product and skilled workers to install the product?
   - What are the lead times for fabrication and delivery?
   - What is the potential for price fluctuations?
8. Specify Workmanship:
   - Establish measurable and verifiable performance requirements.
   - Identify Installer qualifications.
   - Specify tolerances and grades of work.
   - Establish mock-up and pre installation meeting requirements.
9. Coordinate Specifications with Drawings:
   - Use consistent terminology.
   - Eliminate duplicate information between the two documents.
   - Include all products, materials and systems shown on drawings within the specifications.
   - Verify that all information included within the specifications are applicable to drawing and project intentions.

[3] Specifications content partly derived from CSI, Construction Specifications Institute.

Preparing Specification Sections[4]

Determine level to which specifications need to be developed, that is, *Outline* versus *Short Form* versus *Full-Length* sections. Generally ***Short Form*** is sufficient for simple private projects while ***Full-Length*** is typically more adequate for complex private or publically bid projects.

Assure that all information required to prepare content has been assembled. Confirm content with client, product manufacturers, previously successful installations or similar projects, and thorough consultations with specialty contractors, suppliers, fabricators, or other tradesmen.

Carefully assemble similar Section content from previous projects where applicable, but verify that these Sections are fully complete. Do not directly copy information from previous projects without fully understanding the context of that project, including any potential shortcomings or lessons learned.

Utilize firm's boiler plate baseline Specification Sections or Arcom MasterSpec Sections as a starting point for editing.

Become familiar with the Arcom MasterSpec Masterworks editing tool software to make preparation more effective.

Producing a Project Manual

Begin full specification development in Design Development (DD) and further develop throughout the DD and Construction Document (CD) phases until issuance of the Contract Documents.

Coordinate with client to obtain the Procurement Requirement documents if bidding the project.

Coordinate with client to either obtain or edit the Contracting Requirement documents, as these will be binding with the contract between the owner and contractor.

Prepare Specifications as indicated herein.

Prepare Table of Contents to organize information in accordance with CSI's recommendations for a Project Manual.

[4] The Construction Specifications Institute (CSI). *The Project Resource Manual — CSI Manual of Practice,* 5th edition, "Module 5 Construction Documents," McGraw-Hill Professional, September, 2004.

Ensure CSI's "Say it once and say it in the right location" principle has been followed, that is, do not include the same information on both drawings and specifications. The drawing set is complementary to the Project Manual, and implicit relationships exist between the two documents.

If bidding the project, ensure that resource drawings, for example, site survey or existing conditions map, as prepared by a licensed surveyor or engineer and stamped "Geotechnical Report," are either attached as separate documents or made available for review and reference by bidders.

Methods of Specifying[5]

Descriptive Method

Describes desired physical properties, appearance, function and methods of installation.

EXAMPLE:

PART 2—PRODUCTS

2.1 SHELF STANDARDS

A. Standards:
1. Surface mounted projecting 1 inch maximum from finished surface.
2. Mounting screws spaced 12 inches apart maximum.
3. Slots for shelf adjustment on approximate 1 inch centers.
4. Finish: Gold anodized aluminum.

B. Mounting Screws:
1. Size: No. 8 x 1½ inches long.
2. Type: Steel wood screws.
3. Finish: Match standard.

C. Shelf Brackets:
1. Size: Suitable for 8 inch wide shelves.
2. Depth at Butt: 3 inches maximum.
3. Depth at Tip: 1 inch maximum.
4. Attachment: Rigid engagement of lugs into two slots of standard.
5. Finish: Match Standards.

[5] The Construction Specifications Institute (CSI). *The Project Resource Manual — CSI Manual of Practice,* 5th edition, "Module 5 Construction Documents," McGraw-Hill Professional, September, 2004.

Reference Standard Method

A standard established by Industry consensus

1. Uses nationally recognized product or material standard ASTM, ANSI, ACI, AWWA, ASME
2. Sets requirements by authority, custom, or general consensus
3. Standards established and updated by trade associations, professional societies, or the government
4. Often incorporated into code requirements

EXAMPLE:

PART 1—GENERAL

1.5 SHELF STANDARDS

A. AMERICAN STANDARD FOR NURSERY STOCK - ANSI Z60.1–2004

OR

A. American Society for Testing and Materials (ASTM):

C33-90n—Specification for Concrete Aggregates.

C150-89—Specification for Portland Cement.

OR

A. ASTM C33—Specification for Concrete Aggregates.

B. ASTM C150—Specification for Portland Cement.

PART 2—PRODUCTS

2.1 MATERIALS

A. Concrete Aggregates: ASTM C33, Maximum Size No. 57

B. Portland Cement: ASTM C150, Type I.

Performance Method

Describes all required results but not means to achieve them. Includes measurable criteria to verify compliance testing critical to performance specifying at time of fabrication at site after a period of service.

EXAMPLE:

A. Joint Sealant: Provide product that is watertight.

Meet requirements of ASTM E 331 for intended application when tested at minimum pressure difference of 2.86 lbs/sq. ft.; acceptable to substrate manufacturers, recommended for application by sealant manufacturer.

Color: Provide standard available color to match paving.

Proprietary or Prescriptive Method

A standard where a proprietary entity is specified. This method describes products and materials by manufacturer's name, brand/product name, model number, and unique characteristics.

EXAMPLE:

PART 2—PRODUCTS

2.1 Wall Light Type 1

A. Wall-mounted Lighting Fixtures

Bega-US, Carpenteria, CA, 805-684-0533, Model No. 4020P, with #4 brushed stainless steel finish, and 18 watt compact fluorescent twin-4P lamp, or approved equal.

Specification Language

Capitalization

Capitalize legal terms and those defined in the Conditions of the Contract:

- Owner, Architect/Engineer, Contractor
- General and Supplementary Conditions
- Project Manual
- Drawings (when referred to Contract Documents)
- Work (when referring to the work defined by the contract as a whole)
- Project

And other terms when appropriate:

- Components of specifications (e.g. Article, PART, etc.)
- Room names (e.g. Library)
- State (e.g. State of Texas)

Punctuation

Follow standardized, formal rules of punctuation, such as the Chicago Manual of Style.

Hyphenation

Avoid word hyphenation when possible.

Hyphenate numbers with fractions, for example: 3-1/2 inches.

Dimensions should appear on one line, do not separate.

Spelling

Conform to accepted national standard spelling, for example, from American reference such as Webster's Dictionary.

Be consistent.

Simplify whenever possible: calk, not caulk.

Do not use unacceptable spelling: through, not thru.

Abbreviations

Use only in schedules and on drawings where space is limited.

Use only well-known, easily understood abbreviations.

Use as a guide.

Symbols

Follow the same guidelines as for abbreviations.

Avoid use of parentheses and quotation marks.

Due to limitations in electronic media, avoid symbols whenever possible. Some word processing programs recognize the symbol for degrees, while others do not, leaving an untranslated voidin translated text.

Spell out feet with no inches: eight feet

Spell out inches with no feet: twelve inches

Use symbols for feet and inches together: 8'-0"

Spell out numbers less than 10 when referring to quantities:

Provide three anchor bolts

Numbers

Use numerals wherever possible, except where both quantity and measurement occur together:

Four 2x4s

Three ½-inch bolts

Use figures for degrees, percent, and time (except noon and midnight):

50 degrees F (10 degrees C)

10 percent

3:30 p.m on April 21

Express decimals in figures. Use a zero before a decimal if less than one:

6.875 inches

0.010 inch

Specifications Checklist

SPECIFICATIONS TECHNICAL INFORMATION GUIDE

MATERIALS SCHEDULE ITEM	DETAIL NO.(S)	SPEC. SECTION(S)	MFG./SUPPLIER	MODEL/PRODUCT NO.	SIZES/DIMENSIONS	THICKNESS	COLOR(S)	FINISH	PATTERN(S)	STRUCTURAL/ENGINEERING INFO	OTHER INFO/DESCRIPTION
1.0 PAVEMENTS, CURBS and RAMPS											
2.0 JOINTING											
3.0 STEPS											
4.0 SITE WALLS											
5.0 SITE FURNITURE											
6.0 RAILINGS, BARRIERS, FENCING											
7.0 SITE LIGHTING											
8.0 DRAINAGE											
9.0 PLANTING and LANDSCAPE											
10.0 MISCELLANEOUS ELEMENTS											

DIRECTIONS: Use this Spreadsheet as a way to track the system information you will need to adequately write your Specifications. Column A correlates to the "system" you will write in on your Site Details List/Schedule on your Drawings (i.e. Under 1.0, you may list 1.1 Concrete Paving Type 1). Each column identifies the information that will be relevant to that particular system and critical components to obtain for writing the Technical Specification.

PRELIMINARY PROJECT DESCRIPTIONS

G BUILDING SITEWORK

G10 SITE PREPARATION

G1010 Site Clearing

G1010.1 Stripping and Stockpiling of Topsoil

Site topsoil to be stripped to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials and stockpiled on site away from edge of excavations without intermixing with the subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Remove subsoil and nonsoil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.

G1030 Earthwork

G1030.1 Rough Grading

Uniformly grade areas to create a smooth surface, free of irregular surface changes. Comply with compaction requirements in the Geotechnical Report and grade to cross sections, lines, and elevations indicated on the drawings. Slope grades to direct water away from buildings and to prevent ponding.

G1030.2 Finish Grading

Finish subgrades to required elevations within a minimum tolerance of 13mm. Provide a smooth transition between adjacent existing grades and new grades.

G1030.3 Slope Protection and Erosion Control

Provide slope protection and erosion control measures (Biodegradable wood excelsior, straw, or coconut-fiber blankets or cellular, non-biodegradable matting) on all slopes in excess of 3:1. Acceptable products shall be Slopetame 2, as manufactured by Invisible Structures, Inc. or equal.

G20 SITE IMPROVEMENTS

G2030 Pedestrian Paving

G2030.1 Granular Base Courses

Prepared and compacted granular layers placed prior to the installation of pedestrian paving and in accordance with the Geotechnical Report. Provide positive drainage and ensure there aren't any soft pockets or areas of excess yielding. Provide subsurface PVC sleeves as required for irrigation system, lighting, utilities, etc.

G2030.2 Flexible Pedestrian Pavement

Finished pedestrian pavement of locally quarried, compactable, granular materials, 75mm in depth, held true to line with metal edge restraints. Finish surface shall be flush and meet smoothly and evenly with adjacent surfaces. Provide positive drainage.

1. For porous paving surfaces, provide locally quarried, crushed stone or gravel materials, free of granular fines, 18mm in size and 225mm in depth, with compatible crushed aggregate subbase to allow water to permeate through surface.
2. Acceptable metal edge restraint products shall be as manufactured by Sure-Loc Edging Corporation or equal.

G2030.3 Rigid Pedestrian Pavement

Finished pedestrian pavement with high bending resistance concrete. Finish surface shall be flush and meet smoothly and evenly with adjacent surfaces. Provide positive drainage.

1. Natural/Gray concrete with medium broom finish.
2. Integrally colored concrete with medium broom finish, color to be determined by Owner from manufacturer's full range of samples. Acceptable manufacturer shall be Scofield Systems or equal.
3. Integrally colored concrete with 13mm seeded aggregate finish, color to be determined by Owner from manufacturer's full range of samples. Acceptable manufacturer shall be Scofield Systems or equal.

G2030.4 Exterior Steps and Ramps

Cast-in-place integrally colored concrete steps with medium broom finish, color to be determined by Owner from manufacturer's full range of samples. Finish surface shall be flush and meet smoothly and evenly with adjacent pavement surfaces. Provide positive drainage on treads – 2 percent slope/pitch. Provide 50mm O.D. metal handrails, 900mm in height, with high performance paint finish, color to be determined by Owner from manufacturer's full range of samples. Finish shall be smooth to touch with no rough edges.

Cast-in-place integrally colored concrete ADA ramps with medium broom finish, color to be determined by Owner from manufacturer's full range of samples. Finish surface shall be flush and meet smoothly and evenly with adjacent pavement surfaces. Ramps shall not exceed 8.33 percent slope/pitch and 1.6m x 1.6m landings shall be provided every 10m in length or at changes in direction. Maximum slope/pitch of landings shall be 2 percent in all directions. Provide 38mm O.D. metal handrails, 900mm in height, with high performance paint finish, color to be determined by Owner from manufacturer's full range of samples. Finish shall be smooth to touch with no rough edges.

1. Acceptable manufacturer for colored concrete admixtures shall be Scofield Systems or equal.
2. Acceptable manufacturer for high performance paint finish shall be Benjamin Moore & Company or equal.

Design Development—Sample Outline Technical Specifications

Project x
City, State

100% Design Development
Month, Day, Year

SECTION 329300 - PLANTS

1.1 QUALITY ASSURANCE

A. Installer's Qualifications: At least three projects of similar size and level of complexity.

1.2 WARRANTY

A. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.

B. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.

C. Annuals: Three months.

1.3 MATERIALS

A. Mulches: Shredded hardwood.

B. Weed-control barrier.

C. Pesticides.

D. Tree Stabilization: Upright staking and tying.

E. Landscape Edgings: Steel.

F. Planter drainage gravel and filter fabric.

1.4 INSTALLATION

A. Mechanized tree-spade planting of designated trees.

B. Pruning: None, unless directed by Landscape Architect.

C. Ground Cover and Plant Planting: Space ground cover and plants other than trees, shrubs, and vines 6 inches apart.

D. Mulching:

1. Trees in Turf Areas: Mulch ring of 3-inch thickness, with 18-inch radius.
2. Planting Areas: 3-inch thickness of mulch over whole surface of planting area.

END OF SECTION 329300

PLANTS 329300 - 1

Construction Documents—Sample Full Length Technical Specification

Project x
City, State

100% Construction Documents
Month, Day, Year

SECTION 329300 - PLANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Plants.
2. Tree stabilization.
3. Landscape edgings.

B. Related Requirements:

1. Section 015639 "Temporary Tree and Plant Protection" for protecting, trimming, pruning, repairing, and replacing existing trees to remain that interfere with, or are affected by, execution of the Work.
2. Section 329200 "Turf and Grasses" for turf (lawn) and meadow planting, hydroseeding, and erosion-control materials.

1.3 UNIT PRICES

A. Work of this Section is affected by unit prices specified in Section 012200 "Unit Prices."

1.4 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with a ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.

C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required.

D. Bare-Root Stock: Plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than the minimum root spread according to ANSI Z60.1 for type and size of plant required.

PLANTS 329300 - 1

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots are unacceptable.
2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.

B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.

C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which begins at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

D. Labeling: Label at least one plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant.

E. If formal arrangements or consecutive order of plants is indicated on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.

F. Annuals: Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems reaching to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery.

2.2 FERTILIZERS

A. Planting Tablets: Tightly compressed chip-type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.

1. Size: 5-gram tablets.
2. Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive plants, with Installer present, for compliance with requirements and conditions affecting installation and performance of the Work.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Verify that plants and vehicles loaded with plants can travel to planting locations with adequate overhead clearance.
3. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
4. Uniformly moisten excessively dry soil that is not workable or which is dusty.

B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.

D. Lay out plants at locations directed by Architect. Stake locations of individual trees and shrubs and outline areas for multiple plantings.

3.3 PLANTING AREA ESTABLISHMENT

A. General: Prepare planting area for soil placement and mix planting soil according to Section 329113 "Soil Preparation."

B. Placing Planting Soil: Place planting soil in locations and depths as indicated on Drawings and according to Section 329113 "Soil Preparation."

C. Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

10 PRELIMINARY DESIGN

PREREQUISITES FOR PRELIMINARY DESIGN

- ☐ Digital Organization in Place
  - Proper Folder Structure
  - Proper File Naming Conventions
  - Proper CAD Layer Naming and Organization
  - Understanding of Proper Labeling Methods
  - Plot Styles Setup
- ☐ Understanding the Composition of a Document Set
  - Presentation Logic
  - Construction Sequence
  - Document Mock-Ups
  - Numbering Protocols
  - Organization of Sheet Series
- ☐ Understanding the Keynoting/Annotation Standards System Site Detail Keynotes
  - Reference Notes
- ☐ Understanding the Graphic Sheet Symbol System
- ☐ Understanding Drawings and Specifications and Relationships to Each Other

Preliminary Design initiates the landscape architectural design and documentation process and typically includes Pre-Design, Conceptual Design, and Schematic Design phases. During these phases, a preliminary design is established within the context of a client program, budget and schedule, comprehensive and measurable goals, and project parameters.

Main objectives for the Preliminary Design phase are:

- Identify comprehensive goals and parameters for the design, for example, budget, schedule, process, requirements, and so on.
- Define, test, and evaluate the client's site program.
- Define narrative principles and metrics for the design.
- Review and evaluate existing site and contextual conditions.
- Prepare a design(s) that meets design, regulatory and client criteria.
- Establish three-dimensional design intent and character.
- Evaluate alternatives and establish a preferred design direction.

What Are the Components?

Pre-Design

The Preliminary Design process begins with the Pre-Design phase. Pre-Design establishes the parameters that influence the design process.
It establishes the primary requirements and influences on the project.
This includes budget, schedule, consultant work scope, site and contextual conditions, program, client expectations, and necessary approvals.

Conceptual Design

The second phase of Preliminary Design is Conceptual Design. This is the initial design phase during which the key parameters established in Pre-Design are evaluated and processed to develop preliminary design ideas, and the character and physical intent for the project. This is an iterative process involving many participants and cycling of ideas. At the conclusion of this phase, a reasonably vetted design idea is presented, together with preliminary costing to verify budget parameters.

Schematic Design

The final phase of Preliminary Design is Schematic Design. Schematic Design represents a further evolution of Conceptual Design and establishes clear and comprehensive design intent that is verbally and graphically descriptive. Design intentions include principles, performance metrics, a dilemma, thesis, and form and character studies.

Preliminary Design culminates with a comprehensive and logically ordered set of documents—the Schematic Design documentation package. The Schematic Design documentation package is inherently diagrammatic, illustrative, three dimensional, and accompanied by a clear narrative intent.

Who Is Involved?

While it is based on the client's vision and goals, Preliminary Design involves a diverse and coordinated team of professionals. Coordination strategies that will carry through the duration of the project are established in the Preliminary Design phase.

The Preliminary Design process typically includes the client and their representatives, consultants, or advisors; other consultants; and the landscape architecture design team. The landscape architecture design team should include the principal-in-charge, the project manager, project designer, and other key staff and members of the subconsultant team.

PRE-DESIGN

Phase Checklist:

- ☐ Client Work Session
  - Client Vision and Critical Success Factors
  - Project Dilemma
  - Project Thesis
  - Client Care Plan
- ☐ Internal Project Strategic Kick-Off Meeting
  - Work Plan/Schedule
  - Task Breakdown and Budget
  - Quality Management Plan
  - Deliverables Plan
  - Risk and Change Management Plan
- ☐ Coordination and Collaboration Process with Project Team
  - Communications Plan
  - Document Distribution
- ☐ Project Performance Metrics
  - Metrics Strategic Kickoff (SKO) Meeting
  - SMART Goals
- ☐ Inventory and Data Collection

The purpose of the Pre-Design phase in landscape architecture is to establish the primary requirements and influences on the project, including budget, schedule, program, consultant work scope, necessary approvals, and site conditions. While design is a process of continually gathering new information and perspective on the project, purposeful design must begin with a comprehensive understanding of parameters. Parameters are not permanently fixed but reflect current considerations at a particular point in the design process.

Refer to Section 2, *Phases Overview*, for a detailed description of the Pre-Design phase purpose, objectives, documentation characterization, and key coordination needs. An overview of Pre-Design phase components is also described within Section 2, while this section provides more detail on the components (sheets).

The guidelines that follow are organized to highlight key elements of the Pre-Design phase and are ordered as a design process, that is, a logical sequence of associated activities.

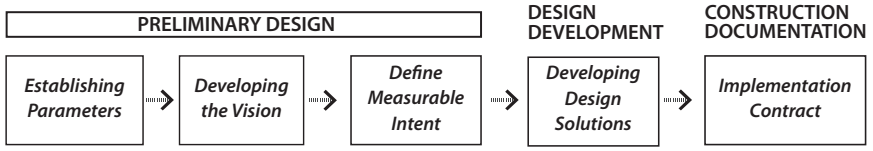
Client Work Session

A comprehensively organized work session should be held at the outset of the Pre-Design process. The primary objective of this session is to clearly determine and record the client's objectives and project requirements. A forum should be established that is open, inclusive, and brainstorm-oriented, so to facilitate broad and diverse thinking. The session may be important in setting the project direction.

The session should include the client and their representatives, the consultant team and any other advisors, and members of the landscape architecture team. The landscape architecture team should include the principal-in-charge, the project manager, landscape architects, other key team members, and representatives from the subconsultant team.

This session is typically held at the client's office, as a nod to their leadership role in the project. The session should be preceded by a site visit with the client to begin to understand their vision, issues, and opportunities as well as any contextual information or insights.

TYPICAL LANDSCAPE ARCHITECTURE DESIGN PROCESS:



Potential discussion items include those listed here. Consider prioritizing the discussion around key items, in order to focus and elevate the meeting. Some administrative items may be reserved for smaller or one-on-one discussions with client representatives.

ADMINISTRATION

- Team Member Roles and Responsibilities
- Quality Management Strategies
- Change Management
- Risk Management
- Critical Success Factors
- Construction Budget and Design Cost Monitoring
- Process(es) for Review and Approval
- Deliverables by Phase
- Design and Construction Schedule
- Project Construction Phasing
- Contractor Implementation Strategy
- Communication Plan
- Project Close-Out

DESIGN

- Measurable Project Objectives
- Favorite Places and Principles
- Built Character and Material Interests
- Issues of Design Precedent
- Economic Issues
- Community Issues
- Environmental Issues
- Aesthetic/Art Issues
- Design Program, with Attributes

Preparation Strategies

Be prepared for this session by assembling an outline or graphic that displays the current understanding of the project circumstances and client objectives. Complement this understanding with a demonstrated interest in conveying an open, interactive, and exploratory work session.

Consider delving into the project content by preparing a number of boards illustrating typological precedents, character images, material and component options with associated costs, and preliminary design principles and objectives.

Be prepared to take notes throughout the session. Obtain participants' contact information and issue a meeting record summarizing key conclusions and action items. The project schedule, including milestones and deliverables, and project team members' contact information should be included. It is essential that notes be recorded in the meeting so that they are visible to participants and accumulate graphically in the meeting room, that is, all notes should be visible at all times.

Identifying Client's Goals, Mission, Vision, and Critical Success Factors

A successful project begins with understanding the client's intentions. The client work session should be organized to solicit these intentions. While there are various formats for defining intentions, recommended practices are described here. It may be useful to encourage the client to expand his or her perspective to reflect greater ambition or deeper project intent.

Goals: Setting comprehensive goals early in the project is foundational to the design process. The deliberate recording of project goals supports transparent decision-making and accountability.

Client Vision: A client Vision is a narrative statement that captures the client's articulation of how they envision the final outcome of the project.

Critical Success Factors: Client critical success factors (CSFs) are the most important features or results by which the client will ultimately judge the project. Client CSFs should be evaluated through the course of the project and it may be necessary to revise the list as the project evolves.

Identifying Client's Program

The landscape and site development program will likely be important to the overall success of the project. Elements such as arrival, parking, and service areas are important to the basic functioning of the proposed development. Specialized program elements such as swimming pools, chaise lounge sunning areas, and cabana facilities often require careful quantification to serve intended users. These requirements are sometimes referred to as "Statements of Need," identifying the client's must-have requirements.

Program can broadly encompass the organization, function, form, economic, time, and management intentions for a site. A client's program can range from vague to specific. In some cases, the landscape architect works with

the client to develop the program. Specific attributes should be defined for each program element, including size, location, and relationships to other elements, as well as physical attributes and needs.

Defining the Sustainable Design Process for the Client

Sustainable design is based on the premise that when environment, economics, community, and art are combined in harmony with the dictates of the land and needs of society, lasting places result. The formation of landscapes of timeless beauty, significant value, and enduring quality is the objective of sustainable design.

Continuous feedback is the cornerstone of the design process. At every phase, alternatives are explored with the client. It is essential they have a clear understanding of the sustainable design process.

Guiding principles associated with the sustainable design process are as follows:

- Defining and documenting the challenges, vision, purpose, and direction of the project and creating a transferable project story that aligns the sponsors and stakeholders is essential.
- Comprehensive thinking from the beginning in four categories of sustainability—environment, economics, community, and art yields outcomes that integrate the fullest range of possibilities and metrics for performance.
- Measurement of project performance using sustainable design metrics goals set early in the design process is required to deliver real value and truly sustainable solutions.
- Inclusive conversations with the full complement of team members and collaborators result in more thorough alternatives and broadly validated solutions.
- Transparent decision making allows all parties to understand thought processes resulting in a more resonant and broadly embraced vision.

Key components of the sustainable design process are described below. These elements are used to guide the development of the primary project narrative.

Dilemma

A *project dilemma* is a storytelling device that describes a project's predicament. It sums up the major challenges that must be reconciled to achieve a sustainable design outcome. Beginning with a discussion of the project's context, it answers the question: "What is standing in the way of a project's potential for success?" A dilemma renders vivid the complexities of the project and the need for a comprehensive solution. The dilemma is not the scope of work or the client's goal.

Thesis

A *project thesis* is an assertion about the project outcome that will be tested and resolved through the team's design and planning investigations. It is a proposed solution to the central problem or question stated in the dilemma. Collectively articulating the big idea of the project aligns the team to a common goal or story.

Example

Bagby Street

Dilemma: The tension between a "Livable Center" and a "Commuter Thoroughfare" limits reinvestment potential in Midtown.

Thesis

By analyzing and creating high quality systems along the entire stretch of the street, proving the real transportation value of the corridor AND focusing added value near key redevelopment parcels, the design will foster sustainability and advance the Midtown redevelopment trend.

Example

Houston Arboretum and Nature Center

Dilemma: Existing conditions at the Arboretum reflect a stressed ecosystem affected by post-hurricane damage, severe drought related canopy die-out, and significant areas comprised of non-native invasive species. The Arboretum suffers from a lack of awareness, no user funding structure, and is in need of an organized vision for the implementation of future projects.

Thesis

By using the master planning process as an educational experience for all the stakeholders—including at minimum the HANC board, staff, approximate 250,000 students and scholars who visit the arboretum yearly, and the general public—the resulting master plan will have helped build awareness, align common goals, cultivate passions, and garner support for the long-term implementation of the plan. The master plan will be developed based on goals in four areas—community, environment, economy, and art—to ensure the plan is comprehensive and will effectively fulfill three primary purposes—conservation, recreation and education—for decades to come. The outcome of the master plan will provide the Arboretum with a vision for the future implementation of planned projects.

Sustainable Goal Setting

Sustainable design goals are project-specific intentions collectively set by a team and client to achieve a comprehensive outcome. They keep the project team accountable by incorporating strategies from each of the primary topics and by measuring the results after implementation. The setting of sustainable design goals is an iterative process that requires research into baselines and benchmarks in order to be realistic about aspirations and outcomes. Goals established much be SMART (specific, measurable, action-oriented, realistic, and time-oriented) and supported by strategies to achieve these goals.

Baseline and Information Gathering

To develop an understanding of an existing landscape, it is important to understand the connections, interactions, and synergies between environmental systems and man-made components. Collecting information about the existing site conditions and adjoining regional context, and the subsequent analysis of this information, provides a comprehensive and fundamental framework from which a sustainable design can emerge.

Baselines are the "as-is" conditions of a site from which goals and measures will be based. Understanding the baseline conditions of the site is an important step in the process of defining metrics and goals. Baselines are used not only to set realistic goals and to measure the progress of the design, but also to deliberately interpret a site, its attributes, and its context through the lens of environmental, economic, community, and art categories.

Benchmarks

Benchmarks are industry best practices, regional standards, legally mandated requirements, and/or comparisons with similar projects. The landscape architect's metrics process involves the deliberate establishment and measurement of baselines, then the setting of comprehensive goals and strategies to improve upon those baselines to meet or exceed regional benchmarks or best practices.

Design Precedents and Principles

Highlighting built precedents and supporting principles that bear relevance to the project helps to define issues, opportunities, and preliminary intentions. Precedents represent any example, model, or potential standard that has applicability to the proposed work. Principles are paired with precedents in order to explain how the precedent works and how underlying values are structured. Design precedents should address metrics associated with environmental, economic, community, and aesthetic issues.

Performance Metrics

Metrics are a discovery-oriented tool used to shape a collective point of view about what is pertinent to a project. They help project teams to develop more thorough design solutions by integrating strategies to address primary issues and measuring outcomes; they help clients understand how sustainable design will positively impact their project. Sustainability metrics lead to a distilled and potent set of goals that are applied to design solutions. A more thorough description of metrics is provided below.

Rapid Cycling

As noted, complex projects benefit from the workshop pattern of repeatedly breaking down the component parts and then synthesizing the results again. This process is called "rapid cycling," and it occurs from the beginning of the design process to the end. By incorporating a thoughtful rapid cycling process, the project design is improved, as design strategies are constantly evaluated and adjusted to meet the intended targets.

Internal Project Strategic Kick-Off Meeting (SKO)

A strategic kick-off meeting (SKO) should be held at the commencement of all projects, design phases, and major tasks. The primary purpose is to inform all team members of the purpose and organization of the effort. A separate "metrics SKO" should be convened early in the project to set measurement objectives that will guide the project.

Internal kick-off meetings are inclusive of all internal team members. They are typically followed by a full team kick-off meeting and a metrics kick-off meeting. These meetings may be combined, if necessary, into a single meeting. This decision should be based on the scale and complexity of the project and fee budget.

Project Overview and Vision

All members of the team should have a clear understanding of the location, stakeholders, and scope of the project. The client's vision should be articulated and understood. Sometimes the SKO may occur prior to the initial client work session; consequently the vision may be preliminary at this point. It can be refined later if a formal meeting with the client has not yet occurred. Critical success factors should also be discussed. These factors may define the ultimate success of the design. The stated project dilemma and associated thesis position should be discussed.

Project Management Plan (PMP)

A critical component to the successful delivery of any project is the development of a Project Management Plan. The Project Management

Plan defines the key organizational elements for the project and should be thoroughly reviewed during the strategic kick-off meeting so all team members understand project expectations.

Key components of the project management plan are as follows.

Roles and Responsibilities of Team Members

A project management plan should establish the role of each member of the team. Each member should understand expectations for their participation in the project and the materials they are responsible for producing. This should be aligned with a clear understanding of the project's scope of work and contracted deliverables.

Project Schedule

A project schedule includes a master project schedule as well as milestone-driven schedules for major tasks.

The master project schedule integrates document release dates and all the subschedules. Subschedules may include, for example, cost estimating and plan check review processes. The schedule should be organized to highlight and create team awareness about project priorities and should include any jurisdictional review and approvals processes.

Coordinating and administering the project schedule is the responsibility of the project manager.

Quality Management and Deliverables

The final deliverables of the project should be identified so all team members clearly understand the work to be completed. The format and itemized content of each submission should be defined for each deliverable.

Quality management review processes and protocols should be identified, including processes and responsibilities for interdisciplinary coordination and review. Processes for addressing comments should be clearly defined.

Communication Protocols

Effective communication is essential to advancing a project in a timely and effective manner. Coordinating communication within the firm as well as with consultants and the client ensures that information is shared and quality deliverables are produced according to schedule.

A **Communication Plan** establishes procedures for communication with the team and client, including the identification of participant communicators and communication lines, communication frequency, and the format or media of the communication.

A team member contact list should be shared as a component of the Communication Plan.

Risk and Change Management Plan

This plan is intended to document potential risks and/or changes during the course of a project that may require correction. Consideration should be given to avoiding predictable risks and/or problematic changes. In addition, specific actions should be identified to address or correct problems immediately after they have been identified. These may include cost overruns, schedule delays, or unexpected changes in conditions of approval for the project.

Internal Design Budget

Fees allocated for design and documentation are defined within the project contract. The contract should include an outline of all tasks to be completed, a fee allocation for each task, a tentative schedule, and anticipated deliverables. Fees should be translated into an internal landscape architecture team budget, with tasks assigned to specific staff members with projected time allocations, that is, work hours to complete the work. The budget should include time required to complete individual tasks by all team members, including design and production staff, design review and quality management personnel, and administrative staff. It is also important to define funds to be allocated to any subconsultants and reimbursable expenses, including printing, plotting, meals, and travel.

Finally, protocols for contracting additional services or services outside the initial scope of the contract should be defined. It is important to minimize work effort outside the contractual work scope in order to effectively manage fees.

Coordination and Collaboration Process with Project Team

Ineffective team collaboration is one of the primary factors in costly rework and project delivery failure. Team collaboration is about sharing knowledge and reaching consensus. Consensus results from effectively identifying and overcoming conflicting objectives, perceptions, and actions. Protocols should be established that clearly define who, how, and when coordination and collaboration will be conducted.

Some of these actions may be included as part of the SKO.

Organization of the Project Team

The consultant team should be assembled to expertly address all project issues and objectives. That includes both core disciplines to support basic

needs and specialized disciplines to address unique project needs. Core disciplines often complement landscape architecture with irrigation, lighting design and electrical engineering, civil engineering, mechanical engineering, structural engineering, and architecture. More specialized disciplines to consider include arborists, horticulturalists, agronomists, wildlife specialists, hydrologists, and public facilitators. For example, if the intention of the client is to develop a property adjacent to a wetland, the team should include a wetland and biological specialist.

Work scope and deliverables for all consultants should be clearly defined so the project manager can effectively track their efforts.

Inventory and Data Collection

One of the most critical steps in the preliminary design process is the inventory and collection of data to define existing conditions, regulatory parameters and establish comparable projects, spaces, or design frameworks. Without a clear idea of existing conditions and other comparable projects, it is difficult to complete an effective design much less evaluate whether it is meeting expectations. This phase also involves collecting data on baseline and benchmark conditions that may be relevant to defined goals and corresponding metrics.

Baseline Research: In this stage, "as is" conditions of the site are studied. These findings serve as baselines from which progress will be measured. Baselines can encapsulate a large amount of diverse data. The selection of baseline topics should be derived from metrics topics prioritized via the metrics kick-off meeting. These may include baseline data such as stormwater runoff rates, percentage tree canopy cover, or water use.

Benchmark Research: Benchmarks are industry best practices, regional standards, legally mandated requirements, and/or comparisons with similar projects. They are typically quantitative in nature. These help to inform project design goals.

The landscape architect should aspire to match or exceed appropriate benchmarks. Benchmark goals should be assigned to reflect actual project conditions and context. A wealth of information and precedent is usually available from which the project may be contextualized. Comparable places or projects should be given priority in determining benchmarks for the project.

Project Performance Metrics

Aligned project goals are a fundamental starting point for a collaborative design process. A process that centers on project performance uses metrics to assess design alternatives and outcomes at any stage of the design. The integration of environmental, economic, community, and art metrics comprehensively shapes a project's outcome.

Participants

All members of the project team, including the design team, client, consultants, and stakeholders are included in the process of establishing goals, determining strategies, baselines, and measuring results.

Design reviews occur regularly throughout the design process. They are the primary forum in which a project team can seek objective and critical insight to keep the project on course and responsive to metrics and goals initially defined in the metrics kick-off meeting.

Metrics Strategic Kick-Off Meeting (SKO)

A specialized kick-off meeting is used to frame and prioritize metrics, establishing an overall approach to the project and ensuring a comprehensively successful outcome. This meeting, described in more detail here, is an integral component of the initial discovery and alignment process.

SMART Goals

A key objective for this stage of the design process is to establish SMART (specific, measurable, action-oriented, realistic, time-oriented) goals. These goals are project-specific intentions collectively set by the team and client during the client work session. These goals keep the project and team accountable by incorporating strategies from each of the areas of inquiry and by measuring the results after implementation.

After the metrics kick-off meeting, prioritized metrics identified by the group should be assigned goals. Baseline and benchmark data help to further quantify and qualify these goals, advancing them as SMART goals. The setting of sustainability goals is an iterative process that requires study of baseline and benchmark conditions defined in Pre-Design, in order to calibrate aspirations and outcomes relative to existing conditions, and precedents.

Project Performance Metrics Documentation

Upon completion of the inventory, data collection, and analysis, assembling this information into a format that easily conveys the findings is critical to telling the story of the project and framing the logic of the proposed design solution. Client and stakeholder buy-in during the analysis phase ensures project goals are SMART and the metrics identified are attainable.

Documentation of metrics is critical in conveying these findings and establishing the foundation for the emerging design solutions. The value of presenting *proof* in a compelling way cannot be underestimated and sometimes plays a convincing role in establishing a particular design direction.

Project Performance Matrix

A set of metrics inherently represents a sustainability framework. A matrix may be used to capture and track the designed implementation of the metrics themselves. This sets up a system for establishing goals and remaining accountable to them. The performance matrix should be revisited and updated at various iterations and project cycles.

Data Collection to Inform Metrics

Baselines are used to deliberately interpret a site, its attributes, and its context through the lenses of sustainable design—environment, economics, community, and art. The existing conditions serve as a foundation for the development of SMART goals.

Benchmarks are used to compare the metric goals and performance of the project, to confirm the design theses, and serve as communication tools for conveying aspects of the design.

Information Collection Methodologies

The most typical information collection method is the site visit and physical review of existing site and contextual conditions. Data collection techniques include photo documentation, surveying, topographic analyses, Global Positioning System data, interviews, utility locates, sketch observation records, audio and video recordings, and statistical analyses, for example, noise, light, sun, wind, temperature, rainfall, snowfall, and percolation. These may be conducted by the landscape architect and subconsultants with specialized data collection capabilities.

Together with understanding physical conditions of the site and surroundings, it is important to understand regulatory and governing code requirements. These may include federal, state, city, town, or other local jurisdictional rules, regulations, guidelines, codes, ordinances, or laws; national standards; and industry standards such as ASTM and ANSI.

Additional tools for capturing baseline data include various forms of research, interdisciplinary meetings and collaboration with other industry professionals and contractors, Geographic Information System data, literature reviews, lessons learned from previous work, and project case studies.

Best Practices

Rigor: The site inventory should be performed methodically, thoroughly, and with accuracy. The emphasis of the inventory should be aligned with project objectives. For example, if existing trees are important assets, then each tree may be assessed for health, physical, and aesthetic qualities. Or, if the visibility of the proposed development is important, a careful inventory of views from adjoining properties may be conducted.

Context: The site inventory should not be limited to the actual property boundary. A "project-shed" should be defined that includes both on- and off-site systems, for example, views, drainage, and climatic conditions.

Comprehensiveness: A broader evaluation may be undertaken by categorizing the analysis in four fundamental categories: environment, art, community, and economics. These analyses may be developed as analytical frameworks, depicting the key issues, opportunities, and constraints in each area. They are not intended to be design proposals, but rather analyses of specific opportunities presented by site conditions.

GIS (Geographic Information Systems)

GIS is a digital system capable of assembling, storing, manipulating, and displaying geographically referenced information, that is, data identified according to locations relative to the surface of the earth (geospatial data). The system facilitates sophisticated data collection and analysis using raster-based data. Landscape architects use GIS software such as ArcView, and often maintain a separate GIS Standards Manual. GIS Standard Manuals are important in establishing explicit guidelines and protocols, including hierarchies, features, and file formats.

Typical, but not comprehensive GIS-based Pre-Design data topics are itemized here. A further overview of GIS applications is given within *Conceptual Design*.

- Hydrology
- Topography (slopes)
- Transportation
- Environmental Factors, for example, aspect, soils, geology, vegetation, and wildlife
- Utilities
- Visual Conditions
- Socioeconomic Conditions
- Historic Conditions
- Political/Jurisdictional, for example, land use, zoning, ownership and boundaries

Sources of this data include but are not limited to:

- Jurisdictional GIS databases
- Surveyor Contour Data
- Aerial Photography
- USGS Data (digital elevation models, digital raster graphics, digital line graphics, and digital orthophoto quadrangles)
- FEMA Data
- US Census Bureau Data (TIGER/line files)

Graphic representation of these maps should be in compliance with the landscape architect's *GIS Standards Manual*.

Data Collection Items for the Sustainable Design Process

The items listed below should be inventoried during the data collection process to assist in understanding site and contextual opportunities and constraints. These data may be obtained by various means, including existing conditions (hardscape and landscape) surveys, maps and reports, on-site observations, photography, testing, inspection, and/or exploration, GIS data, and document and code reviews.

Analytical Data: Includes technical reports (geotechnical, hydrologic, traffic engineering, accessibility, civil engineering, mechanical engineering, environmental impact, biologic wildlife, wildfire, energy, historic, archeology, etc.) prepared by licensed professional specialists as required to meet the requirements of the project.

Products of Inventory and Data Collection

For most landscape architecture projects, minimum requirements for documentation in Pre-Design are defined here.

Base Plan: Comprehensive exiting conditions survey with legal property boundary; topographic data and spot grades; all existing above-grade and below-grade structures, buildings, and utilities; tree and vegetation; natural and man-made water bodies, floodplain delineations, and wetlands; easements; pavements, roads, driveways, trails, pathways, sidewalks, and other hardscape paving; curbs, walls and other above-grade improvements and landscape architectural elements; and historic or archeological data.

CONCEPTUAL DESIGN

Phase Checklist:

- ☐ Analysis and Evaluation
- ☐ Project Program
  - Site Program
- ☐ Design Intent
  - Design Brief
  - Project Dilemma and Thesis
  - Project Performance Metrics
  - Typological Precedents and Principles
  - Design Frameworks and Parti Diagrams
- ☐ Design Studies
  - Plan Alternatives
  - Design Character
- ☐ Construction Budgeting
- ☐ Phasing

Having acquired a preliminary understanding of the project site and having established broad parameters for design at the Pre-Design phase, Conceptual Design is organized to explore a preliminary design framework. A design framework is the primary and essential organizing structure for the design. Frameworks are the basis for what becomes an emerging vision and detailed intent to be developed at the Schematic Design phase. The emerging concept should be a direct response to requirements established at the Pre-Design phase.

Refer to Section 2, *Phases Overview*, for a detailed description of Conceptual Design phase purpose, objectives, documentation characterization, and key coordination needs. The current section gives the reader more detail on the components (sheets).

The guidelines that follow are organized to highlight key elements of the Conceptual Design phase and are ordered as a design process, that is, a logical sequence of associated activities. These elements represent an extension of the Pre-Design phase, and in some cases, reaffirmation and further development of Pre-Design studies.

The guidelines are generally organized to communicate general, specific, and graphic recommendations for each element. Best practices are included also. In some cases, this format has been more loosely organized.

Analysis and Evaluation of Baseline Information

The objective of analysis and evaluation is to appraise site characteristics in order to effectively develop a site plan that maximizes assets and opportunities, minimizes adverse impacts, and establishes a sustainable fit on the site.

To develop an understanding of any landscape, it is important to understand connections, interactions and synergies between environmental systems and man-made components. It is important to know how systems work, and the nature of their interactions and sensitivities. It is from this analysis that the landscape architect develops an understanding of potential impacts from prospective construction and site alterations. These analyses may require the input of specialists such as ecologists, hydrologists, and soil scientists.

Environmental Impacts: For sensitive natural sites, conduct a comprehensive ecological assessment to determine key physical conditions and relationships.

Community Needs: Determine site-based community needs, concerns and opportunities to serve their interests with the proposed development.

Economic Value: Establish a value analysis for the site that defines primary assets and liabilities.

Aesthetic Value: Assign aesthetic value to site conditions, determining high and low value visual attributes.

Products of Analysis and Evaluation

The Site Analysis and Evaluation builds upon the Site Inventory and data collection initiated during Pre-Design. This should represent a forward looking analysis, recording attributes that present opportunities or limitations that represent potential design constraints.

Plans should be especially graphic and clearly illustrate analytical conclusions that will help to shape a design direction. Documentation should generally be diagrammatic and may include aerial photography, site photos, GIS maps, analytical data, existing conditions surveys, and three-dimensional graphics or models.

Some projects may require that multiple topics be documented separately in order to adequately convey content. Ideally, a single composite plan should be developed, highlighting relationships between various considerations.

Prioritized on-site conditions are used to frame design intent within the constraints of the site. Design alternative studies, should be derived from an analysis of on-site conditions.

Example of Site Analysis Mapping: Varied GIS data associated with the Client's Critical Success Factors were gathered and cataloged for this small-scale park project.

Figure 4: *Median Age by Census Block Group (2012)*

Figure 6: *Population Density by Census Block Group (2012)*

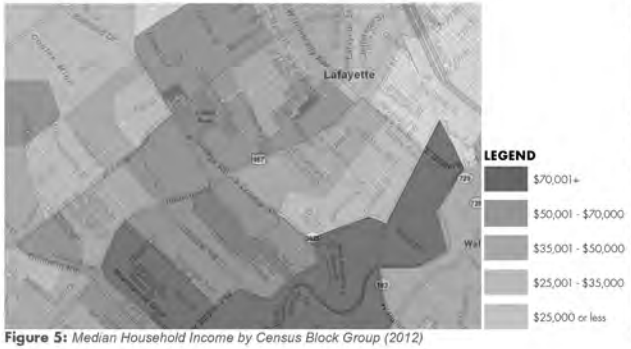
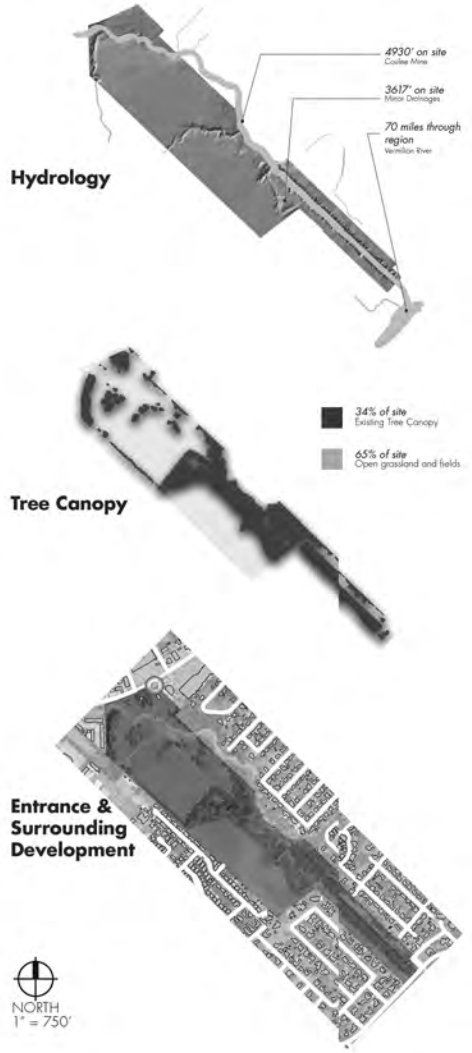
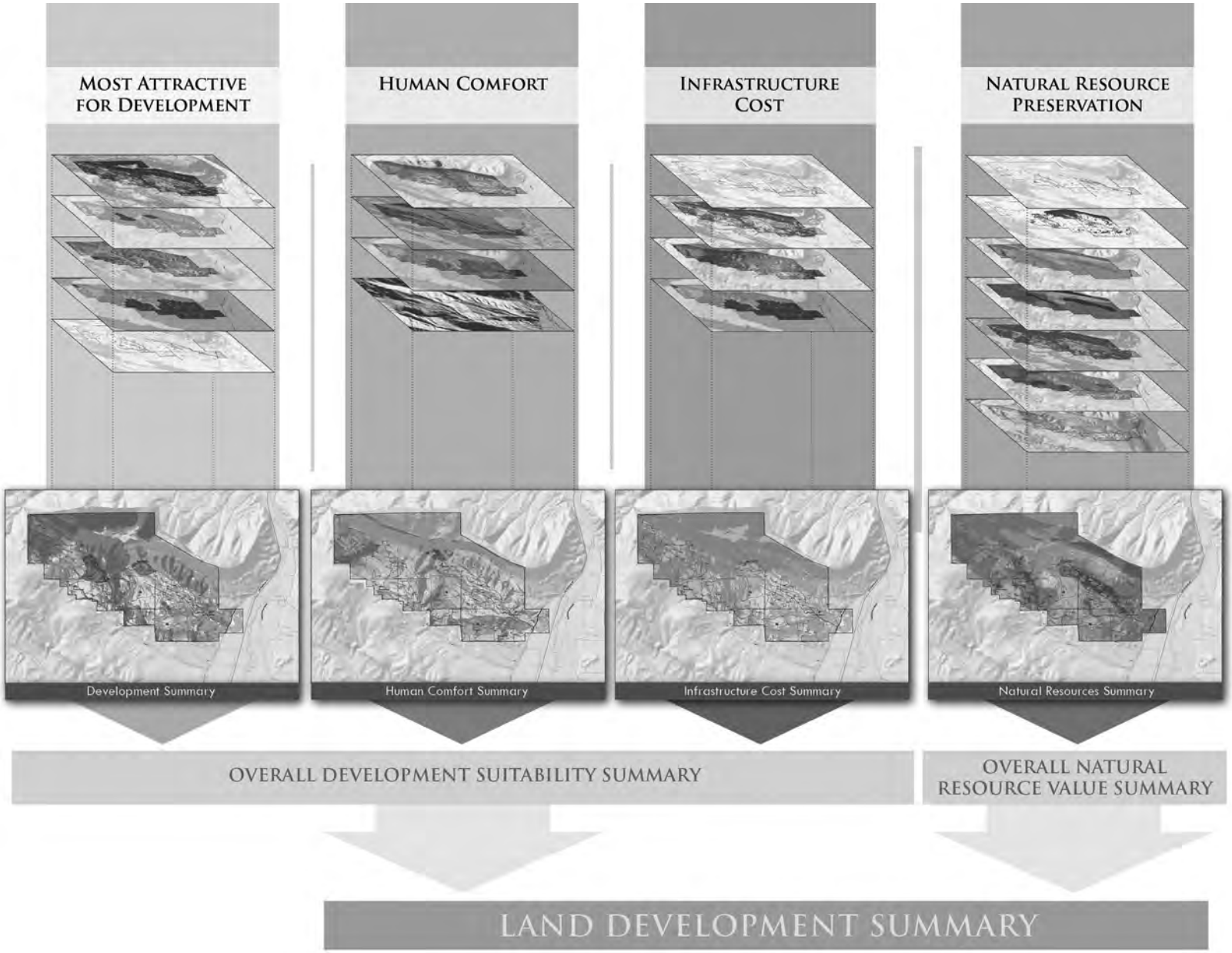


Figure 5: *Median Household Income by Census Block Group (2012)*

Figure 7: *Land Use*



Example of Summary Analysis and Evaluation Mapping: Multiple layers of GIS data were gathered and synthesized for a large-scale planning and landscape architecture project. Key categories were selected to create summary maps to analyze the land parcel and provide the scientific basis for sustainable design decision-making.



Example of a Spreadsheet-Based Project Program

	PASSIVE RECREATION												ACTIVE RECREATION											
		Time of the day				Season				Users				Time of the day				Season				Users		
		M	D	E	W	S	S	F	W	R	O	V		M	D	E	W	S	S	F	W	R	O	V
POND	Irrigation Storage	●	●	●	●	●	●	●	●															
	Constructed Wetland Habitat	●	●	●	●	●	●	●	●															
	Sunbathing		●				●			●		●												
FOUNTAIN	Water Garden				●	●	●	●		●		●												
	Interactive Water Fountain	●	●	●	●	●	●	●		●		●												
	Sunbathing		●				●			●		●												
HUB	Overlook/ Stargazing				●		●			●		●	Croquet/ Lawn Bowling/ Bocci		●		●		●			●		●
	Small Outdoor Music Concerts/ Performances			●	●		●			●	●	●	Horseshoes		●		●		●			●		●
	Farmer's Market				●	●	●	●		●	●	●	Children's Playground	●	●		●	●	●	●		●		●
	4th of July Fireworks Viewing			●			●																	
	Holiday Decorations			●	●				●	●	●	●												
	Easter Egg Hunt		●		●	●				●		●												
	Weddings/ Block Parties			●	●	●	●	●	●	●		●												
	Fire Pit			●	●				●	●		●												
	Outdoor Movies			●	●	●	●	●		●	●	●												
	Board Games (i.e. Chess)		●		●	●	●	●		●		●												
LAWN	BBQ/ Picnic Areas				●		●			●		●	Walking	●	●	●	●	●	●	●	●	●	●	●
	Sunbathing		●				●			●		●	Jogging/ Running	●	●	●	●	●	●	●		●	●	●
	Large Outdoor Music Concerts/ Performances			●	●		●			●	●	●	Informal/ Lawn Sport (i.e. Frisbee, Kites)	●	●	●	●	●	●	●		●		●
	Outdoor Movies			●	●	●	●	●		●	●	●	Volleyball		●	●			●			●		●
	4th of July Fireworks Viewing			●			●			●	●	●	Roller-blading		●	●	●		●			●		●
	Lunch gathering		●			●	●	●		●	●	●	Soccer (Youth)	●	●		●		●			●		●
NATIVE WOODLAND	Sculpture Garden	●	●		●	●	●	●	●	●	●	●	Walking	●	●	●	●	●	●	●	●	●	●	●
	Orchards/ Edible Garden	●	●		●	●	●	●	●	●	●	●	Jogging/ Running	●	●	●	●	●	●	●		●	●	●
	Wild Flower Center Branch	●	●		●	●	●	●	●	●	●	●	Croquet/ Lawn Bowling/ Bocci		●		●		●			●		●
	BBQ/ Picnic Area				●		●			●		●	Children's Playground	●	●		●	●	●	●		●		●
	Lunch gathering		●			●	●	●		●	●	●	Dog Park	●	●	●	●	●	●	●		●		●
	Board Games (i.e. Chess)		●		●	●	●	●		●		●												

Project Program

The Site Program explicitly itemizes and characterizes the site work scope to be designed, as a discrete set of exterior spaces, components, and systems. The confirmed site program is used to prepare site plans, details, specifications, and budget estimates and establish interdisciplinary design relationships.

The program is a fundamental consideration in the design process and should be viewed as a primary means to accomplish the mission and goals of the project. The landscape and site development program includes key spaces (including functions and activities), components, and systems that are important to the successful operation of the project.

Strategies should be developed to both define and position the program. These strategies should combine an understanding of site conditions with the application of program objectives.

Precedent-based research may be necessary to determine typical program considerations for the project type, for example, a regional park, marina, or motocross track. The research should seek to understand size and spatial criteria and necessary functional relationships between spaces and elements. These criteria should be made explicit.

The landscape program is best defined when accompanied by performance metrics, for example, demographic attractiveness, cost-revenue, aesthetic impact, and environmental benefits such as resource conservation and embodied energy needs.

Program decisions often require group input and evaluation. Group participants may include community and stakeholder representatives, and the client and consultant team.

Site programming exercises should generally be completed early in the design process. However, the site program should be evaluated throughout the Conceptual Design phase for compliance with project goals and critical success factors.

Program Development

Consider developing the site program as a set of three categories. These several elements should be studied and documented integrally but discretely through the process of program development.

- Spaces
- Components within these spaces
- Systems

Spaces: Much landscape architecture work can be defined as a spatial program. For example, a resort hotel may require an exterior "spill-out" space capable of accommodating a selected number of guests concurrent with an interior event. The space itself will be characterized in terms of size, form, and necessary relationships. Activities and functions to occur within these spaces may also be defined.

Components: Components within spaces will be itemized and defined separately. For example, a shade structure may be required. The detailed requirements for that shade structure can be contained within a set of component descriptions. There may be a number of such structures within the program.

Systems: Systems should also be defined as part of the initial programming exercise. Landscape architects should establish brief narrative intentions for all proposed systems, for example, paving, walls, and stormwater management. It is at this point that the architect also defines intentions for systems such as HVAC, fire separation, and communications.

Allied Fields

In architecture, programming is a complex and highly specialized component of building design process. Some individuals and firms conduct only this type of work. As buildings get more specialized, building programming standards and guidelines are being developed to serve specific building types. In some cases, new building technologies and associated uses are emerging without much precedent or programmatic standards or references. In this case, new research is necessary to inform these standards.[1]

Graphic Representation

Program development is most effectively summarized in spreadsheet format. Spaces, components, and systems should be organized along the vertical axis and attributes should be listed along the top horizontal axis. Alternatively, a more graphic format may be desirable when visual characteristics are important to the program.

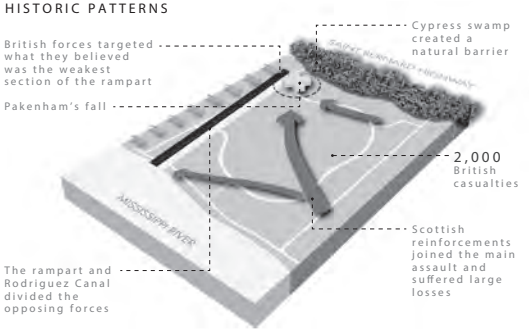
A three-dimensional depiction of the required program may be useful in order to locate program on the site. This representation should be done in the Concept phase in an abstract, but scalable diagrammatic form.

A useful strategy is to utilize a template developed for a similar project, in order to establish an efficient point of departure. Consider establishing a graphically keyed relationship to the site plan, to clearly communicate the location and relationship between elements.

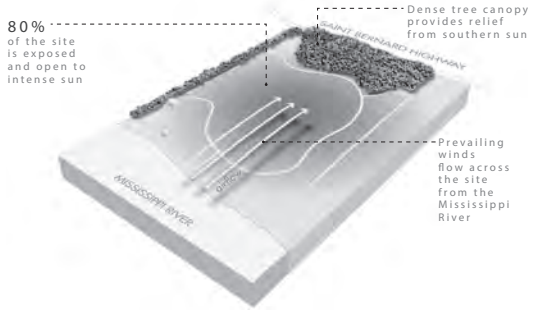
[1] Cherry, Edith, and John Petronis. "Architectural Programming." *Whole Building Design Guide*, A Program of the National Institute of Building Sciences. September 2, 2009. www.wbdg.org/design/dd_archprogramming.php.

Examples of Illustrative and Three-dimensional Project Program

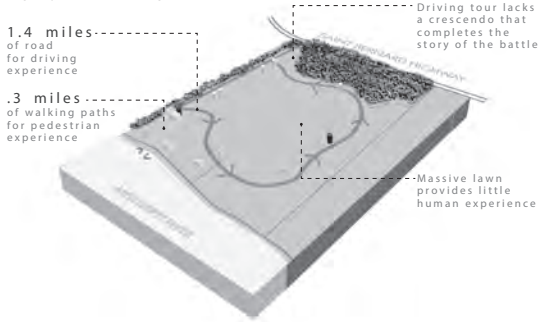
HISTORIC PATTERNS



LANDSCAPE SYSTEMS AND HUMAN COMFORT



VISITOR EXPERIENCE

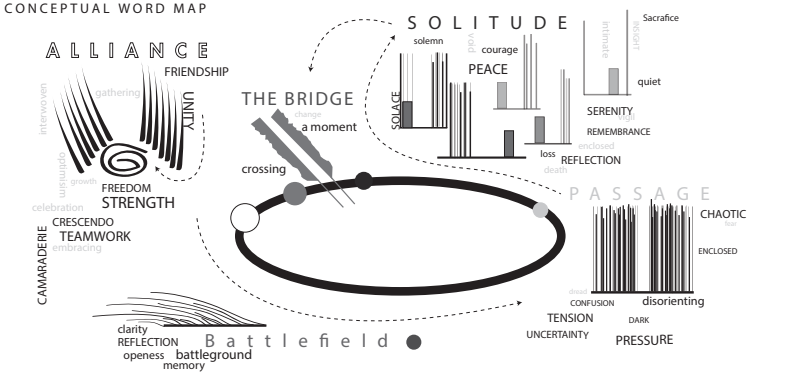


P A S S A G E T O U N I T Y

C H A L M E T T E M E M O R I A L C O M P E T I T I O N

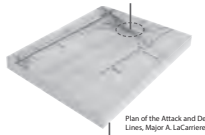
B I C E N T E N N I A L C O M M I S S I O N O F T H E B A T T L E O F N E W O R L E A N S

CONCEPTUAL WORD MAP



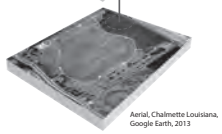
GEO-REFERENCING A GENERAL

By consulting historians and referencing historical maps of the battle with modern aerials, an accurate siting of General Pakenham's fall was located.



Plan of the Attack and Defense of the American Lines, Major A. LaCarriere LaTour, 1815.

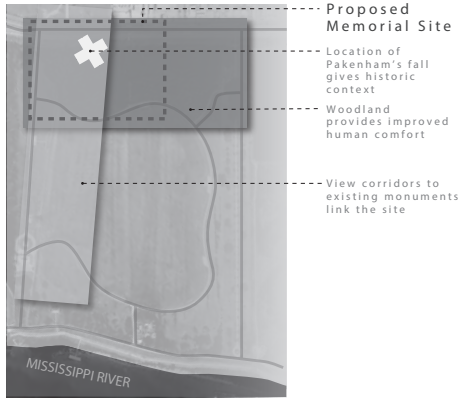
Troop Movement Map, New Orleans Campaign, 1814-1815, Map I-7. Engagement of January 8, 1815. National Park Service, 1985.



Aerial, Chalmette Louisiana, Google Earth, 2013

INTO THE WOODS

The stacked layers of analysis inform the location of the proposed Chalmette Memorial in the woodland at the northern portion of the site.



Example of a Plan Graphic Project Program

Concept A - Program

The program for this option focuses around maximum flexibility for both event and daily uses. The edges of the Park provide a variety of activities, visual interest, and surfaces while the core of the Park is open and flexible.

In addition to the 40 tents that may be set up in the new Federal Court Plaza pending an agreement with the General Services Administration, the Farmers' Market would be able to set up along the promenade, with shopper circulation looping from the kiosk back to the deck and existing "Auction Oaks." Movies in the Park and other staged activities can easily fit in the open lawn, with loading access from 4th St.

A: Food Kiosk

B: Cafe and Multipurpose Plaza

C: Children's Play Area

D: "Auction Oaks" Preservation Area to be protected

E: Existing Deck and Seating to be protected

F: Open Lawn

G: Shaded Lawn and Slopes

H: Game and flexible use area for bocce, ping-pong, washers, etc. on crushed stone aggregate

I: Corner Pedestrian Plaza for bike storage, event queue, art display, etc.

J: Planting Area and Buffer

K: Seating Area

L: Transit station with shelters and seat walls provided by CapMetro

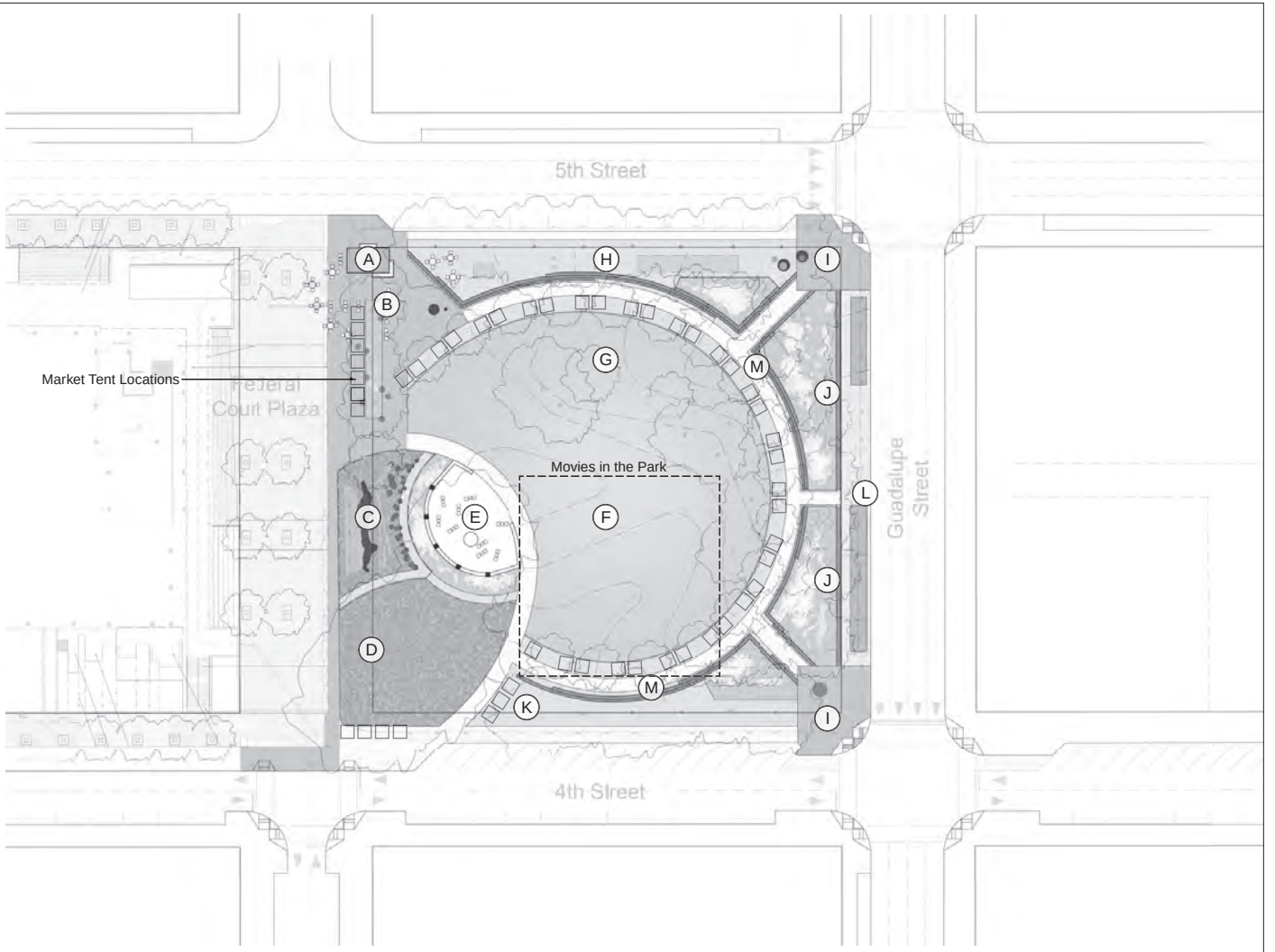
M: Arc Promenade with stone seat wall and new tree plantings

6%

Area of park dedicated to arts or creative programming; Baseline is 2%

75%

Area of park that is "flexible"; can accommodate more than one use; Baseline is 85%



Design Intent

Upon obtaining a preliminary understanding of the site, adjacent contextual conditions, and the client's program, the landscape architect can further develop more detailed design intent for the project. This process should be continually evaluated throughout the Preliminary Design phase as additional data, client, consultant, and jurisdictional feedback and programmatic understanding is obtained. This is not a static task.

Key components of the Design Intent documentation are further described in the sections that follow:

- Design Brief
- Project Dilemma and Thesis
- Project Performance Metrics
- Typological Precedents and Principles
- Design Frameworks and Parti Diagrams

Design Brief

A comprehensive and consolidated portrait of the project work scope is required for any successful design process. The design brief captures the essence of the project. It is based upon the client's goals, mission and vision, and critical success factors for the project. It also addresses the baseline site conditions, the project budget and the metrics critical to the project.

Statement of Client's Goals, Mission, and Vision

The client's goals, mission, and vision for the project should be at the core of the design. This information should be gathered from client interview(s) conducted during the Pre-Design phase and summarized as part of the design brief.

Definition of Client's Site

Concepts and programs for any site should be grounded in the characteristics of the place itself. A summary of the key facts about the site—for example, location, size, land use, vegetation, and so on—is important framing project intent. The site survey, any reports, aerial and site photography, physical samples and inventories, and other available and recorded base data should be considered in this definition. This data should be obtained in the Pre-Design Inventory and Data Collection phase. The description should be comprehensive but concise.

Statement of Project Budget

The project budget should be established or approved by the client. The landscape budget should be itemized to correspond with major improvement areas, for example, gardens, terraces, plazas, pools, and amenity areas. The budget should also distinguish between landscape architecture and civil/infrastructural improvements. It is the landscape architect's responsibility to clarify and design to established budget parameters from the project outset.

Statement of Project Dilemma and Thesis

A discussion of the project dilemma and thesis should have been initiated at the Pre-Design client work session and further developed during the strategic kick-off meeting and client metrics meeting. Now, with a better understanding of the site, the project dilemma and thesis should be reviewed, refined as necessary, and restated.

Statement of Program and Performance Metrics

Site design intent incorporates both qualitative and quantitative metrics to characterize the work scope. These correlate with metrics defined during Pre-Design in the metrics kick-off meeting. The landscape architect should frame qualitative metrics for each space or component, and include characteristics such as intended mood, experiential and aesthetic qualities. Quantitative metrics should also be determined for each space, component, or system and include attributes such as size, number of people accommodated, and infrastructural needs. These attributes are further described next.

Typical Landscape Architecture Program Headings

SPACES

- Primary spaces and gathering areas
- Roads and parking requirements
- Recreation components
- Regulatory-required open space or other requirements
- Service needs

COMPONENTS

- Art components
- Furnishings
- Lighting

SYSTEMS

- Key environmental systems
- Infrastructure systems
- Landscape typologies
- Pavement systems
- Walls
- Signs
- Water features

For each space, component or system, include the following typical attributes:

- Descriptive *name* of each space, component or system, for example, "Promenade"
- Locational or *siting* criteria
- Key *characteristics* of each space or element, for example, "the Reserve, a shady mesa, an intimate retreat from the city. A place to read, relax or have a quiet conversation . . ."
- *Size* of each element, and potential capacity or human occupation, for example, amphitheater, 550 persons or swimming pool, 150 persons
- Primary *materials* intended for each element
- Key *relationships*, to other site elements, or components by other disciplines, for example, architecture
- *Infrastructural* needs

Principles and Typological Precedents

The purpose of this task is to highlight built precedents and supporting principles which bear relevance to the project, in order to define issues and opportunities.

Precedents represent any example, model, or potential standard that may have applicability to the proposed work. Precedents may include an established design practice, or any judgment that can be used as justification for a similar decision. The role of precedents suggests that the designer can benefit from historic lessons.

For these purposes, a typology may represent a specific type or approach to design. A typological precedent is simply a means of highlighting a specialized approach to design. Typological precedents may include spatial standards, form and organizational models, or construction technologies. Other, more specialized typological precedents include elements such as green roofs, sculpture parks, or rain gardens.

Principles are paired with precedents in order to explain how the precedent works and how underlying values are structured. In aggregate, principles define the essential theory associated with the precedent.

Note that the role of typology and precedent in design is not intended to serve as an end, but rather as a means of understanding the complex array of problems and potential solutions. The designer should avoid relying on old solutions to evolving problems. Typology, precedent, and principle are used to establish a foundational perspective that can be built upon as the unique and contemporary conditions of the project are understood.

Precedents should:

- Define scale relationships associated with similar spaces.
- Define spatial issues associated with similar spaces.
- Define essential program components.
- Define key program relationships associated with the project type.
- Investigate history and evolution of this type of space.
- Define how use patterns associated with this type of space are changing.
- Define principles and essential theory associated with the precedent.
- Identify shortcomings associated with the precedent.
- Define opportunities to innovate.
- Summarize key issues associated with this type of space.
- Identify typical construction systems and technologies

Specific Requirements

Conduct focused research to determine the best examples associated with the project type. This process may build upon research initiated in the benchmarking process at the Pre-Design phase.

Organize the precedent review by grouping projects with similar scales. Make conclusions from these projects relative to the scope and spatial parameters that apply to design project underway. Conclusions made from each precedent should be distilled to essential conclusions.

Consider the local, cultural, and contemporary factors that influence the definition of a new precedent for this type of space.

DILEMMA:

How can we create THE destination public space for the suburb of Gunbarrel with limited room and design involvement?

THESIS:

Identifying the unmet outdoor needs of the community, coupled with simple, bold and unique design moves and guidelines will enable the team to move the design concept forward to a successful outcome.

PRINCIPLES:

- A park is where community life and interaction are on display. We must create a physical plan that stimulates impromptu social engagement and communal activities to occur.
- Safe and convenient physical linkages from surrounding areas to the park are critical for visitation and usage.
- Satisfying the unmet needs of the community is key to engendering ownership and increasing usage of the park.
- A series of choreographed spaces between Main Street and the park will make for a grander impression.
- Programming for outdoor improvements shall appeal to a variety of audiences.
- Sustainable improvements in the park reinforce the community's (Boulder's) brand as a sustainable community and place.
- Simple materials detailed in elegant ways can differentiate this project from others and be cost effective.

GOALS (METRICS):

Water

- Utilize bio-swales and rain gardens in all streetscapes to reduce stormwater infrastructure cost by a percentage yet to be determined.
- Utilize dry detention ponds in narrow landscape areas so they can be used as passive open spaces.
- Reduce potable water consumption for all public landscapes by 50% of baseline condition.

Energy

- Provide wind turbines and/or solar panels in the park to provide enough energy to power the irrigation and park lighting systems.
- Utilize LED lighting for public spaces whenever possible.

Economics

- Employ BMPs for the stormwater handling and cleansing to reduce water quality and storage requirements elsewhere in the project.
- Create a mixed-use development to improve the jobs-to-housing balance.

Ecology

- Create new wetlands that are equal or better than what previously existed.
- Provide "night sky conditions" in all public spaces.

Social Capital

- Encourage a community-wide art program (local artisans).
- Consider private community or vegetable gardens in the park.
- Use technology to teach about the value of sustainable living, for example, kilowatts of energy from wind, human power (bikes), etc.

Green Building and Urbanism

- Connect to the existing surrounding pedestrian linkages to outlying areas.
- Develop performance standards for the built environment.

Waste Management

- Recycle home, business, and landscape waste for other secondary uses.
- Eliminate 95% of the construction waste by employing a "cradle-to-cradle" approach for materials.
- Reduce air pollutions/dust by 50% during and after construction.

Example of Precedent Imagery Board

Graphic Requirements

Design precedents and corresponding principles are best captured through photographs of built projects. Some of these photographs may have been collected in the Benchmark phase in Pre-Design.

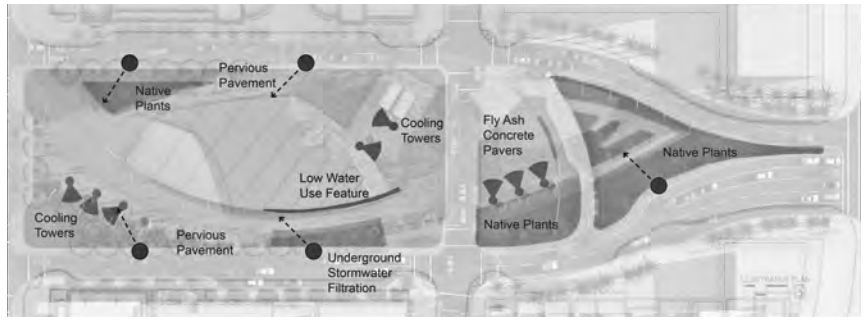
Project and photographic sources should be credited.

Group graphics in logical categories to reflect corresponding ideas or principles, for example, spatial or scale intent, program, or functional ideas.

Environmental Analysis Framework

The Environmental Framework defines specific site opportunities for best environmental practices, for example, habitat restoration, water quality initiatives, and solar energy opportunities. Some key site considerations are listed here:

- *Slopes*, defined by slope percentage and associated narrative description, for example, slopes greater than 30 percent are typically not well suited for buildings, roads, and other improvements.
- *Elevation*, defining the relative elevation of the site in order to: organize views, evaluate visual impacts, and determine circulation and design opportunities.
- *Aspect and orientation*, defining north, south, east, and west facing slopes, combined with degree of slope in order to define solar and lighting impacts for planting, pedestrian use, and building orientation.
- *Micro-climatic conditions*, identifying both desirable and potentially objectionable conditions, for example, intense summer sun areas, desirable winter sun zones, windy areas requiring mitigations, and micro-climatic conditions that may affect plant selection.
- *Hydrology,* positioning the site within its watershed context, in order to understand impacts. Identify drainage patterns that should be maintained and those that are poorly drained and require mitigation. Identify streams, rivers, and other water bodies, including floodplains and wetlands that require setbacks and preservation and avoid or minimize disturbance.
- *Existing vegetation*, identifying existing plants that deserve to remain and identify other plants that are in poor condition or are invasive or hazardous. Detailed tree assessments may be necessary and should be completed by an arborist.
- *Soil characteristics*, determined via a soil survey to accurately identify soil conditions. Highlight areas susceptible to erosion, poorly drained areas and areas poorly suited to construction.
- *Wildlife*, with habitat and migration patterns defined in order to avoid disturbing these areas.
- *Infrastructure conditions*, identifying all existing utilities.
- *Wildfire Conditions*, defining areas and level of hazard, and area(s) for proposed development in order to ensure appropriate measures are implemented to minimize fire danger.



Example of a Diagram of Environmental Parameters Considered for a Site

Community Analysis Framework

The Community Analysis Framework defines specific site opportunities for community destination and attributes, as presented in the existing site condition, for example, connections to an existing trail system or natural or cultural artifacts that suggest interpretive opportunities. Key site considerations are listed here:

- **Points of Connection:** Analyze pedestrian activity and circulation patterns, derived from informal observations, or actual field counts to design for types and rates of flows on and around the site.
- **Historical Landscape Assessment:** Identify the surviving, visible historic components within the landscape. Include community perspective relative to historic character.
- **Community Preferences and Potential Concerns:** Defined as part of a comprehensive dialogue with adjoining or nearby neighborhoods.

Example of a Diagram of Community Parameters Considered for a Site.

Economic Analysis Framework

The Economic Analysis Framework defines opportunities and constraints with the long-term economic performance of the project, for example, visibility and access conditions, return on investment, and future potential development in the area.

- The estimated relative (not actual) *value* for different site areas, derived from a general analysis of relative site assets and liabilities, for example, access, visibility, adjoining land use relationships and potential liabilities such as noise, pollution, or flood potential. High and low value site areas are defined.

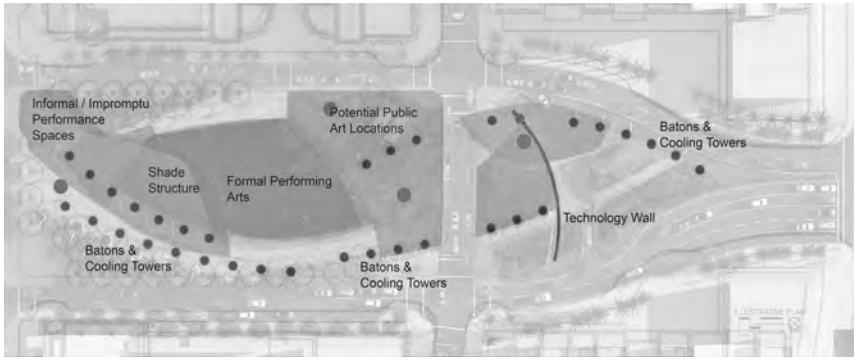
Example of a Diagram of Economic Parameters Considered for a Site

Art Analysis Framework

The Art Analysis Framework defines opportunities to improve the site aesthetic, particularly conditions that suggest the incorporation of art, sculpture, or audio, or visual enhancement. These may include opportunities for public or private art/sculpture, landform, performing arts, use of color, texture, and smells, and so forth.

Site art considerations may include:

- *Views/Scenic Quality:* Include the precise location of desirable and undesirable views, both from the site and to the site
- *Noise:* Include the location of desirable and undesirable soundscapes on the site.
- *Key Off-Site Relationships:* Identify areas on the site that are connected to potential off-site opportunities. These may include open spaces and culturally significant or aesthetically pleasing scenery.
- *Photos:* Use site and aerial photography to document existing site and context conditions, and capture influential imagery, details, or precedents potentially applicable to the proposed design.



Example of a Diagram of Art Parameters Considered for a Site.

Framework and Parti Diagrams

The objective of this task is to establish the key organizational structure of the design proposal and identify critical relationships between proposed functions and spaces.

The "parti" or big idea rationale is a diagrammatic depiction of the most fundamental organizing philosophy of the proposal. The parti announces the driving force behind the emerging schematic idea, in a simple yet compelling fashion. "The parti is the widest yet most profound description possible of [the] act of making."[2]

Most Important Message

A "parti" is generally developed as an abstract representation, but with key site intentions clearly defined. The diagram should be strategically developed with hierarchical representation, that is, the most important messages should read most robustly. The content and associated message of the parti should not be complicated; the landscape architect should be able to illustrate the intent simply and describe the intent in a few sentences.

The framework plan or "parti" does not rely upon form or compositional conclusions. One of the first steps of the actual design process where real possibilities are explored, the diagram assembles conclusions made from Pre-Design steps of the process. The framework plan is generally a holistic, project-wide idea, encompassing the full complement of disciplines involved in the project. The framework plan should not be developed as a site-only depiction, but rather should reflect critical contextual relationships.

[2] Bermudez, Julio. "On the Architectural Design Parti." University of Utah College of Architecture Planning. http://students.arch.utah.edu/courses/arch6971/parti.pdf.

The parti should address and overcome the key challenges associated with the project. Key challenges should be described in the project dilemma. The parti must represent the thesis of the project. Remember the thesis is a statement of intent supported by an argument.

Multidisciplinary content may be important to include within the parti, as it is intended as a holistic depiction of project circumstances. That does not suggest that the plan must comprehensively define all intentions associated with the project. The parti should incisively depict the most important logic of the project, i.e. that intent which is most critical to the success of the project.

Graphic Requirements

The parti plan does not need to be drawn to scale, but spaces should be roughly sized in relative proportion to one another.

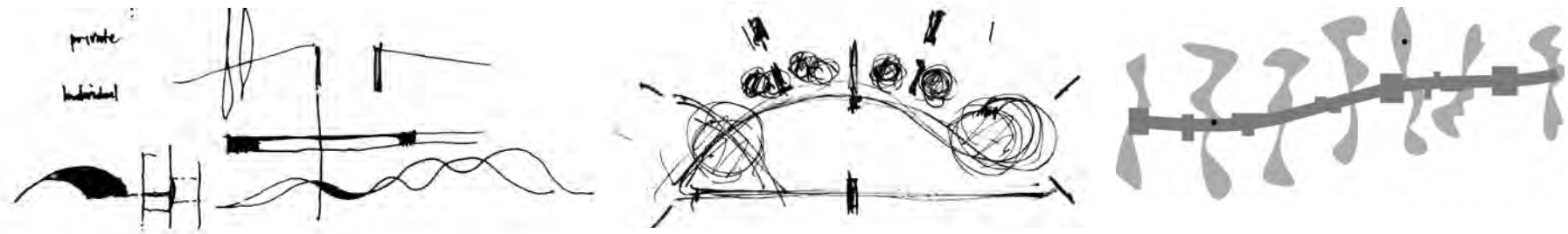
Legibility is critical to a parti. This diagram works best when understood at a glance. In other words, symbols should be developed that logically and intuitively represent intent.

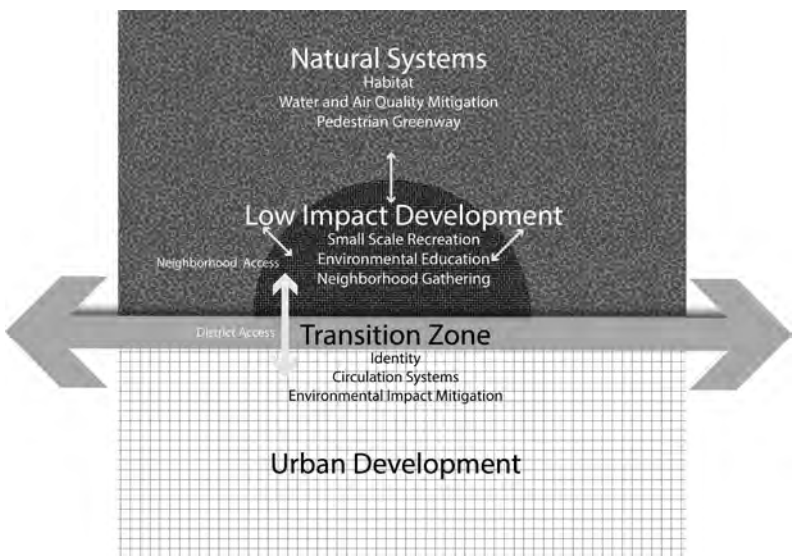
A three-dimensional diagram may provide clearer depiction of intent, although plan graphics may be suitable to communicate intent.

Consider including the following elements in the framework or parti diagrams:

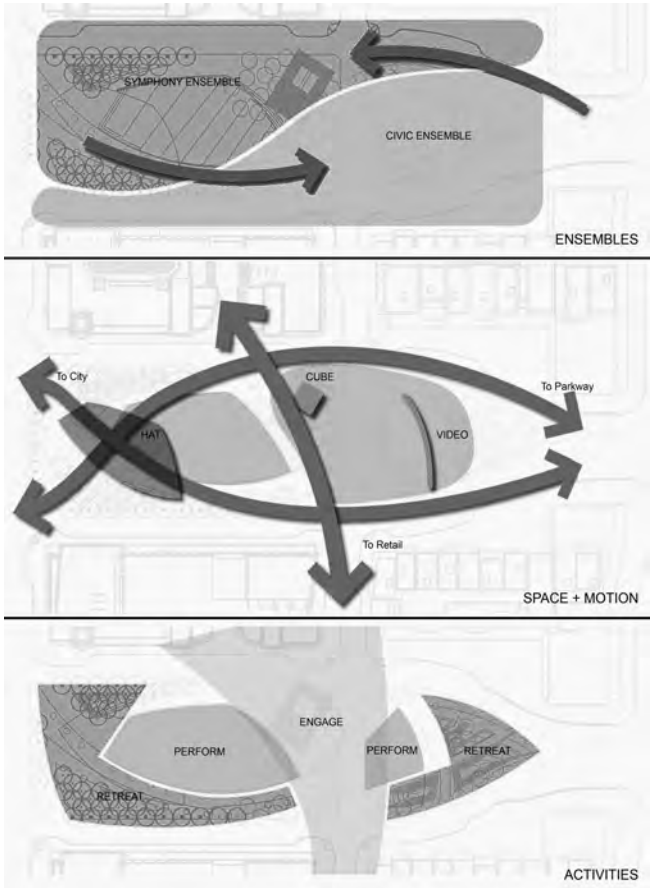
- *Primary circulation structure* and primary movement sequence
- *Central organizing space or spaces*
- *Primary spatial structure*, including general degree of enclosure
- *Hierarchical relationships* between spaces and components
- *Essential programmatic relationships*
- *Significant views or visual relationships* between components

Examples of Various Parti Sketches.





Example of a Concept Formation for an Urban Park



Concept Formation

Concept formation is instrumental as design moves from design requirements to design philosophy and its abstract manifestation.

Design conceptualization begins after initial programmatic development and Inventory and Data Collection phases. The project concept should be based on the project goals, site and context, dilemma and thesis, performance metrics, frameworks, and partis.

There are many launching points for concept formation, many of which are not described in detail within this document. They may even include imagery, narratives, poetry, theories, charrettes, quotes, songs, plays/performances, physical models, and art. While the creative pursuit of ideas is often derived from wide-ranging sources, design solutions will ultimately be judged by objective criteria.

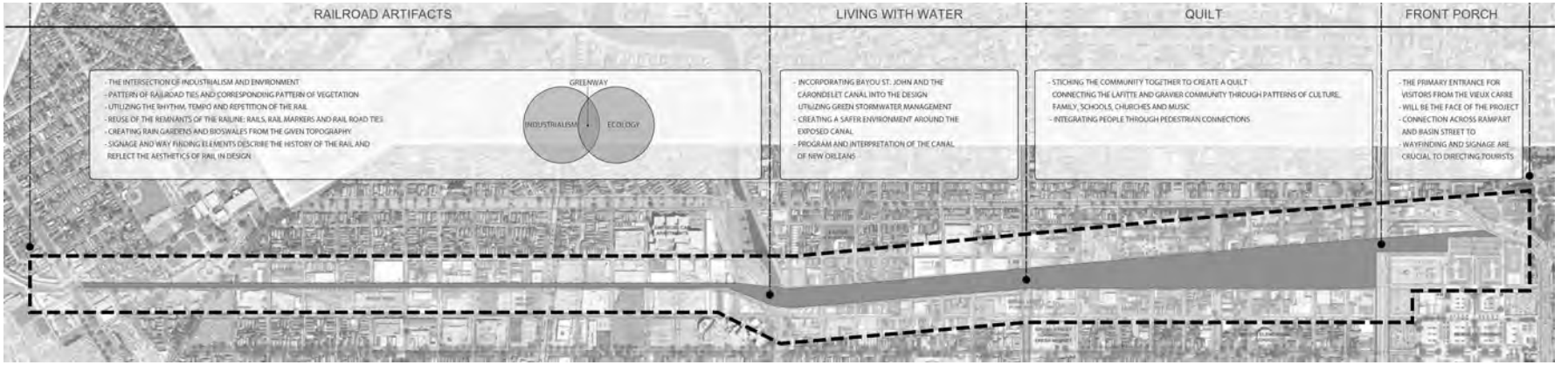
Design Studies

Preliminary form-giving typically begins at the Concept Design phase. As noted, there are many ways to initiate design. This publication, however, promotes a baseline design process that should be considered by the landscape architect. Adaptations and derivations from this process may be followed by project teams in the pursuit of well-defined intent.

Plan Alternative Studies

Design studies are used to explore and evaluate a range of formal means to accomplish design mission and goals. The primary design scope of the project should be conveyed. These studies should include full interdisciplinary intent, including architecture, civil, transportation, environmental, and art elements.

Example of a Concept Formation for an Urban Greenway



Plan studies are a method of realizing a generally consistent program on the site. This method should be focused on allowing the designer to quickly consider a variety of compositional variations on the site. The process of selecting from a number of alternatives is a form of rapid cycling, in which goals, metrics, and the likely performance of a design are considered. This explorative approach is aimed at seeking out best solutions.

Develop a common set of plan intentions (*Commonalities* below) to be shown on each plan.

PLAN ALTERNATIVE *COMMONALITIES*

- Consistently serves the project's mission, vision, and goals
- Consistently addresses the project's budget or provides logic for variance
- Acknowledges equivalent site conditions
- Acknowledges equivalent contextual influences
- Essential program included consistently, albeit with potential variations in position

Develop a unique set of plan intentions which offer significant comparative *distinctions* between plan alternatives.

PLAN ALTERNATIVE *DISTINCTIONS*

- Alternative spatial organization
- Alternative formal strategies
- Alternative supporting program
- Alternative environmental emphases
- Alternative material emphases

At a minimum, Plan Alternative Studies plans should incorporate the following components:

- **Off-site relationships**, defined as they relate to proposed plan
- **Primary three-dimensional intent**, including level changes and grading intent
- **Primary site program**, annotated or otherwise described on plan
- **Hardscape and softscape distribution**, defined graphically, without necessarily defining material intent
- **Key environmental strategies**, for example, sustainable water management, micro-climate design, habitat preservation, or material reuse
- **Art program**, including two-dimensional, three-dimensional, narrative, and auditory elements
- **Narrative intent**, accompanying the plan to define the essence of each plan and distinctions between them

BEST PRACTICES

- Plan studies should be derived from design framework/parti diagrams
- Innovative responses to stated problems should drive the process. Utilize an interdisciplinary rapid cycling session to define plan alternatives.
- Sustainability and long-term legacy should be at the fore during the development of design ideas
- Include full interdisciplinary intent, including architecture, civil, transportation, environment, and art

Selection of Preferred Alternative

The preferred alternative represents the outcome of a collaborative process. This process might include the design team; client team; representatives of the local, state, or federal jurisdiction; other consultants; key stakeholders; and/or the community at large. Ultimately, the preferred alternative is selected by the client based upon the methodical evaluation of alternatives, as facilitated by the landscape architect.

Methods

The parameters used by the landscape architect to assist the client in making a selection should include metrics and corresponding goals, program requirements, constructability, operation and maintenance costs, flexibility, schedule impacts, and estimated construction cost.

Refine Performance Criteria

The project metrics and corresponding SMART goals should now be revisited. Design alternatives should be evaluated relative to their ability to fulfill the mission of the design and satisfy performance metrics.

The project program should comprehensively summarize the project requirements as defined by the client and project stakeholders.

Existing conditions must be considered as they affect and are impacted by the performance of the design.

Evaluate Alternatives against Criteria

The sustainability matrix should be used as a tool for capturing the performance of each alternative plan and evaluating how each performs against each of the established criteria.

Selection of the Best Performing Design

The best-performing alternative should be selected as it best satisfies performance criteria. The selection should be completed in collaboration with the client and project stakeholders.

Graphic Requirements

The design plan should be further developed following its selection, in order to address any identified shortcomings or improvement needs. That will properly position the concept plan for much more extensive development at the Schematic Design phase. Identification of further development needs should be incorporated in the concept plan package.

The preferred plan alternative should be graphically prepared to vividly depict key characteristics, rather than be drafted in exhaustive detail. The graphic medium should be selected to reinforce design intent. For example, cool, shaded spaces might be accentuated or colorful garden qualities might be rendered into the plan, or carefully arranged relationships between interior and exterior spaces might be portrayed in collaboration with the project architect. The preferred plan alternative should be drawn to scale. Context around the site should be illustrated in a manner that highlights key relationships.

Character Imagery

Character imagery vividly communicates the intended physical personality of the project, derived from the overall project mission and as a consensus-building step toward accomplishing detailed design and detailing.

The character of the designed environment should reflect the mission of the project. As such, some description of the intent behind the proposed character should be included as part of this document. For example, the project aesthetic may be derived from some combination of regional influences, environmental conditions, community interests, and the financial pro forma.

Imagery may also be used to establish the general quality level for the project. A well-trained landscape architect will maintain an informed understanding of built quality and associated cost.

Imagery may also be used to convey performance, function, and intended use of proposed spaces and elements. Performance may include environmental processes such as stormwater infiltration. Functions and intended use may include spaces that are intended to include multiple functions, such as plazas that may be used interchangeably as passive gathering spaces and for farmers' markets.

Graphic Requirements

Photographic images defining intended character for proposed materials, systems, components, spaces, or settings.

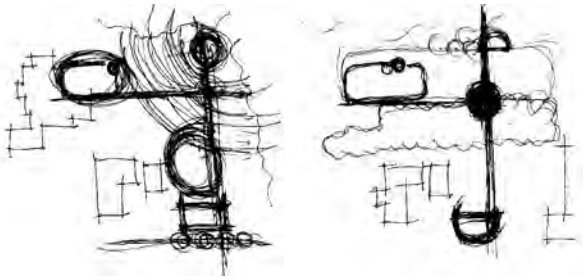
Succinct narrative to accompany images, highlighting primary intent, e.g., pavement images may be accompanied by the words "tactile, porous, low reflectivity, and low maintenance."

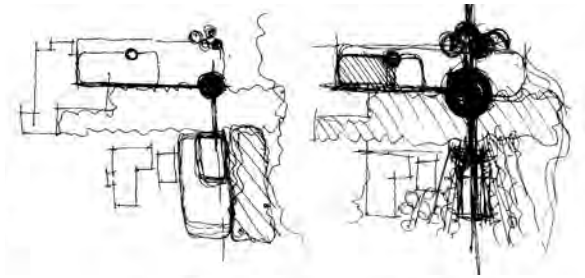
Images organized and potentially grouped to communicate design logic, such as those scenarios described under *Best Practices*:

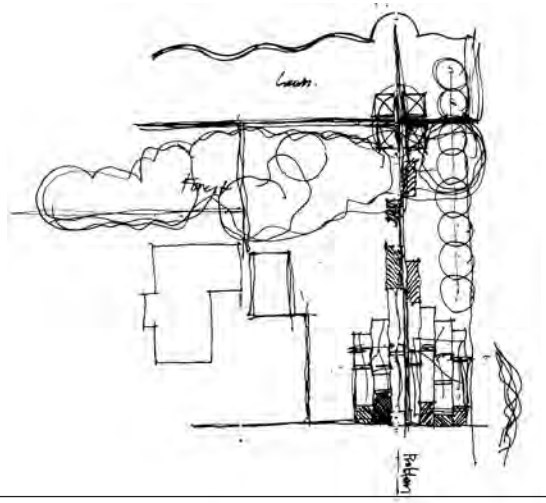
Best Practices

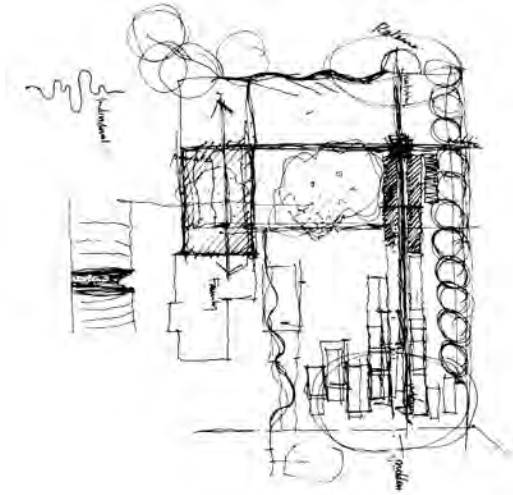
- Consider organizing images by overall intent, for example, landscape preservation or wetland mitigation.
- Consider organizing images in categories of environment, art, community, and economics. Statements of intent or principles should accompany each category.
- Consider organizing images by spatial program, for example, auto court, winter garden, veranda.
- Consider organizing images by principle categories, for example, a didactic landscape, spaces-within-spaces, or strong interior–exterior relationships.
- Consider organizing images by project component categories, for example, pavements, lighting, furniture, landscape, and feature components.
- Images may be most useful when the audience clearly understands the message. Phrases, statements of principle, or other headings can be used to accompany images.
- Consider multidisciplinary imagery, for example, with civil engineer, architect, artists, and environmentalists. The act of working together to define intent and assemble images will benefit the collaboration.
- Seek the input of the client prior to establishing character imagery, requesting his or her identification of projects that they would like to emulate, and/or a verbal description of intended built character. For example, a client might report that he is looking for "a cool, comfortable garden-rich setting that extends daily and seasonal shopping periods."

Examples of Alternative Plan Studies from a Private Residence.

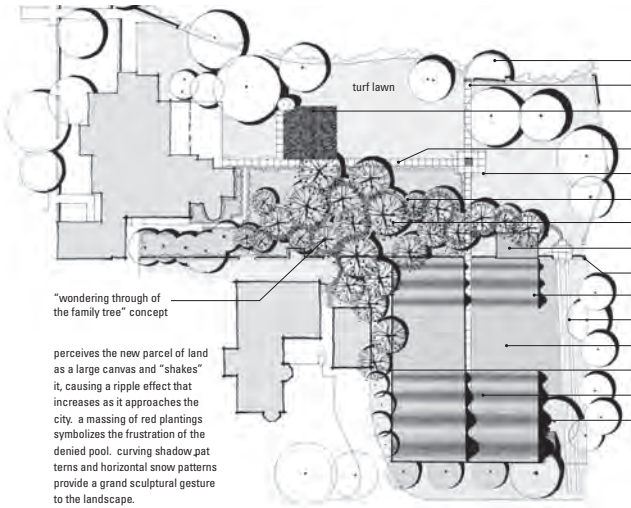








alternative.one.a

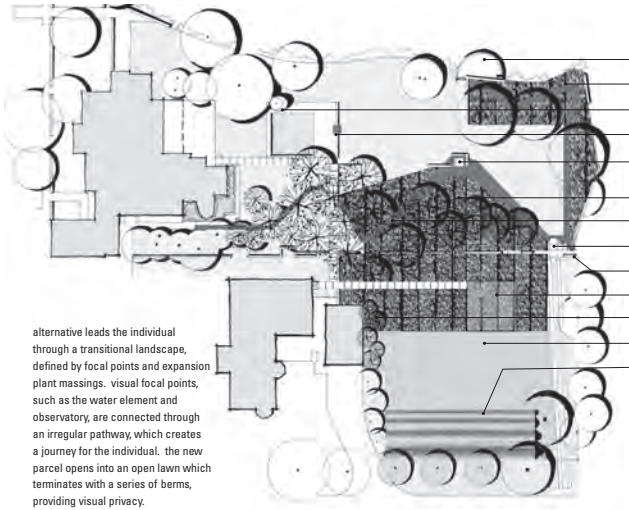


existing observation deck
n-s linear axis walkway
red perennial mass represents the void of the denied pool
e-w linear axis walkway
firepit at terminus point
massing groundcover
black pebble pathway
utilitarian shed
existing concrete wall system
linear earth berms
existing drive
turf lawn
buffer of aspen grove
linear earth berms
"shaking out the rug" concept

"wondering through of the family tree" concept

perceives the new parcel of land as a large canvas and "shakes" it, causing a ripple effect that increases as it approaches the city. a massing of red plantings symbolizes the frustration of the denied pool. curving shadow pat terns and horizontal snow patterns provide a grand sculptural gesture to the landscape.

alternative.two.a



existing observation deck
irregular stone fines pathway
glass structure and pool
firepit
water element located at terminus point
linear color planting beds
connecting pathway
existing drive
existing concrete wall system
glass conservatory
buffer of aspen trees
open lawn
series of linear berms, increasing in size

alternative leads the individual through a transitional landscape, defined by focal points and expansion plant massings. visual focal points, such as the water element and observatory, are connected through an irregular pathway, which creates a journey for the individual. the new parcel opens into an open lawn which terminates with a series of berms, providing visual privacy.

Preparation of Perspective Renderings and Other Illustrative Drawings

Perspective renderings vividly illustrate principal design intent, both as a means of developing support for the project and to evaluate the proposal. These drawings should be strategically devised to highlight key design principles, illustrating the intended physical character and quality of the development, as part of an overall strategy for visual and physical quality.

Renderings should be prepared to depict the primary project features. These drawings should be well coordinated with plan organization and schematic detail development.

Graphic Requirements

Vantage(s) carefully selected to convey primary ideas and principles

Medium, coordinated with other illustrative documents as part of an overall graphic strategy. The rendering medium and style should be strategically selected to portray and coincide with the intended mood and character of the built environment. The technique can range from abstract to precise. For example, a festive public gathering space may utilize a loose and colorful medium to convey the blur of a crowded urban experience, like the work of LeRoy Nieman and his "stunningly energetic" style. Or, the media may be selected to convey a well-resolved level of craftsmanship, utilizing a crisper medium.

Best Practices

- Determine key people activities, those intended to be supported by the proposed design solution. Include people engaged in these activities in the perspective rendering.
- Develop perspective renderings together with the consultant team, namely architects and others whose work is portrayed in the rendering. Utilize an interdisciplinary work session, together with the rendering professional, to develop content.

Design Models

Design models are used to examine spatial intent, scale, and three-dimensional form.

Physical Study Models: Physical study models should first be used during the Conceptual and Schematic Design phases in order to study alternative spatial configurations. These models should generally be unfixed and flexible enough to accommodate a series of ongoing revisions. As alternative configurations are physically modeled, they can be photographed for further comparison as new alternatives are studied. "Study" is the key attribute of the modeling process. Presentation-quality detail and rendering finish are generally not considered important at this stage.

Conceptual and Schematic models can be quite abstract. Design Development modeling focuses on the development of the selected schematic alternative. These models are generally more refined than their schematic predecessors, as the emphasis shifts from space and scale to forms, materials, and relationships between elements. While materialization of the DD model can be depicted at various levels of detail, colors, patterns, and textures should approximate actual proposed characteristics. Components within the landscape architectural space should now be fashioned with attention to form. That will allow the design team to make integrated design decisions. Individual components can subsequently be modeled at a larger scale and with more detail.

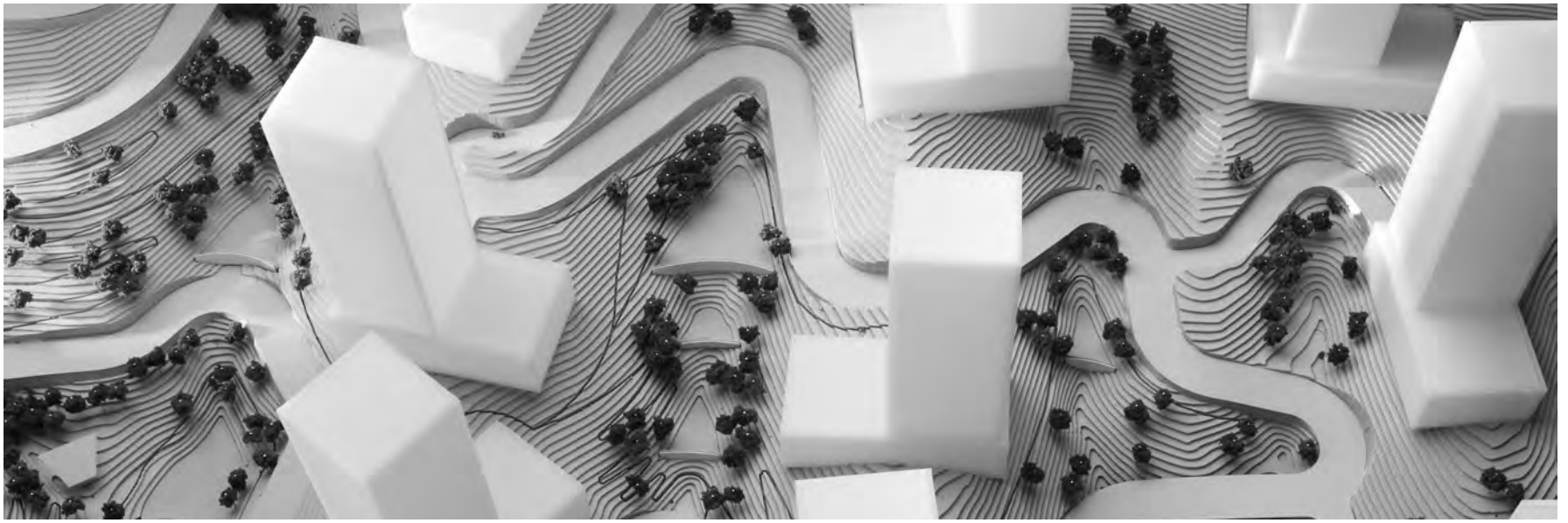
Digital Models: Digital models also offer spatial and component modeling and, depending upon the software, can allow efficient revisions to be made. Prior to selecting a software program, the purpose of the model should be made clear, as proprietary software can serve somewhat different purposes. For example, distinction should be made between the role of the model as a design study tool versus presentation tool. Some software is fast and easy to use but comes with some graphic limitations. Examples include Sketch-Up and Rhino. Other software requires meticulous attention to detail and generally takes more time to model and subsequently render. Examples include 3D Studio VIZ and Maya. Some programs, such as Form Z, are designed to address a range of needs, from basic modeling to advanced rendering and animation. The landscape architect should understand distinctions between design-oriented software programs, which focus on general-purpose modeling, and programs that focus on photorealistic rendering and animation.

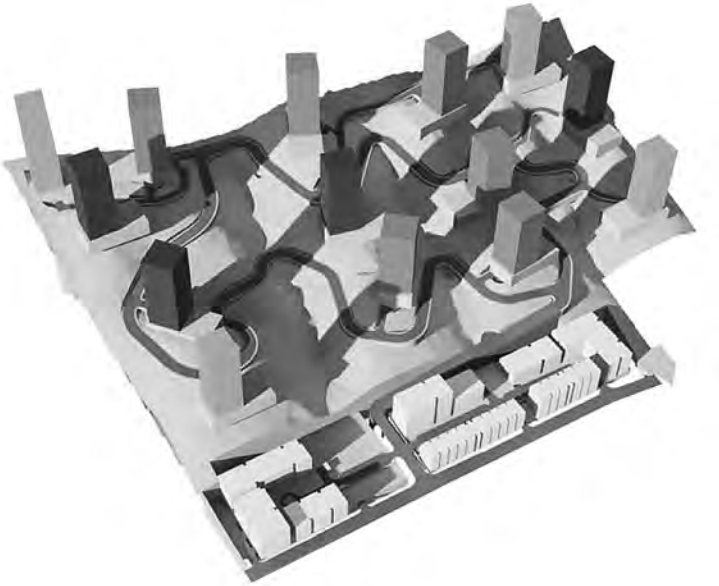
Example of a Digital Perspective of an Urban Park

Example of a Pencil Sketch Perspective of a Private Residence

Example of a Perspective of an Urban Greenway by John Moon

Digital animations and fly-throughs establish a sequential perspective on the project, simulating an experiential view through the spaces as a pedestrian. These animations can generally be completed on most software such as those noted earlier. It is sometimes preferable to utilize live navigation capabilities within the model in order to explore freely, rather than follow a scripted animation sequence.





Example of a Physical Model

Construction Budget/Cost Model

The project cost model reflects the total cost necessary to construct the site improvements and fulfill the intended mission and associated quality level intent. The construction budget should explicitly and comprehensively define costs for all work under contract by the landscape architect.

However, the cost model and construction budget are not cost estimates. Construction budgets are generally allocated prior to any significant design work. Cost estimates are prepared with quantity takeoffs, details, and specifications to define the current *Opinion of Probable Cost* for an existing design proposal. The *Opinion of Probable Cost* phrase conveys the idea that the estimate has not been determined with certainty, as there are variables that cannot be fully addressed by the design consultant. This language is used in the industry as part of a liability communications strategy.

It is important to solicit the construction cost budget from the client prior to beginning any design work in order to develop a fee proposal to provide the landscape architectural services. The landscape architect's fee proposal may be derived, at least in part, from the allocated construction cost budget, as a percentage.

The client's construction budget should be based upon the target program and quality level for the project. If a budget has not been provided by the client, the program should be quantitatively and qualitatively defined to a level that it can be estimated by the landscape architect during the Conceptual Design phase. In this case, the cost estimate prepared by the landscape architect will become the basis for approval by the client.

The landscape architecture budget should be separate from work completed by the civil engineer and include all improvements from the face of building to the back of curb at streets and parking areas. All components within this area, including site walls, signs, lighting, planting, landscape grading and drainage, paving, site structures, water features, and site furnishings should be included.

As projects progress through each design phase, cost estimates evolve in approach, from budgeting upcoming design work to quantifying and estimating current design work. That evolution is described in more detail in two additional areas within this publication: Chapter 7: Design Development, Best Practices, Design to Budget; and Chapter 10: Preliminary Design, Schematic Design, Guidelines and Best Practices, Site Cost Model/ Construction Budget/Estimate of Probable Construction Costs—Pre-Design, SD, DD, and CD Phases.

Graphic Requirements: Cost Model

Using the Concept Site Plan that has been developed for the project, highlight and quantify the site area designed under the landscape architect's contract. Exclude all building footprint areas. If necessary, define a range of quality zones within the overall site area by assigning a unit cost to each of these areas. These areas may be preliminary and generic in reference, but they will help to more effectively define an initial site budget.

Consider the following types of quality area definitions:

- Existing Landscape Not to Be Disturbed (No cost implication)
- Proposed Landscape, Highest Quality Level ($*XX* per Square Foot)
- Proposed Landscape, Middle Quality Level ($*XX* per Square Foot)
- Proposed Landscape, Lowest Quality Level ($*XX* per Square Foot)
- Proposed Hardscape, Highest Quality Level ($*XX* per Square Foot)
- Proposed Hardscape, Middle Quality Level ($*XX* per Square Foot)
- Proposed Hardscape, Lowest Quality Level ($XX per Square Foot)
- Proposed Water Feature ($*XX* per Square Foot)
- Proposed Art Element or Other Feature ($*XX* Lump Sum Allocation)
- Proposed Site Architectural Element ($*XX* Lump Sum Allocation)

Composite unit costs should be assigned for each area. These costs include any site protection, site demolition, site preparation, mobilization, general conditions, and actual construction necessary to deliver the project.

Best Practices

Design

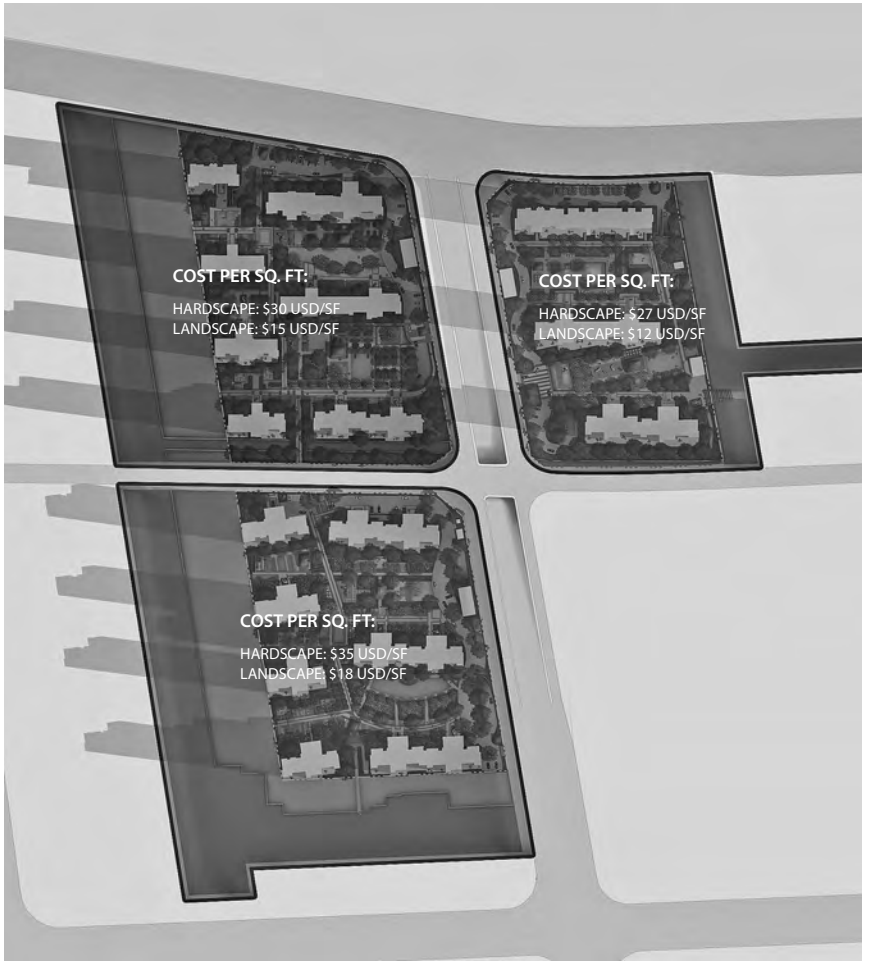
Develop a site budget based upon target program and quality level for the project by calculating a total budgeted cost based upon targeted square foot unit costs. The square foot unit cost will be derived from historic project data, adjusted for inflation, to match intended quality and program for the project.

Utilize images to convey intended quality level(s) for the project, as part of the cost modeling exercise. Organize these images by categories to coincide with zones as defined with the plan.

Coordination

Coordinate quality levels between building development and site development in order to establish desired relationships. Determine landscape architecture construction budget separate from work completed by civil engineers. Include all costs from face of building to back of curb at streets and parking areas. Include all components within this area, including site walls, signs, lighting, and site furnishings.

Example of a Cost-Model Graphic



Phasing

Objective

The conceptual site phasing plan defines preliminary intentions for constructing the project in multiple phases, or stages, albeit under a single contract.

General Requirements

The conceptual and subsequent SD site phasing plan depicts construction stages within the proposed site development work. In DD and CD phases, the site reference plan assumes this responsibility and is important because it may be the only plan within the landscape architect's document set to show the entire project on a single sheet. Prior to developing the site reference plan, the Conceptual and Schematic phasing plans should be composed to illustrate the entire site design program, and key design spaces and elements.

The site phasing plan also communicates the position of the project site within its immediate context, illustrating, and labeling adjoining streets, properties, land uses, and other relevant contextual factors that may affect the design proposal or its implementation.

Specific Requirements

- **Survey base sheet** to show all existing conditions to remain
- Preliminary **limits of work,** as agreed by landscape architect, civil engineer, and owner
- *Perimeter* **existing conditions** immediately adjoining the project site, allowing the reader to understand the relationship between on- and off-site conditions
- All major **on-site existing conditions** to remain, for example, streets and other pavements, landscape, water bodies, and existing buildings
- All **proposed buildings** or structures, labeled to reference their generic or official name, if designated at time of documentation
- All **proposed site improvements**, to coincide with those landscape architectural improvements shown on the Site Materials Plan
- **Labels** to identify major program elements and design features
- Preliminary project **phasing**, defined by geographical areas and relative sequencing

Graphic Requirements

- **Existing conditions to remain**, screened back a maximum of 50 percent as original unaltered survey, in order to better highlight proposed improvements

- **Single, undivided site plan**, scaled as large as possible to fit on sheet
- **Plan orientation** to match orientation of plans within the document set
- **Work limit line** represented by equally spaced dashed bold line, with "limit of work" note; line width as per landscape architect's CAD standards
- **Labels** for major components, as described here

LABELING SYSTEM HIERARCHY IN DESCENDING ORDER OF IMPORTANCE:

1. Phasing areas
2. Major landscape spaces and elements, for example, "Activity Terrace" or "Water Wall"
3. Major buildings
4. Proposed roads, parking, and service areas
5. Existing roads and other conditions to remain

Line-weight hierarchy, rigorously applied to distinguish proposed from existing conditions.

LINE WEIGHT HIERARCHY, LIGHTEST TO HEAVIEST:

- Screened survey base showing existing conditions, including subgrade conditions
- Lines to distinguish on-grade materials and elements, for example, edges of pavements
- Lines to distinguish above-grade materials and elements, for example, walls, stairs, and furniture
- Notes and labels, including phasing area annotations
- Phasing area outlines

Consultant Improvements: As described earlier, screened to allow landscape architectural program to read distinctly

Preliminary Project Phasing: Outlined with heavy line, defining enclosed area with clear work limits.

Best Practices

Design

Examine interdisciplinary design relationships to ensure that complete and integrated systems are built within logical phasing strategies.

Coordination

Use the site phasing plan to coordinate work limits with others, for example, the civil engineer and prime design consultant, if applicable.

Strategies

Consider phasing strategies that reflect the following considerations:

- Establishment of "upfront" value, reflecting either visual impressions or site usability
- Construction access and staging
- User access and circulation
- Relationships between site development and associated building phasing

Example of a Phasing Diagram for a Community Project

SCHEMATIC DESIGN

Phase Checklist:

- ☐ Cover Page
- ☐ Table of Contents
- ☐ Context Framework
  - Existing Conditions
  - Analysis Overview
- ☐ Sustainable Design
- ☐ Illustrative Site Plan
- ☐ Site Protection and Removal Plan
- ☐ Site Materials Plan
- ☐ Materials Palette
- ☐ Site Grading and Drainage Plan
- ☐ Planting Plan
- ☐ Planting Palette
- ☐ Illustrative Visualizations
  - 3D Site Aerial/Bird's Eye Renderings
  - 3D Detailed Perspective Renderings
  - Sections and Elevations
- ☐ Preliminary Project Descriptions
- ☐ Estimate of Probable Construction Costs*

* Estimate of Probable Construction Costs is not typically included within landscape architect's SD package. It may be provided by either a professional estimator or a contractor upon review of the package and coordination with the landscape architect.

Introduction

Purpose

Having established parameters in Pre-Design and a conceptual design framework at the Conceptual Design phase, Schematic Design can be initiated with a basis to begin formulating detailed design intent. Intent defines the essence of Schematic Design. Intentions come in the form of principles, performance metrics, a mission, a thesis, and form and character studies. It is also important to recognize that like Conceptual Design, this is still an analytical phase, a response to the conditions established in Pre-Design, the evolution of the design during Conceptual Design, and the intent established at the outset of Schematic Design. To conceive of a coherently whole design direction that encompasses the myriad objectives, parameters and constraints is the primary challenge of Schematic Design.

For a more comprehensive summation of the definition, purpose, key issues and objectives of Schematic Design refer to Section 2—*Phases Overview.*

Organization of this Section

This core section of the publication encompasses a comprehensive and detailed description of recommended practices for the core landscape-architectural design and documentation process. This section places emphasis on representative graphic examples with associated itemization of recommended components.

The *Objective* or purpose of every component, or sheet within each phase is first defined. It is important to understand the purpose of each sheet as well as relationships between associated sheets.

General Recommendations for each sheet are defined in order to establish broad needs. For example, Schematic Design Illustrative Sections and Elevations should "communicate the primary message, storyline and strategic intent for each section, as part of the overall mission of the project."

After General Recommendations, *Specific Recommendations* for each sheet follow. These represent a subset of the general recommendations and include a more detailed list of suggested elements. For example, on the Schematic Design Context Framework Plan, it is recommended that "Key Land Use Relationships and the potential implications on program positioning for the proposed development" be defined.

Graphic Recommendations for each component or sheet are also defined. These recommendations should be considered baseline and flexible, as a vast number of graphic approaches are available to the landscape architect.

Finally, *Best Practices* are defined for each of the landscape architecture sheets. These practices are organized by category: design, technical, coordination, and strategies. Key coordination needs are important to this section.

Schematic Design Components

Schematic Design processes and associated documentation vary across the architectural design industry, and even within landscape architectural practice. Schematic Design variations are generally more significant than DD or CD variations. Content and graphic variations suggest a legitimate and wide-ranging means to conduct analyses, define intent, explore, illustrate, and evaluate alternative design approaches. This publication recommends a set of core Schematic Design components, in order to properly define design intent. Additional components or variations from the recommended components may be considered by the landscape architect.

For example, Site Lighting and Site Furnishings may be included on the Site Materials Plan, if the plan is simple enough to allow consolidation. Or, as another example, a specialized Materials Schedule may be required by the client or municipality. Other project conditions may require the documentation of community input, study models, interdisciplinary coordination issues, or phasing plans.

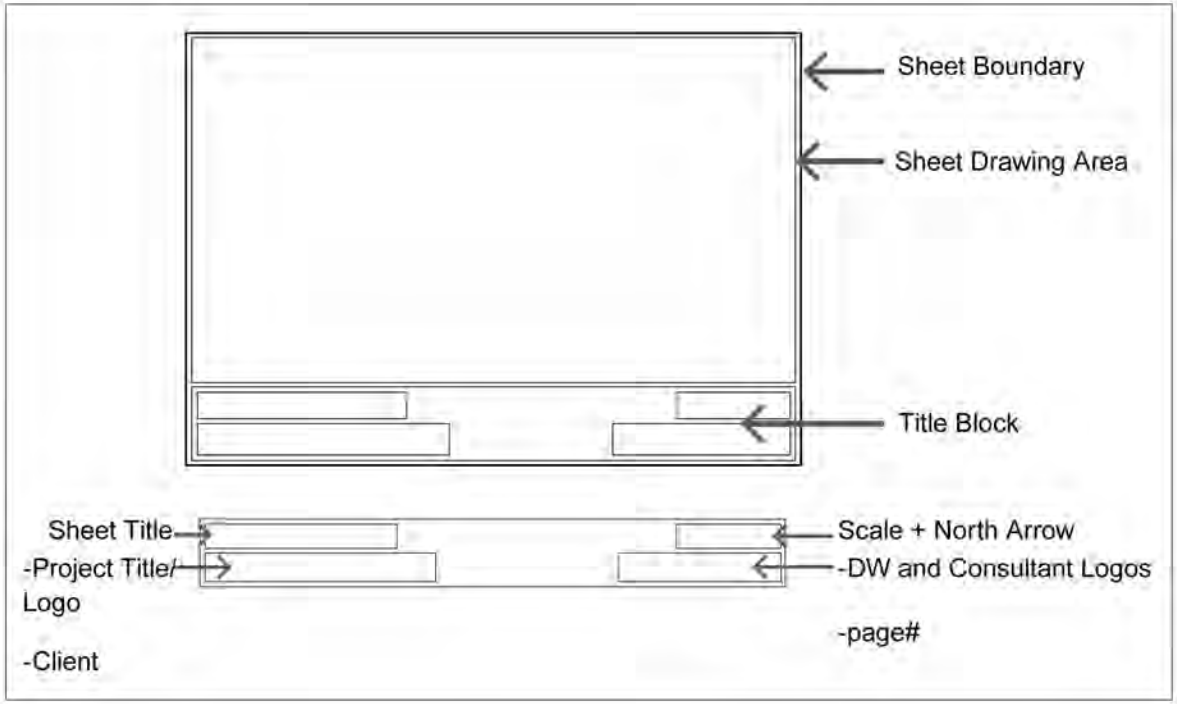
The Schematic Design package here is generally represented as an 11" × 17" or A3 booklet. Larger scale drawings may necessary to better convey detail. Clients may require larger scale drawings for review and approval.

Cover Sheet—Schematic Design

Objective

The Schematic Design (SD) Cover Sheet provides the reader with a snapshot of the project design content, with compelling visual image(s) and limited words.

Example: Title Block Graphic



Components of a Schematic Design Title Block

General Requirements

The SD Cover Sheet conveys the primary design scope of the project. It should also communicate the general contents of the documents and the primary consultant team leadership.

Recommendations

(The recommendations that follow are listed in recommended order of presentation on the Cover Sheet, generally from top to bottom.)

*Indicates optional requirement.

Project Title: Precisely as noted in other project records and documentation, for example, "Wheeler Neighborhood Park and Wetlands Mitigation."

***Descriptive Phrase:** Consider the use of a very brief catch phrase to suggest and reinforce the mission or intent of the project. The catch phrase may remind the reader, who may be in a position to review and/or approve the project of the primary benefit of the project. For example, a project in a sensitive waterfront environment may read "Oceanside Waterfront Improvements: Restoring the Wetlands." Or, a downtown public space with an emphasis on public art might be titled "Union Square: Bringing Art to the People."

***Project Location:** City and state; detailed address is not necessary until Design Development documentation.

Title of Document Set: For example, "Schematic Design," "Schematic Streetscape Design," "Schematic Resort Site Design," or "Schematic Residential Site Design."

Official Date of Issuance: Verify that individual sheets and consultants show the same date within title block on each sheet.

Illustrative Image(s): These convey the essence of the project, potentially a plan or perspective view. See requirements for SD perspective renderings within these guidelines. A series of images may be also used to more broadly communicate intent.

Landscape Architectural Firm Name or Logo: To identify author of the documents.

Client Reference, Name, or Logo: To identify the client or owner of the project.

Graphic Recommendations

The SD Cover Sheet should be graphically clear and simple. Hierarchy and simple composition are important organizing principles.

The SD Cover Sheet should be designed with "design" emphasis, rather than a technical emphasis.

Font Sizes

Font size determinations will depend upon extent and placement of content, and may vary per project. The landscape architect should follow the landscape architect's CAD standards for these requirements.

One approach would establish a hierarchy from larger text to smaller text as listed here:

- Client Reference
- Project Title
- Title of Document Set
- Project Location
- Official Date of Issuance
- Landscape Architectural Firm Name

Best Practices

Design

Use the Schematic Design Cover Sheet to convey a graphic attitude about the project, with font choices, imagery choice, and layout to support the subject matter of the project.

Coordination

If the landscape architect is not the prime design consultant, but rather a subconsultant, the prime consultant Cover Sheet should be utilized for the overall document set. A sub-Cover-Sheet may be used to mark and distinguish the landscape architectural documents. With that practice, coordinate and confirm that information precisely matches between the two Cover Sheets, for example, project name, project location, date of issuance, and consultant names.

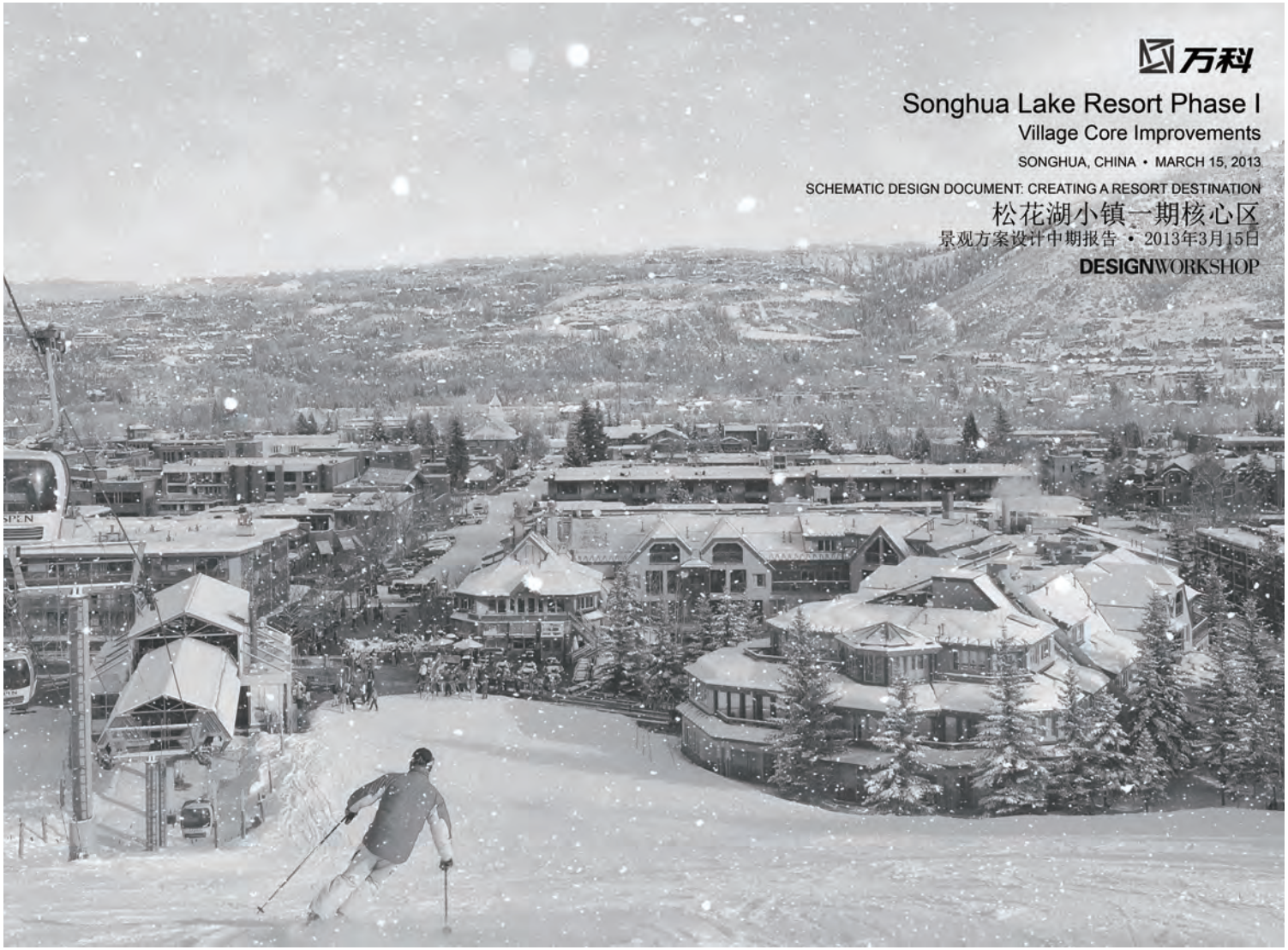
Client

Coordinate client or agency requirements for the Cover Sheet. Encourage use of the landscape architect's standard, from which content and layout changes can be made.

Example of an SD Cover Page

CORE COMPONENTS (IF APPLICABLE)

- Client Reference
- Project Title
- Descriptive Phrase
- Title of Document Set
- Project Location
- Official Date of Issuance
- Illustrative Image
- Landscape Architect's Firm Name
- Subconsultant Logo(s)



Schematic Design Table of Contents

Objective

The Schematic Design (SD) Table of Contents defines the content and organization of the Schematic Design Drawing Set.

General Recommendations

Succinctly communicate each sheet and page number within the package.

Specific Recommendations

Titles or descriptions of first-level headers, such as Section titles if organized in Sections, for example, "Site Context and Base Information," "Preliminary Design," and "Final Design."

Titles or descriptions of second-level headers, such as sheet titles, for example, "Illustrative Site Plan," "Site Protection and Removal Plan," "Site Materials Plan," and "Materials Palette."

Page numbers, where each part starts.

Subconsultant References, if identification of content prepared by consultants other than landscape architect is applicable.

Illustrative Image(s), conveying the essence of the project or other important content, potentially a plan or perspective view. See other requirements within these guidelines for illustrative drawings or images.

The SD Table of Contents should be graphically clear and simple. Hierarchy and indentation are important organizing principles.

Content appearing before the Table of Contents, is generally not listed on the Table of Contents. However, in numbering the pages, all pages before the Table of Contents are counted, and the Table of Contents is typically numbered with a lowercase Roman numeral page number.

Leaders, connecting headers with page numbers, as determined necessary by graphic designer.

Example of an SD Table of Contents

CORE COMPONENTS (IF APPLICABLE)

- Titles or descriptions of first-level headers
- Titles or descriptions of second-level headers
- Page numbers
- Illustrative image

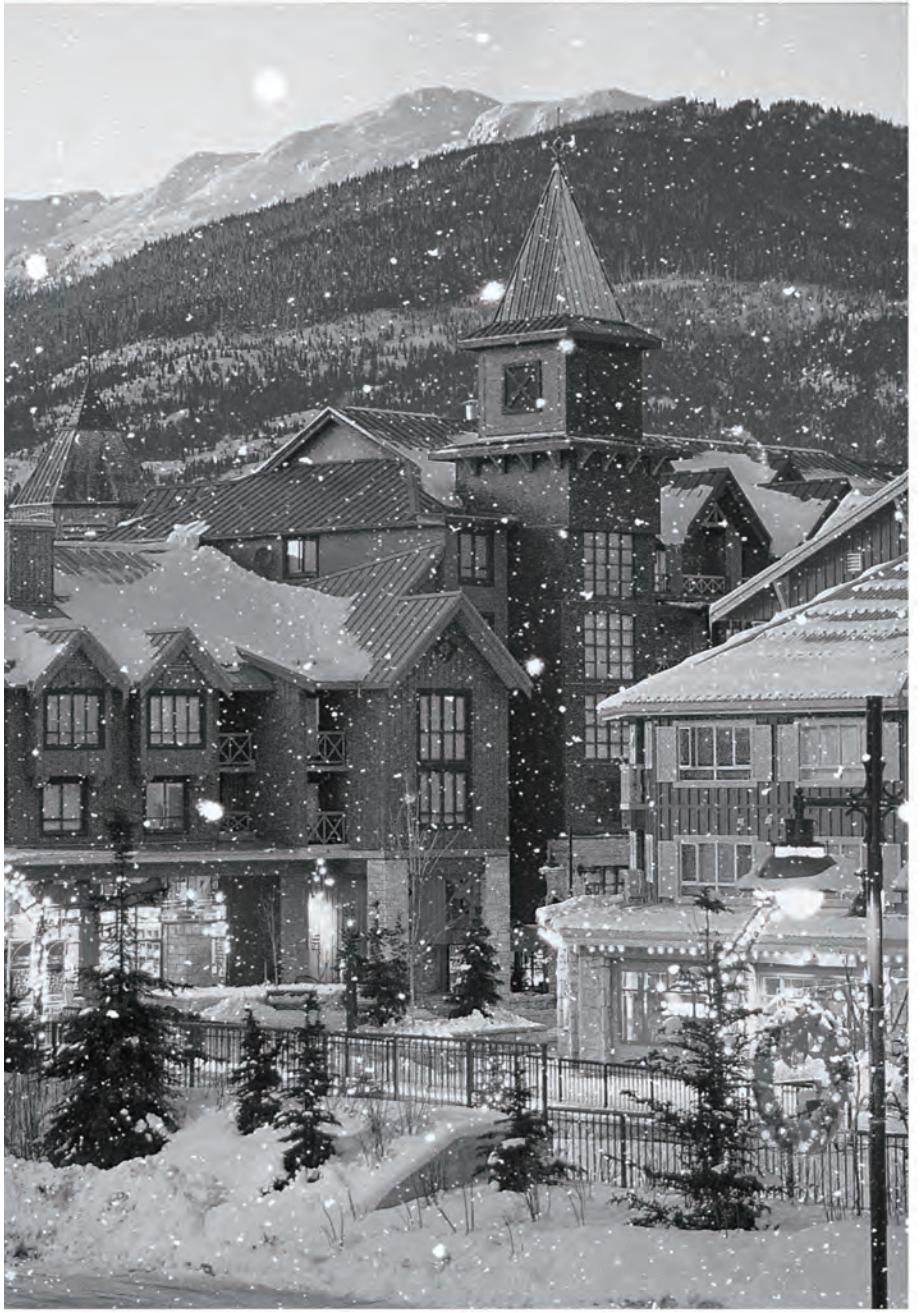


Table of Contents

Chapter 1 – Inspiration ____ 1
- Understanding Client Vision
- Project Story and Inspiration
- Pine Flower Village—Identity Elements
- Design Inspired by Nature

Chapter 2 – Analysis and Framework ____ 7
- Site Photos
- Existing Conditions Map
- Analysis Diagrams
- Precedent Imagery

Chapter 3 – Schematic Design ____ 22
- Illustrative Site Plan
- Site Circulation and Fire Access Diagram
- Site Materials Plan
- Site Lighting PlanSite
- Furnishing Plan
- Enlargement Plans
- Materials Palette
- Grading and Drainage Plan
- Perspectives
- Illustrative Elevations and Sections
- Sketch Details
- Planting Plan
- Plant Palette

Chapter 4 - Preliminary Project Descriptions ____ 48

Site Survey/Existing Conditions Plan

Objective

The Site Survey/Existing Conditions Plan accurately and comprehensively defines existing site conditions as a basis for determining site development proposals and associated costs.

General Recommendations

It should be completed by a licensed professional surveyor or engineer.

It should be procured through a formal process of obtaining required survey components, as per the list that follows.

Verify and review the survey for accuracy and completeness.

Specific Recommendations

The Site Survey shall include, but is not limited to, the following administrative and legal information, as applicable to project circumstances. Physical survey requirements follow in separate lists by category.

- Administrative/General
- Project Name, Project Number, Client Name
- Date Survey Completed (initial and revisions)
- Scale, Written and Graphic
- Legend
- North Arrow (true and magnetic)
- Statement of Survey Techniques Used and Surveyor Certification
- Legal
- Bench Marks and Control Points (location and description)
- Property Markers (location and description)
- Property Boundaries (including metes and bounds data); property boundary data should be verified for closure)
- Easements, (for example, utility and access)
- Street Rights of Way (including street names).
- Neighboring Property Lines, Owners, Occupancies and Structures

The site survey should be used to summarize the site stormwater runoff and infiltration conditions as a baseline for developing and evaluating development proposals. Cover types should be defined on the survey, including impervious and porous surfaces. Proposed development should not result in runoff rates that exceed those on existing site conditions. In cases where existing site conditions are heavily covered with impervious surfaces, it may be desirable to improve the overall infiltration rate of the site with proposed development.

Topography, Water, and Drainage

Datum for elevations, including local datum and U.S.G.S. reference.

Topographic contours 1'-0" interval Imperial, 0.25 meter metric, preferred.

Spot elevations, as specifically requested by landscape architect, for example, building finished floor elevations, roads, parking lots and curbs, major paved areas, utilities, drainage structures, tops and bottoms of stairs, tops of walls, and adjacent finish grades and elevations at base of tree trunks, per notes that follow.

Flood prone areas and flood hazard zones, using the National Flood Insurance Program Database, for example, 100' floodplain, wetlands, wave runout zones, and so on.

Water bodies, water course and drainage features, for example, oceans, lakes, ponds, canals, creeks, rivers, and so forth. Include typical and high-water level for water courses.

Culverts type, size, length, and elevations.

Storm sewer inlets rim and invert elevations.

Components and Materials

Description of natural ground surfaces (grass, rocky, sandy, clayey, marshy, filled, etc.). Include location and extent of exposed bedrock and areas where shallow soil depths cover bedrock.

Soil borings, locations and numbers.

Note: Soils data are not normally included as part of the site survey. Soils information is important to the landscape architect in order to understand the soil's structural capabilities and stormwater runoff and infiltration rates. Runoff and infiltration rates will also be affected by the type of cover on the site, for example, vegetative or hardscape. A soils analysis should be obtained separate from the survey.

Buildings and structures, including identification of type, size, primary materials, number of stories, building overhangs and subgrade conditions, including those that project beyond the primary floorplate.

Location and description of **paved surfaces** (cast-in-place concrete, asphalt, pavers, etc.).

Include streets, curbs, driveways, and sidewalks, with material descriptions for each.

Site stairs, including indications of handrails.

Walls, both freestanding and retaining, including material description.

Fences, including material description and gates.

Underground features, including current and abandoned foundations, vaults, basements or structures, tunnels, and tanks.

Any **other pertinent physical characteristics** of the property (include nearby facilities that may be affected by proposed construction).

Utilities

Underground utilities, including identification of utility type, material, size, elevations (rim and invert), and flow direction.

Private utilities (include cisterns, septic tanks or fields, etc.)

Power, telephone and CATV poles and lines, overhead and underground.

Fire hydrants and stand pipes.

Valves and meters, including backflow preventers.

Wells, including depth.

Manholes, including rim and invert elevations and other utility appurtances including boxes, pipes, plates, and the like.

Existing Plants: Trees, Shrubs, and Groundcovers

Trees and other plants must be properly inventoried in order to create a successful Plant Protection Plan. The survey drawing serves as the base for the plant protection plan.

The survey base should include the following information:

All existing tree **trunk locations**, with tree trunks scaled proportionately to actual size, for trees with caliper 1½" and greater.

Identification of **ground elevation** on upper slope side of each tree trunk.

All existing tree **canopies** shown to actual drip line, with simple circle, potentially eccentric to reflect actual crown position.

All existing trees identified by **caliper and species**, indicated at tree trunk on plan. Identification of tree species for each tree, in common and botanical terms, for example, "12" Caliper Lodge Pole Pine, *Pinus contorta* is preferred but 12" caliper pine should be provided at a minimum

Caliper and species descriptions may not be necessary for large forested areas generally removed from work areas.

General **state of health**, for example, poor, fair, good or excellent (in accordance with *Reference Guide for Plant Appraisal, Eighth Edition*, copyright 1993 by the International Society for Arboriculture for determining tree health). Stressed trees in poor health, with dead wood, major bark damage, wilting leaves, or lean crowns may need to be removed, even if they are not susceptible to construction impacts.

Shrub massing, including identification of species with common and botanical names.

Groundcover massing, including identification of species with common and botanical names.

Graphic Requirements

The landscape architect should use the surveyor's printed (and stamped) existing conditions survey as the baseline document, with no graphic revisions by the landscape architect. The surveyor should provide an official signed and stamped copy and an electronic version in .pdf format. This drawing will be incorporated into the SD package as a reference plan and serve as the base for plan sheets. Alternatively the landscape architect may desire to control in-house printing or change the drawing orientation or scale. In this case the landscape architect should obtain the surveyor's .ctb file (pen settings for plotting) in order to precisely match the graphic qualities of the surveyor's hard copy.

Best Practices

Design

As an existing conditions map prepared by others, no alterations should be made to the survey by the design team. For legal reasons, the survey should remain an unaltered document produced by the licensed professional surveyor or engineer.

Coordination

Collaborate with other design team members, especially the civil engineer and architect, to review and verify survey for accuracy and comprehensiveness. A thorough site visit should be conducted to check the survey for completeness.

Technical

The landscape architect should request both a signed and stamped hard copy as well as digital copies in both .pdf and .dwg format. The surveyor should also provide a .ctb file so the design team may match line weights and line weight hierarchy in the landscape architectural documents.

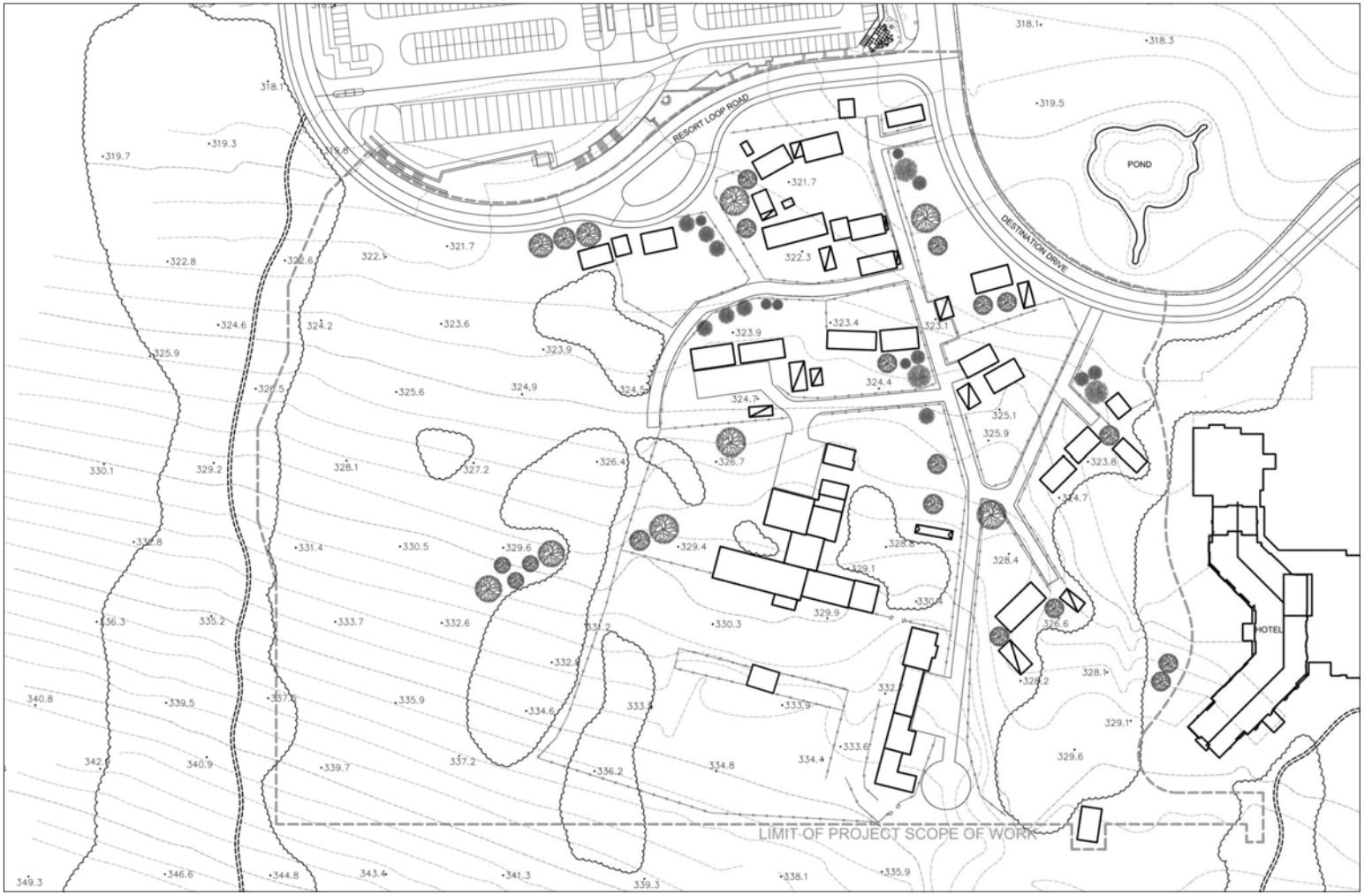
X-Referencing: At the Schematic Design phase, all plans should largely be constructed as part of automated CAD processes through use of external referencing (X-Ref'ing) tools. X-Ref'ing allows a reference drawing to be linked (referenced) to another drawing, so that changes to the referenced drawing will be reflected in other drawings. The Site Survey will be a consistently referenced drawing, across most plans.

Note that the use of external referencing is used throughout the document set to allow all plans to be updated via automated processes, from a single "referenced" plan.

Strategies

Accuracy level of the survey may vary with the type of site, for example, an urban plaza may require extensively detailed spot elevations whereas an open field may simply require contours.

Example of SD Existing Conditions



Context Framework

Objective

When projects are well integrated contextually, they can be transformative, rather than merely additive. The SD Context Framework defines key issues, influences and opportunities associated with the project site within its broad context.

General Recommendations

Contextual conditions may be defined physically, visually, economically, demographically, statistically, or even perceptually. The more comprehensively context is understood, the more likely the design proposal will be meaningful, responsive, and even adaptive to that environment.

The Context Framework should not simply inventory existing conditions, but more importantly should represent analytical conclusions regarding relationships to off-site conditions.

The landscape architect should determine how contextual conditions and proposed site development may benefit one another. For example, open space systems benefit from connectivity; storm drainage systems call for integration; and micro-climate conditions such as wind and ventilation can be improved via studied off-site relationships.

It is also useful to determine perimeter assets and liabilities, as these influences may affect the positioning of proposed uses. Typical asset conditions include access, visibility, and beneficial land use relationships. Liabilities may include undesirable views, incompatible uses and adverse environmental conditions.

Specific conditions that affect the pursuit of project objectives may be emphasized or studied in greater detail. For example, an interest in nurturing wildlife habitat would be best informed by a detailed study of habitats and habitat corridors that extend well beyond the site limits. This type of study usually requires a wildlife expert who may collect on-site data to reveal detailed conditions and the potential presence of wildlife species.

Specific Recommendations

Key land use relationships and the potential implications on program positioning for the proposed development.

Multimodal circulation patterns that may influence site planning or design, including access opportunities that may enhance broader circulation patterns within the site vicinity. Traffic volumes may be included to define relative street hierarchy.

Relationships to off-site drainage patterns, and water bodies, including hydrological conditions, in order to understand opportunities for effective stormwater management and water-quality enhancement measures. Position the role of the development site in its watershed context.

Regional or community open space systems, with potential connections to proposed open spaces or other destinations.

Neighborhood conditions, such as centers, edges, and key program elements.

Transit connections, for example, train and bus stops, and bicycle paths, including routes to these locations.

Character influences, for example, regional or local architectural vernacular, landscape, or street character.

Historic context, including any noteworthy historic events, artifacts, or sites, including districts.

Off-site sight-line relationships, for example, views to landmarks or panoramas, or desirable views to on-site features from off-site locations.

Landscape systems, including areas which extend across the site, or which exist only beyond the site limits, for example, wooded areas, grasslands, wetlands, and other native or domestic landscapes.

Regional materials, especially those with immediate contextual presence, such as naturally occurring stone, masonry, wood, or landscape.

Micro-climatic conditions, especially those with off-site relationships, including wind patterns, sun, and shade.

Infrastructural context, including adjoining utilities.

Ecological systems, including soils, vegetation, fire danger, wildlife, and habitat, to understand relationships to sensitive areas that may need to be avoided, preserved, or mitigated.

Graphic Recommendations

An **aerial photo or existing conditions survey base** works best to depict actual ground conditions, and offers the most constructive data set for conducting a context analysis.

This diagram works best when readily understood, so **at-a-glance legibility** is important. Symbols should be developed that logically and intuitively represent intent. For example, it should

- Include a **hierarchical depiction**, diagrammatically organized to focus attention on the most important issues.
- Be **color-coded**, to distinguish unrelated systems and group related systems.
- Be **scaled** to extend to the limits of systems that impact the site design, for example, contiguous watershed limits, adjoining neighborhood facilities, or a park system.

Best Practices

Design

The Context Framework can be used to frame the key challenges or dilemmas associated with the broad project mission. Very few projects function in isolation, without contextual influences and impacts.

Coordination

Work with local municipal agencies to incorporate applicable conditions and intentions from neighborhood plans, specific plans and zoning documents.

Collaborate with allied disciplines to define specialized contextual conditions, for example, environmental systems, hydrological conditions, wildlife habitat and demographic conditions.

Technical

Consider the role of Geographical Information Systems (GIS) in assembling contextual data.

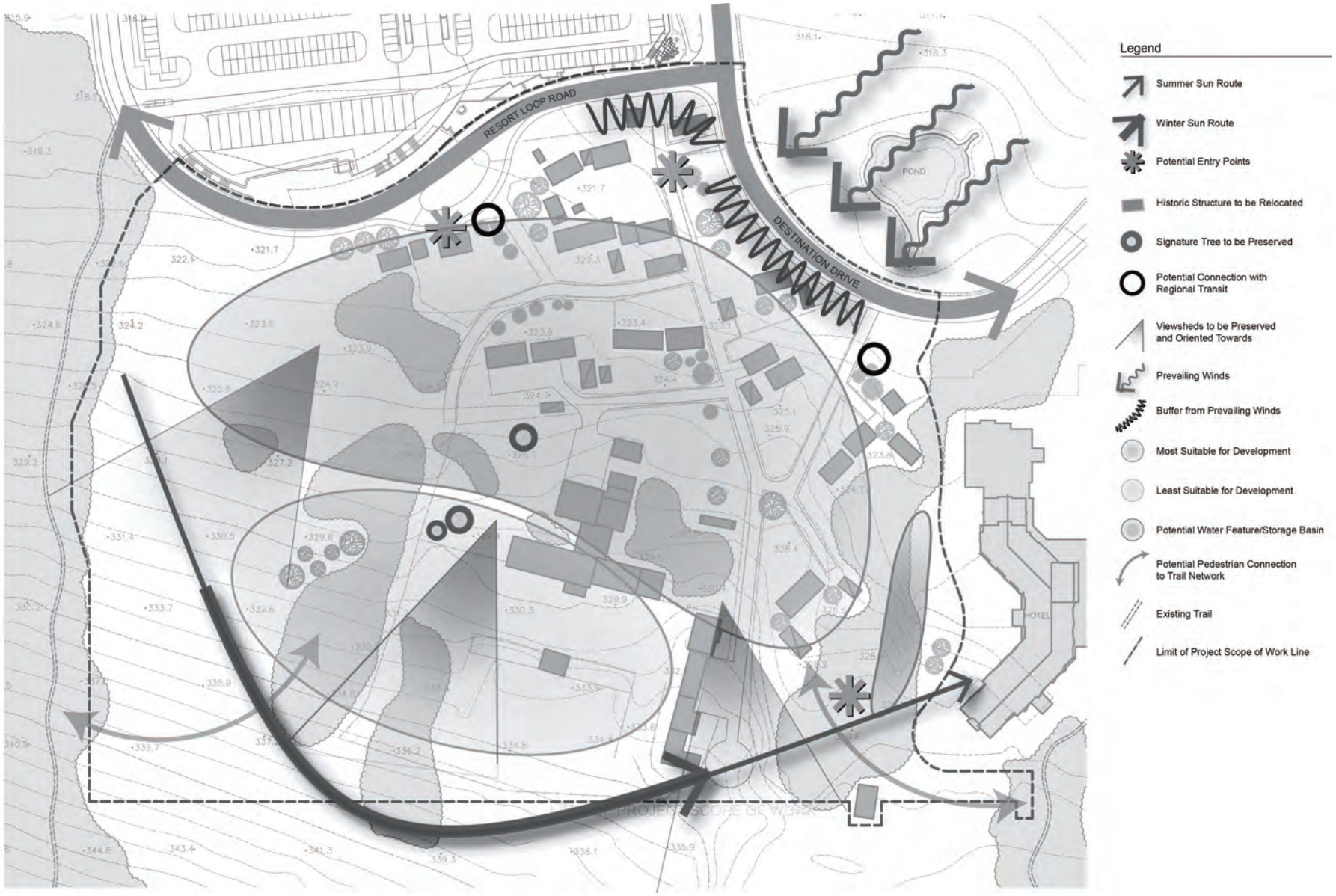
Strategies

The landscape architect should capture a holistic perspective when analyzing the site. Multiple site visits across seasons throughout the year should be conducted to allow a comprehensive and accurate perspective on the site ecology and other systems, for example, climate, wildlife, vegetation, and hydrology.

Consult with the client to understand the various means by which the site is accessed, used and maintained.

Collaborate with the interdisciplinary design team members to ensure that hydrology, soils, utilities, and infrastructure are well understood and opportunities for innovation and sustainability are maximized.

Example of an SD Context Framework Plan



Sustainable Design

Objective

The sustainable design process was described in detail in Chapter 10, Preliminary Design within Pre-Design. The intent of this process in Schematic Design is to further develop this content. Documentation of sustainable design in this phase should be concise and summary-oriented to highlight key objectives, intent, and measurable actions.

Key elements to include from the sustainable design process include:

- Dilemma and thesis
- Client's critical success factors
- Design principles for the sustainable design topics—art, community, environment, and economics
- Metric goals

Dilemma and Thesis

As the design is tested and progresses toward a preferred alternative, the site and its context continue to influence the proposed solution. Rapid cycling of these alternatives should both challenge and confirm statements of problem and intent, in the dilemma and thesis.

Critical Success Factors

Upon completion of Conceptual Design, the client may decide that certain intentions may be reconsidered or adjusted based upon new influences or analyses. During Schematic Design, it is important to reconfirm client goals and what defines project success. These affirmations should be revisited, restated and better understood at the Schematic Design phase.

Design Principles

Design principles and precedents developed during Conceptual Design should continue to evolve through the preliminary design process but especially in Schematic Design as the design solutions are tested against the site conditions and alternative opportunities are explored.

Those frameworks defined preliminarily in Pre-Design for key sustainable design topics (art, community, environment, and economics) should be more definitively understood in this phase. More extensive research should be used to test design alternatives. More rigorous collaboration and coordination with team consultants should also be conducted, together with a more thorough understanding of the site and its context.

Performance Metrics

By the completion of Schematic Design, sustainable design metrics should be clearly defined to support the proposed design solution(s). Performance criteria should be adequately studied to set baseline and benchmark requirements for a comprehensive project evaluation. These will be the measures by which the project will be defined, as "what gets measured, gets done."

The established metrics should be used to address and advance the SMART goals initially outlined with the client for the project.

Best Practices

Refer to the Chapter 10 discussion of the sustainable design process.

Example of Sustainable Design Process

Dilemma

The Songhua Lake Phase I Village is one of the key revenue generators of Songhua Lake International resort. The client group would like to provide the visitors with an authentic North American resort town experience. The design must refl ect this with a nod to the successful resorts in Vail, Beaver Creek, Whistler, etc.

Thesis

To achieve the client's vision, the project team will utilize Design Workshop's forty-plus years of experience in mountain resorts to create an authentic and inspired North America-style landscape design. At the same time, site culture, local natural elements (including plants) will add uniqueness and identity to the site, making it a memorable place for visitors.

Songhua Lake Village will distinguish itself from other resort developments in China based on how it treats the existing landscape and natural systems. The natural attributes of the site will inform the design approach for outdoor activities, material selection, water treatment techniques, planting styles, and site details. The end result will be a China mountain resort landscape design known for: an integration of systems; sustainable energy-effi cient operations of the site; cutting-edge design and aesthetics of the built environment; and comfort and quality of life for visitors and residents alike due to a mix of amenities, various uses and the creation of places that connect people to each other, to nature and to a more healthful life.

Critical Success Factors

- Embody a world-class, authentic North American-style mountain resort village to attract required market share.
- Meet local EVA requirements.
- Solve essential grading challenges and provide an effective drainage system that protects the real estate investment.
- Integrate slip-proof details and be ADA compliant to be accessible to all.
- Establish a four season resort that maximizes year-round revenue.
- Protect sensitive natural conditions, including ecological habitats and night-sky conditions.

Design Principles

COMMUNITY

- Community opens space is most functional, enjoyable and accessible when connected to local and regional systems.
- Community is nurtured when public spaces are organized and programmed to engage diverse users.
- Community-based environmental stewardship is nurtured when the community is exposed to and understands good environmental practices.

ENVIRONMENT

- Preservation of existing natural drainage systems reduces infrastructure costs.
- Use of sustainable water management systems can enhance flood control and water quality.
- Use of native plants results in hardier and more maintainable landscapes.
- Use and reuse of local materials establishes a local vernacular, benefits the local economy and reduces consumption.

ECONOMICS

- Most strategic economic decisions assimilate initial capital costs with long-term life-cycle costs.
- A broad range of aff ordable venues accommodate broader crosssection of the community..
- Flexible outdoor spaces that accommodate diverse events and activities are more likely to be embraced by visitors, establishing economic development benefits.

ART

- Outdoor spaces are most meaningful when they are beautiful and enjoyable across four seasons.
- A singular and cohesive identity establishes a memorable place for visitors.
- A strong relationship between site and building design, with both influenced by nature and vernacular elements, establishes the most cohesive aesthetic and sense of place.
- When arts are integral with the identity of a place, the spirit is lifted.

Illustrative Site Plan

Objective

The Schematic Design Illustrative Site Plan expresses site design intent in a vivid and compelling fashion, emphasizing key features and characteristics, to both promote and evaluate the proposal.

General Recommendations

At its most fundamental level, the Schematic Site Plan defines how site conditions and project requirements result in the most feasible design solution. The plan is much more than a pretty picture and should be rigorously derived from research, analysis, alternatives evaluation, and multidisciplinary collaboration.

Ultimately, Schematic landscape architectural design culminates with the Illustrative Site Plan. Here, the collaborating landscape architect highlights ambitious design intent, addressing aesthetic, environmental, social, and economic strategies. Of the various Schematic Design documents, this plan most comprehensively exemplifies these intentions.

The plan is developed with broad responsibility. Contextual conditions and intended relationships to these conditions are identified. A complete, rather than selectively depicted multidisciplinary program should be communicated. The intended physical character of the development should be illustrated, as part of an overall strategy for visual and physical quality. And, no less importantly, the mood and spirit of the place should be conveyed.

These intentions should be well coordinated with perspective and sectional drawings and schematic or sketch detail development.

Specific Recommendations

Existing Conditions

Contextual conditions*,* including adjoining sites, streets, districts, and natural systems.

Existing site conditions to remain, including buildings, utilities, pavements, walls, plants, and other elements.

Existing topography, illustrated as part of the Survey Base Plan.

Existing circulation and use patterns, strategically illustrated with enlightening graphic means, for example, higher automobile densities on high volume streets.

Site Systems

Primary and subsidiary spaces, including role or function.

Complete site and landscape architecture program, including social, recreational, sports and other use areas.

Building service areas, including delivery, waste, and major utilities.

Softscape and hardscape areas, distinguished graphically.

***Primary proposed plantings**, at a minimum showing tree massing.

***Pedestrian circulation network**, including any hierarchical definition.

***Generic indication of materials**, for example, stone, concrete, or defined simply as pavement or pavers.

Art program, including two-dimensional, three-dimensional, narrative, and auditory elements.

*See "Diagrammatic Overlay" requirements below.

Interdisciplinary Systems and Elements

Proposed buildings and architectural structures, including exterior elements such as columns, roof overhangs, and elements requiring site relationships, for example, doors and service areas.

***Automobile circulation network and parking areas**, including subgrade conditions.

Primary environmental systems, for example, sustainable water management, habitat preservation areas, and steep-slope preservation areas.

Major above-grade utilities, for example, electrical substations and waste-water treatment facilities.

**See "Diagrammatic Overlay" requirements below.*

Supporting Information

Solar conditions, accurately depicted, for example, shade, at a strategic date and time.

Annotation, identifying listed elements.

Diagrammatic Overlays to Highlight Key Systems

In order to more clearly communicate key schematic landscape systems, a series of diagrams may be developed to highlight these intentions. The Illustrative Site Plan may be used as a base plan for these drawings. The base site plan may be graphically muted to allow overlay systems to read, for example, with color.

Note that in some cases a more rigorous definition of these systems may be required, for example, to suit municipal requirements or a need to advance and expedite project definition to meet schedule, costing, or other needs.

SCHEMATIC GRADING

- Primary level changes indicated with approximate spot elevations
- Key high and low point elevations, including any detention, retention, or infiltration areas
- Primary slope directions, indicated with arrows

CIRCULATION SYSTEMS

- Public transportation systems
- Auto circulation
- Service circulation
- Pedestrian circulation
- Bicycle circulation
- Handicap accessibility routes

SCHEMATIC PLANTING SYSTEMS

- Existing plant areas to be protected
- Distinctions between major plant types, for example, deciduous trees, evergreen trees, shrub massing, ground-cover massing
- Unique or special plant intentions, for example, seasonal attributes, specimen or feature plants, transplants
- Specialized planting conditions, for example, tree trenches, over-structure planting or pots

MATERIAL SYSTEMS

- Primary pavement systems
- Primary wall types
- Primary lighting elements

Graphic Recommendations

Rendered site plan, in color, depicting proposed site improvements. Adjacent site conditions may also be rendered, if necessary, but may be screened so project scope of work area is clearly prominent. Rendering techniques may include markers, colored pencils, paintings, watercolors, chalk, computer generated, or a combination of these media.

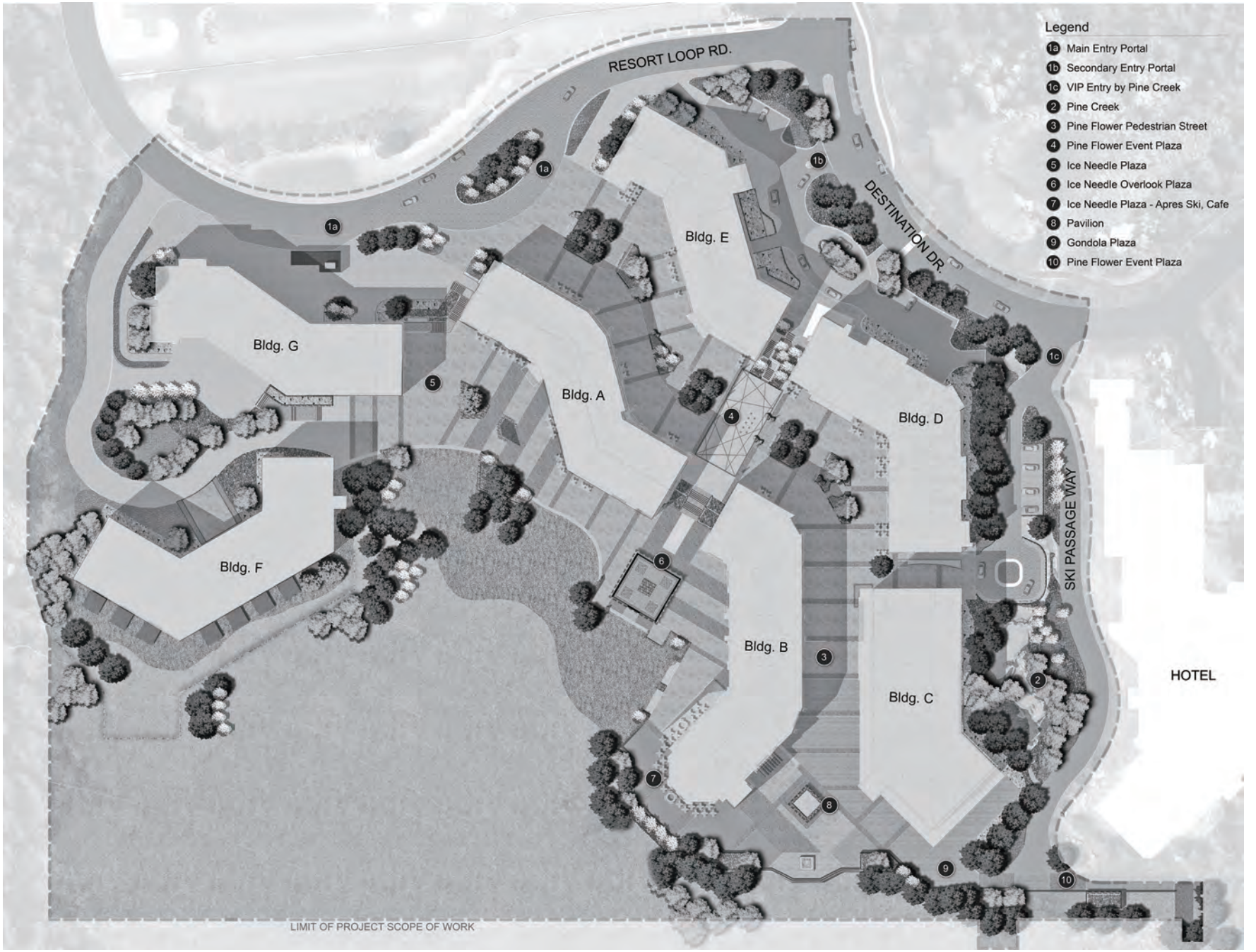
Shadows projected from three-dimensional elements, in black, gray, or other dark tone, to provide three-dimensionality and depth to the drawing. Note that black shadows may obscure content below, and consequently with certain types and scales of drawings, black may be undesirable for shadows.

Existing conditions and proposed improvement linework, in black and white, screened to the level necessary to ensure clear definition of elements in the drawing. Linework should not be the dominate feature in the drawing.

Existing and proposed contours, in a screened tone, to convey the topographic characteristics of the site. Proposed contours may read more dominantly than existing contours.

Limit of project scope of work line, in a light-gray tone, to define the extent of the project area. Limit lines allow the client to confirm the scope of the project and understand contextual relationships.

Example of an SD Illustrative Site Plan



Legend

CORE COMPONENTS (if Applicable)

SITE SYSTEMS

- Contextual Conditions
- Existing Site Conditions
- Primary and Subsidiary Spaces
- Site and Landscape Architecture Program
- Building Service Areas
- Softscape and Hardscape Areas
- Primary Proposed Plantings
- Circulation Networks
- Generic Indication of Materials
- Art Program

INTERDISCPLINARY SYSTEMS AND ELEMENTS

- Proposed Buildings and Architectural Structures
- Auto Circulation Network
- Primary Environmental Systems
- Major Above-Grade Utilities and Utility Structures

◀SD Illustrative Site Plan

Site Protection and Removal Plan

Objective

The SD Site Protection and Removal Plan defines preliminary intentions for protection and removal of existing conditions, including primary tree and shrub areas, as these intentions support broader design objectives.

General Requirements

The SD Site Protection and Removal Plan reflects the landscape architect's initial understanding of existing conditions, both in terms of their inherent value, and the relationship of those conditions to the emerging design.

The SD plan identifies areas to be protected or removed and disposed of, recycled, salvaged, reused, and/or transplanted based upon current design intentions.

Recommendations

Use a **survey base sheet** to show all existing conditions, including above- and below-grade structures, pavements, plants, topography, utilities, monuments, benchmarks or other reference datum, and all legal conditions and restrictions, such as property-line bearings and distances, recorded easements, zoning setbacks, deed restrictions, adjacent property owners, and zoning districts if relevant to the project layout.

Trees and plants must be properly inventoried in order to create a successful Plant Protection and Removal Plan. The survey drawing serves as the base for the Plant Protection and Removal Plan. The survey base should include all existing trees and plants.

Preliminary Reference Notes to supplement graphic instruction if required or where further annotation is necessary to describe Schematic Design intent. The SD Site Protection and Removal Plan may utilize a set of initial *Reference Notes* that communicate primary, rather than exhaustively annotated intent. Note that Schematic Design *Reference Notes* are instructions that may be further developed at the Design Development phase.

An example of SD Site Protection and Removal *Reference Notes* follow (see the generic description of Reference Notes in Section Three: Guidelines and Best Practices, Keynoting and Reference Noting System). Note that these are sample notes and do not represent a comprehensive list. They address key topics.

1. Protect all plants in this area.
2. Remove all plants in this area.
3. Remove individual tree.
4. Transplant specimen tree.
5. Remove and dispose of designated pavement area.
6. Protect existing pavement(s) during construction.
7. Existing element (project specific—landscape architect to identify element) to be carefully removed and salvaged for reuse in project.
8. Existing element (project specific—landscape architect to identify element) to remain.

Graphic definition of individual trees and plants to be protected and left undisturbed.

Tree and plant massing areas to be protected and left undisturbed.

Trees and plants that are to be removed.

Graphic definition of all structures, pavements, utilities, and other items to be protected, or demolished and removed.

Symbols legend illustrating graphic symbols used on the plan to identify site elements to be removed, or saved and protected, and buildings to be removed or retained (see Graphic Requirements in the next section).

Limit of project scope of work line, defining boundaries of proposed scope of work, if able to define at this stage.

Graphic Requirements

Survey base sheet, utilized to show all existing conditions, including above- and below-grade structures, pavements, plants, topography, utilities, restrictions, monuments, benchmarks, or other reference datum. Do not modify base sheet to change or obscure content.

Existing conditions, if desired, may be screened back maximum 50 percent as original unaltered survey, in order to better highlight demolition requirements. The landscape architect may also elect to incorporate existing conditions at full value, if that better serves graphic objectives.

Symbols overlaid on the unaltered survey, used to represent existing elements, trees, and other plants to be protected, removed, or transplanted, shall be as specifically noted below:

> **Trees and plants to be saved and protected**, designated without any additional graphic overlay to surveyed tree trunk symbol. Maintain a graphically unaltered survey tree symbol to indicate that the tree is to remain. Indicate protection areas with a Reference Note as necessary.
>
> **Individual trees and tree massing to be removed**, designated with cross-hatching or other hatch symbol. Include a Reference Note indicating intent to remove and dispose.
>
> Existing **components to remain** in an area, in their entirety, represented without graphic symbol overlay and reference noted, to indicate their protection.
>
> Existing **components to be removed and disposed of** in an area, in their entirety, overlaid with diagonal crosshatch and reference noted, to indicate removal and disposal. All existing conditions screened back per landscape architect's CAD standards as original unaltered survey.
>
> Individual **components to be removed and disposed of,** for example, flagpole, overlaid with an "X," centered on the component.

Best Practices

Refer to *Design Development Plant Protection and Removal Plan Best Practices and Site Demolition Plan Best Practices* for a more extensive description of best practices.

Design

Align site protection and removal decisions with the mission and objectives of the project. This should be an initial overview of protection and removal requirements, rather than exhaustive documentation.

Coordination

Field Review

Define plant protection and removal intentions based upon an intimate understanding of field conditions, including plant quality and health. Coordinate this analysis with horticulturalists and foresters.

Subgrade Utilities

Site protection and removal should correlate with an accurate survey depiction of all existing site conditions. However, a detailed description of protection and removal of subgrade conditions and utility infrastructure is typically not required at this phase. Should the project require this level of technical documentation at the Schematic Design phase, the landscape architect should collaborate with applicable subconsultants to complete the necessary documentation.

Technical

Plant Protection

Consider that grading impacts to trees and plants are often the key factor in their survival. Minimize grading within the drip line of trees to be protected.

Site Demolition

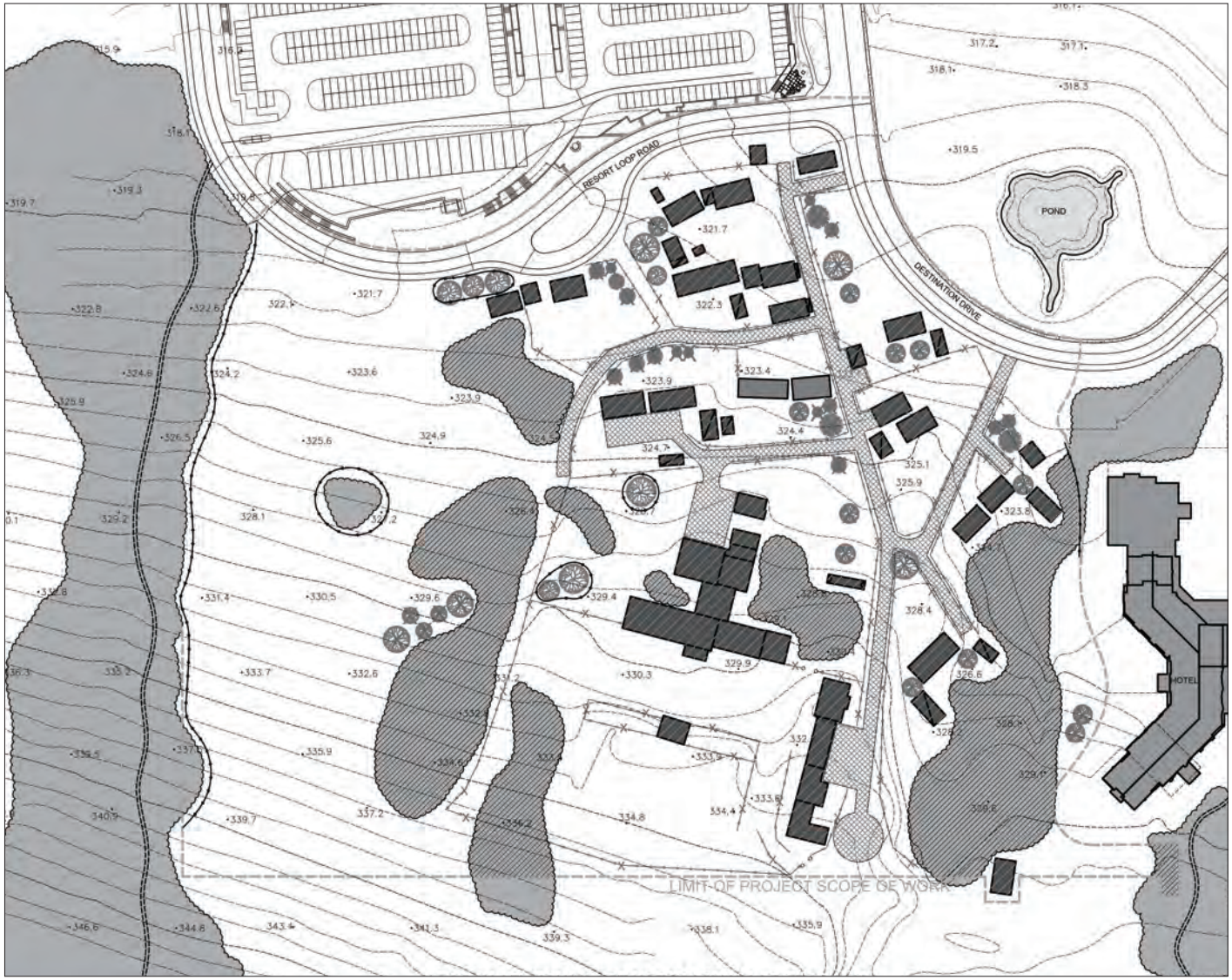
Ensure that proposed demolition work does not adversely impact those existing plants indicated to remain. Consider the extent of removal by demolition contractor and the process by which they will conduct demolition.

Strategies

Survey Fit

Well-executed landscape architectural documentation relies upon a high-quality existing conditions survey. While it is essential that the site survey be complete and accurate, survey content and detail level should generally match the level of information required to design and implement the specific project type. A small residential garden may require a less detailed survey than a complex urban corridor revitalization.

Example of an SD Site Protection and Removal Plan



Legend

- Evergreen Tree to be Removed
- Deciduous Tree to be Removed
- Tree and Plant Massing Protection Fencing
- Existing Fence to be Removed
- Plant Massing Area to be Removed
- Existing Road to be Removed
- Existing Building to be Removed
- Existing Historic Building to be Salvaged and Relocated Off-Site

CORE COMPONENTS

- Base Sheet (survey, aerial, or a combination of both)
- Limit of Work (if able to define)
- Trees and Plants (Individual and Massings) to Be Protected
- Trees and Plants (Individual and Massings) to Be Removed
- Hardscape Elements (paving, buildings, wall, fences, structures, etc.) to Be Removed
- Plant Protection and Removal Legend

Site Materials Plan

Objective

The Schematic Design Site Materials Plan overviews the site hardscape design program, with the use of well-considered symbols and detail Keynotes.

General Requirements

The SD Site Materials Plan portrays the full landscape architectural work scope including potential references to preliminary or sketch details. The plan should comprehensively illustrate all improvements, in order to conduct pricing, coordination and detailed documentation. The plan identifies all materials, components, systems and finish selections proposed on the project, and therefore plays an integral role in the development of preliminary project descriptions.

A fully developed symbols and pattern system is organized to define the proposed program, but also provide illustrative rendering detail in order to convey intent. The plan graphically illustrates all proposed landscape architecture work, and for reference and coordination, also shows primary interdisciplinary elements, drawn accurately and to scale. Preliminary interdisciplinary collaboration is an essential component of the Schematic Design phase, and the Site Materials Plan plays an important role in that effort.

An important purpose of the plan is to guide the reviewer to associated documentation and establish the foundation for more technical DD and CD phases. A well-organized annotation system will begin to do this.

Recommendations

Survey base sheet to show all existing conditions to remain, including above-and below-grade elements.

Graphic definition of all **landscape architectural improvements** such as pavements, walls, fences, steps, railings, curbs, drainage structures, signs, mounted furnishings, fixtures, planters and pots, site structures, and elements, per the graphic requirements listed here.

Graphic definition of all **non-landscape architectural improvements** that occupy the site.

Site lighting components, with plan symbols and detail keynote references.

Site furnishings, with plan symbols and detail keynote references.

Planting areas, as defined below under *Graphic Requirements.*

*Preliminary **Detail Keynote List**, with references to all proposed details, components and systems.

*Initial **Detail References**, including Section References, Elevation References and Plan Enlargement References.

*These elements are not always developed for the Schematic Design Site Materials Plan. Under certain circumstances, the project may require that they be developed at the SD phase. In some cases, annotation, labels or legends may substitute for Detail Keynotes and Detail References. However, Detail Keynotes and Detail References are preferred in developing the most complete Schematic Design documents.

Preliminary **Limit of project scope of work line**, defining boundaries of proposed scope of work, if able to define at this stage.

Graphic Requirements

Survey base sheet, utilized to show all existing conditions.

Existing conditions, if desired may be screened back maximum 50 percent as original unaltered survey, in order to better highlight proposed requirements.

Consultant improvements, screened or full bleed, depending upon importance of relationship to landscape architecture improvements.

Ground-plane (on-grade) structures distinguished from above- or below-grade components.

Below-grade components (utilities, subgrade structures, etc.) shown with screened dash; on-grade components shown with full-tone solid line; above-grade components (building overhangs, trellises, etc.) shown with full-tone dash. Include delineation of all subgrade architecture and overhanging floors and roof lines.

Symbols and patterns, used on the Site Materials Plan to distinguish and define the limits of materials and components and to evaluate proposed design solutions.

Plan hatch and pattern symbols should precisely match scale of hatch and pattern on symbols legend.

Labels, used only to identify major project spaces, features, buildings, roads or streets, and water bodies.

Building footprint, graphically portrayed to reflect specific project needs. In most cases the building will be shown simplified, with perimeter walls only, in order to place graphic emphasis on landscape architectural improvements.

Pavement materials, distinguished with pattern symbols, including finish distinctions within same material, for example, broomed versus sandblasted concrete.

Pavement jointing patterns shown accurately and to scale, unless size of paving unit is too small to be read at plan scale.

Curb and ramp types, distinguished with symbols and annotation or Keynotes.

Wall types, distinguished with different symbols and annotation or Keynotes, for example, cast-in-place concrete wall with pre-cast cap, and stone veneer wall with stone cap.

Handrails and guardrails, drawn accurately, for example, top and bottom extension at stairs, distance from face of wall.

Site furnishings, depicted with readily identifiable symbol, shown to scale and precisely matching symbols legend.

Planting areas if necessary, shown for reference and coordination purposes and defined generically with a consistent hatch or other symbol. Screen back at least 50%.

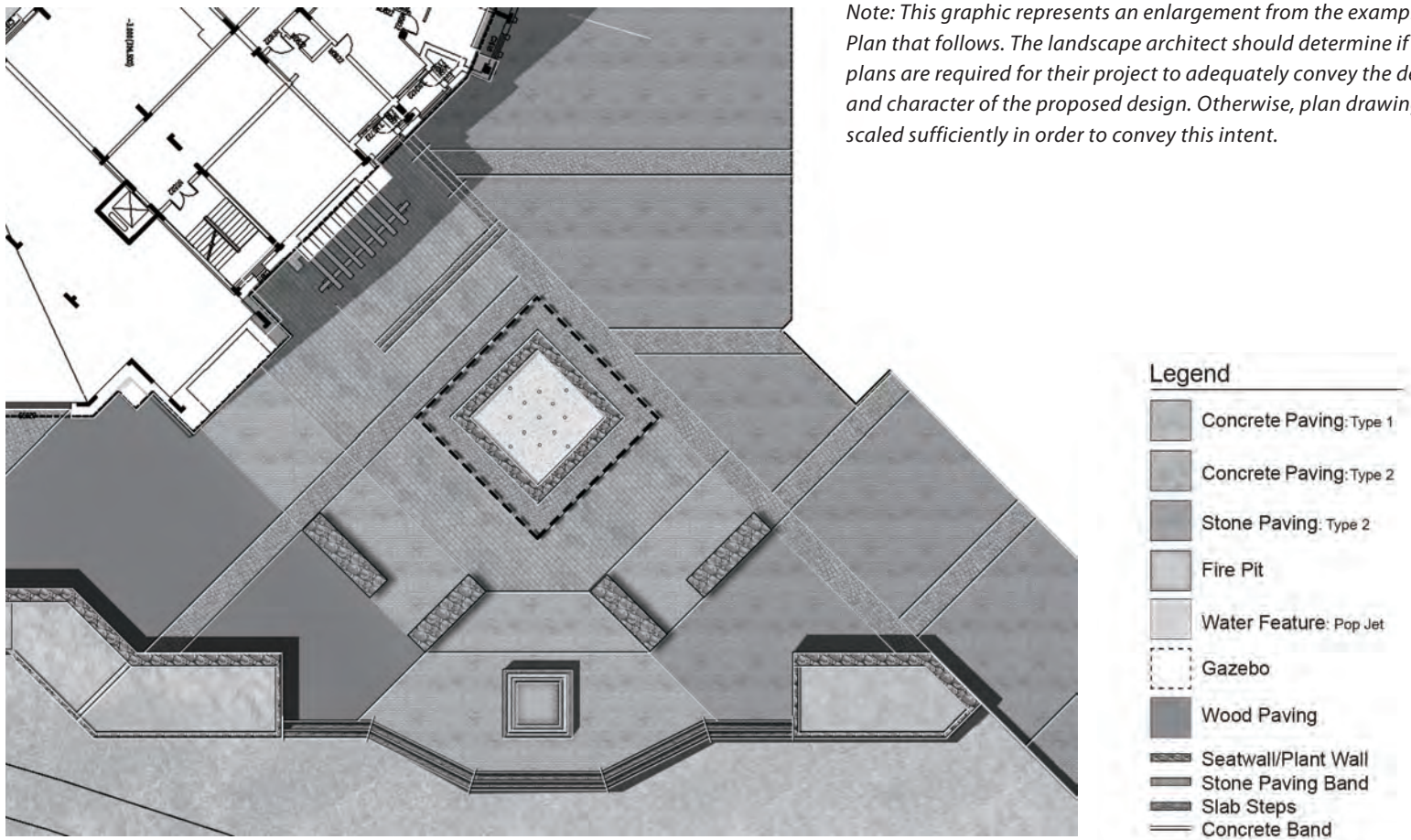
Limit of project scope of work line, defining boundaries of proposed scope of work, if able to define at this stage.

Master detail keynote list, located to right of plan, in consistent location on all sheets, organized with titles to precisely match detail titles, and accurate reference to detail and sheet number and specification section(s). Note that Detail Keynotes may be substituted with annotation or sole use of a legend system.

Best Practices

(Refer to *Design Development Site Materials Plan Best Practices.*)

Example of an SD Site Materials Enlargement Plan



Note: This graphic represents an enlargement from the example Site Materials Plan that follows. The landscape architect should determine if enlargement plans are required for their project to adequately convey the design intent and character of the proposed design. Otherwise, plan drawings should be scaled sufficiently in order to convey this intent.

Example of an SD Site Materials Plan

Site Lighting Plan

Introduction

Prior to initiating Schematic lighting design, a number of Pre-Design issues should be addressed, many of which relate to roles and responsibilities shared between the landscape architect, lighting designer, electrical engineer, and other consultants. While these items are defined within the Schematic Design phase, they should generally be resolved prior to initiating the project contract.

The initial question addresses when the lighting designer should engage the project. As with all disciplines, it is important that the lighting designer participate from the outset of the design process, once a Conceptual Design framework has been established. That suggests that the lighting designer begin his or her involvement at the Schematic Design phase, at the latest. Both the lighting designer and the team may benefit from earlier lighting designer participation, for example, with framing objectives, developing concept studies and identifying any parameters that may influence a design direction.[3]

- Pre-Design Issues and Responsibilities [4]
    - There are several services associated with the project's electrical and lighting design that can be handled by more than one team member; it is therefore critical to clarify who is contractually responsible for completing each task. Generally, the lighting designer is responsible for the design, specification, detailing, and code compliance of all lighting equipment from the fixtures mounting plate "out" into the user occupied environment. This includes illumination calculations as required as well as lighting layouts and circuiting "intent" drawings depicting what fixtures should be switched or dimmed together. The electrical engineer is responsible for connecting those fixtures to the project's electrical system. From the fixture's J-box "in" toward the panel (and beyond), the electrical engineer designs and specifies all aspects of the power distribution system, much of which requires his professional seal for submittal to governing authorities.

      If the landscape architect is functioning as the project lead, he should determine whether the lighting designer or the electrical engineer performs the tasks below. Ideally, this results from an open conversation between the landscape architect, lighting designer, and electrical engineer, with the landscape architect formally assigning these tasks after the discussion.

      1. "Controls" can typically be designed and specified by either the lighting designer or the electrical engineer; however, the electrical engineer will always retain responsibility for connecting the control system to the site's power.
      2. "Emergency" egress lighting can also be designed and specified by the lighting designer or electrical engineer; however, the emergency lighting system must ultimately appear on plans stamped by the electrical engineer. For this reason, it is common to have the electrical engineer design this system with review by the lighting designer who ensures that the system is coordinated with the project's lighting design.

- In addition to the interface between the lighting designer and electrical engineer, the landscape architect must be aware of and facilitate the interaction between the lighting designer and several other potential team members: [5]
    1. The project's structural or civil engineer must provide the details for the foundations or bases that support light fixture poles, catenary systems, and the like.
    2. The arborist may consult on tree mounted light fixtures and appropriate candidate trees.
    3. The signage/graphic designer may be involved with the lighting of banner programs, as well as internally and externally illuminated signage.
    4. The security consultant will define minimum illumination levels and contrast ratios for optimum performance of their security cameras. The landscape architect should coordinate transfer of this information to the lighting designer.

- A nighttime site visit is a critical element of the Pre-Design survey and assessment process. Key existing illumination levels and contrast ratios should be recorded, as well as the type(s) of light sources and the color of light produced in and around the project. The project lighting designer should report on both the quantity and quality of light as well as unique characteristics of the project site at night.

[4] Patrick Quigley, Patrick B. Quigley and Associates, Architectural Lighting Consultants.
[5] Patrick Quigley, Patrick B. Quigley and Associates, Architectural Lighting Consultants.
[6] Patrick Quigley, Patrick B. Quigley and Associates, Architectural Lighting Consultants.

Objective

The SD Site Lighting Plan* defines a preliminary approach to site lighting design, as it supports overall schematic intent and responds to well-defined lighting design intent.

*Note that Schematic site lighting may be included either as part of the SD Site Materials Plan, or as a separate Site Lighting Plan. Requirements defined below apply to both scenarios.

General Requirements

The Schematic Site Lighting Plan is prepared by the landscape architect to establish the role of lighting in addressing broader design objectives. Therefore, an initial (baseline) lighting plan is established that can be evaluated against these objectives and further developed at the Design Development phase.

Site lighting design should be fully conceived in collaboration with a professional lighting designer, as described above. Lighting design should support spatial and photometric intent, safety, wayfinding, night sky protection, energy efficiency, and other objectives. Clear and comprehensive intent is the most important attribute of the Schematic Site Lighting Plan.

INTENT

Comprehensively define site lighting intent, both in broad design terms and with explicit technical criteria. Note that while intentions can include both subjective and objective criteria, the majority of lighting intentions are quantifiable and can be measured at each phase of the design and documentation process.

The intent highlighted in the following list can be defined with plan diagrams, charts, storyboards, three-dimensional models, in narrative form or with some combination of these media. This documentation may be included as primary representation of the Schematic Site Lighting intent, or prepared to support the Site Lighting Plan.

Broad Intent

USER NEEDS AND FUNCTIONS, including the quantity and quality of light needed for each activity, including flexible requirements such as occasional events or entertainment functions.

SPACIAL INTENT/WAYFINDING, including important features and spatial edges that define the project at night, consider project entries and a lit sequences of visual events, leading users to destinations.

Photometric intent, including lighting distribution, light levels, hierarchy, color, light trespass considerations and glare.

Safety and security, including appropriate light levels at stairs, ramps, grade or material transitions, and for effective operation of security cameras and property surveillance.

Relationships between lighting and landscape systems, for example, locational, visual, and technical relationships between lights and the landscape architecture program, including materials, pavements, jointing, walls, and other site systems.

Explicit Intent

Technical requirements, for example, municipal codes, energy codes, life-safety codes, and LEED or other sustainability objectives.

Budgets, both construction and operational, including energy needs. Note the importance of an energy budget and associated energy compliance analysis.

Maintenance and durability issues, including maintenance cycles for equipment and its impact on staffing, availability of replacement parts, product quality.

Target illumination levels, for example, footcandles (fc) or lux (lx) for designated areas and activities, for example, roadways, walkways, parking areas, gardens, and service areas.

Light color, that is, temperature and color rendering index.

Preliminary fixture types (may be generic), luminaire and lamp options, source (color and temperature) types.

Specific Requirements

Graphic definition of all existing site lights that will be maintained and integrated with proposed lighting.

Proposed landscape architectural improvements base plan, simply illustrating proposed hardscape components such as pavements, walls, and steps with outlines only.

Typical Detail Keynote references for each light. Schematic keynote references are used to direct the reader from the plan to the associated light fixture illustration or cut-sheet within the documents.

Graphic definition of primary **proposed site lights**, including each fixture type such as pole mounted, ground mounted, wall mounted, suspended, and any other type included on the development site. Show them within a context that depicts aesthetic relationship of the fixtures to one another and to other project elements.

Photometric data if required by the client, approving agencies or design team to illustrate point by point illumination levels on ground surfaces.

Example of an SD Site Lighting Enlargement Plan

Note: The graphic represents an excerpt from the SD Site Lighting Plan included on the following page. The plan depicts an approach to illustrating site lighting design intent. The plan depicts lighting in a photorealistic way by illustrating actual lighting distribution.

This approach should be pursued only when photometric data is provided by the lighting manufacturer and can be accurately projected with simulation software. Indiscriminate use of this technique is discouraged, as grossly inaccurate representations may mislead the client or reviewing agency. Discretion with this technique is recommended.

Graphic Requirements

General

As with all Schematic documents, various graphic means can be used by the landscape architect to communicate intent. Site Lighting Plans are one of various graphic means to define schematic site lighting design.

It is recommended that the Site Lighting Plan graphic be somewhat spare in order to allow lighting symbols and associated annotation to read clearly.

A **graphic hierarchy** should be developed to highlight the lighting system and direct the reader to key relationships between lighting and site design elements.

Proposed hardscape conditions, if desired may be screened back in order to allow the proposed lighting symbols to read vividly.

Planting areas, if necessary, shown for reference and coordination purposes and defined generically with a consistent hatch or other symbol. This information may be relevant to lighting design. Screen back at least 50%.

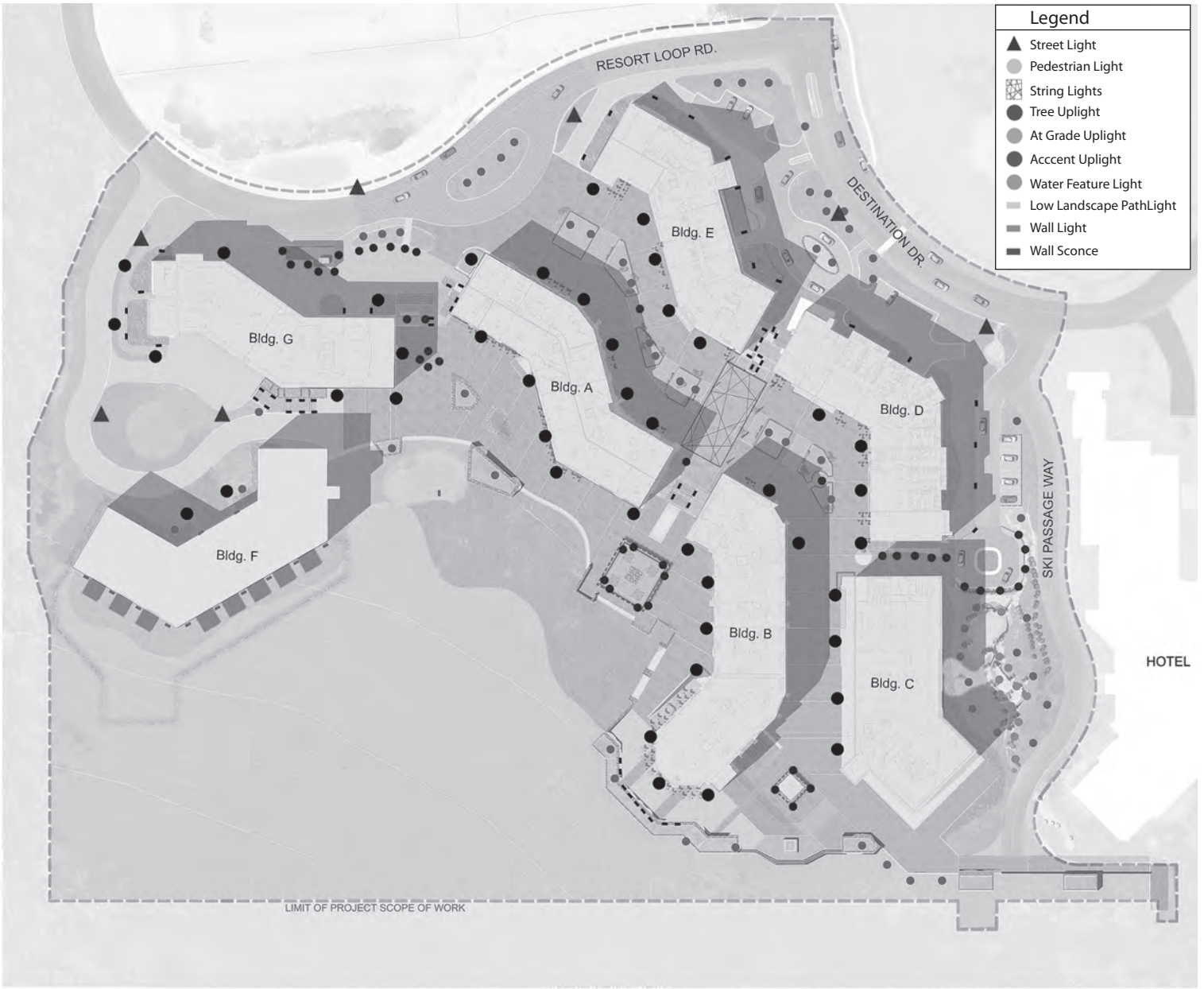
Diagrammatic, oversized (not drawn to scale) symbols to represent proposed lights.

Limit of project scope of work line, defining boundaries of proposed scope of work, if able to define at this stage.

Best Practices

Refer to *Design Development Site Lighting Plan Best Practices.*

Example of an SD Site Lighting Plan



CORE COMPONENTS

- Base Sheet (survey, aerial, illustrative site plan, or a combination of these)
- Lighting Legend
- Proposed Site Lighting components
- Limit of Work (if able to define)

Note: Graphic shown is intended to depict night scene and emphasize site lighting. Plan may also be shown over illustrative site plan with clear graphic, color-coded, symbols.

Site Furnishings Plan

Objective

The Schematic Design Site Furnishings Plan graphically highlights the preliminary site furnishings design program, with the use of well-considered symbols.

General Requirements

The SD Site Furnishings Plan graphically introduces the full landscape architectural furnishings work scope and directs the client and design team to associated detailed drawings within the set. The plan is used when the complexity or scale of the project does not allow furnishings to be shown clearly on the SD Site Materials Plan.

The plan identifies all fixed and moveable site furnishings, including seating, tables, umbrellas, trash receptacles, ash urns, drinking fountains, planter pots, bollards, and other like elements proposed on the project. The Site Furnishing Plan plays an integral role in the development of preliminary project descriptions, as a means of itemizing these elements.

A fully developed symbols and pattern system is organized to define and distinguish the proposed program. The plan graphically illustrates all proposed site furnishings and for reference and coordination, also shows all associated civil, architectural, and structural elements, drawn accurately and to scale.

As noted, an equally important purpose of the plan is to clearly and directly guide the client and interdisciplinary consultant team to associated documentation within the set, including furnishings details and/or imagery. That requires a well-resolved legend or annotation or keynote system, used to reference all proposed components.

Specific Requirements

Survey base sheet to show all existing conditions to remain.

Preliminary **limit of project scope of work line**, defining boundaries of proposed scope of work, if able to define at this stage.

***Comprehensive detail keynote list**, with references to all proposed site furnishings.

*Initial **plan detail references**, including section references, elevation references and plan enlargement references, for any drawings that illustrate site furnishings.

*These elements are not always developed for the Schematic Design Site Furnishings Plan. Under certain circumstances, the project may require that they be developed at the SD phase. In some cases, annotation, labels or legends may substitute for Detail Keynotes and Detail References. However, Detail Keynotes and Detail References are preferred in developing the most complete Schematic Design documents.

Reference Notes are typically not used on the Site Furnishings Plans, as these instructional notes are generally reserved for the Site Layout Plan.

Note that Reference Notes may be used to identify specific interdisciplinary coordination needs, for example, jointing relationships between paving systems and site furniture or to call to attention specific items requiring special consideration during construction.

Graphic but simplified definition of all **landscape architectural improvements** such as pavements, walls, fences, steps, railings, curbs, drainage structures, signs, mounted fixtures, site structures, and elements, per the graphic requirements given in the next section, in order to allow site furnishings to read well.

Graphic definition of all **non-landscape architectural improvements** that occupy the site.

Site furnishings, with plan symbols and Detail Keynote references.

Pavement jointing patterns, as defined under *Graphic Requirements*. Note that in many cases, detailed pavement patterns may not be critical at the SD phase. However, in some cases, integral relationships between typical paving patterns and furniture positions may be applicable.

Planting areas, as defined under *Graphic Requirements*.

Graphic Requirements

Survey base sheet, utilized to show all existing conditions, including above-and below-grade structures, pavements, plants, topography, utilities, restrictions, monuments, benchmarks, or other reference datum.

Existing conditions, if desired may be screened back maximum 50 percent as original unaltered survey, in order to better highlight site furnishings.

Symbols overlaid on the unaltered survey, used to represent existing conditions to be protected, removed or salvaged, shall be as specifically noted here:

Limit of project scope of work line, defining boundaries of proposed scope of work, if able to define at this stage.

Line-weight hierarchy, rigorously applied to distinguish three-dimensional components, material changes, jointing, pattern symbols, and keynote symbols.

Line-weight hierarchy, lightest to heaviest:

1. Screened survey base showing existing conditions, including subgrade conditions
2. Screened depiction of all landscape architectural improvements except for site furnishings
3. Full value depiction of site furnishings
4. Keynotes and leader lines
5. Building and structures

Consultant improvements, screened or full bleed, depending upon importance of relationship to landscape architecture improvements.

Ground plane (on-grade) structures distinguished from above- or below-grade components.

Below-grade components (utilities, subgrade structures, etc.) shown with screened dash; on-grade components shown with full-tone solid line; above-grade components (building overhangs, trellises, etc.) shown with full-tone dash. Include delineation of all subgrade architecture and overhanging floors and roof lines.

All proposed on-grade or above-grade **utility structures** and components shown for reference and conflict identification.

Symbols and patterns, used on the Site Furnishings Plan to distinguish and define the position and scale and relationships between furnishings and other landscape architecture systems.

- Plan hatch and pattern symbols should precisely match scale of hatch and pattern on symbols legend.
- Furnishings may be drawn to scale or depicted with diagrammatic symbols. Oversized diagrammatic symbols may help furnishings to read more clearly.

Labels, used only to identify major project spaces, features, buildings, roads or streets, and water courses/ways. Additional annotations may be used in lieu of Detail Keynotes, as noted above.

Building footprints, graphically portrayed to reflect specific project needs.

Pavement materials, distinguished with boundary outlines, or pattern or hatch symbols.

Concrete pavement joints, only if relationships to site furnishings are desired.

Site furnishings, depicted with readily identifiable symbol and precisely matching symbols legend. Difficult to read symbols should be highlighted with letter code, for example, trash receptacles shown as circle with "TR."

Planting areas defined generically with a consistent hatch or other symbol and screened back at least 50% for clarity of site furnishings.

Best Practices

(Refer to *Design Development Site Materials Plan Best Practices.*)

Example of an SD Site Furnishings Plan

CORE COMPONENTS

- Base Sheet (survey, aerial, illustrative site plan, or combination of these)
- Site Furnishings Legend
- Proposed Site Furnishings
- Limit of Work (if able to define)

Materials Palette

Objective

Establish a unified and coordinated depiction of proposed materials and components, to fulfill design intent and cost parameters.

General Requirements

Establish a vivid graphic depiction of actual materials and components, and, importantly, the relationships between these elements as they support the project mission and vision.

Establish performance objectives (metrics) for material systems. Metrics should include LEED and similar requirements, such as reused and recycled materials, durability and life cycle, albedo, and urban heat island characteristics.

As a Schematic Design exercise, alternatives or options deserve consideration. During the Design Development phase, materials and components will be selected.

Recommendations

Primary Recommendations

Primary recommendations include those core elements that must be documented to provide a baseline description of the materials or components.

Materials and components grouped by major headings as organized on the landscape architect's standard Detail Keynote List. Include only those materials and components that are important to accomplishing design intent.

- Pavements and Curbs
- Walls and Steps
- Fences and Railings
- Site Furniture
- Site Lighting
- Water Features
- Miscellaneous Site Features and Art

Statement of intent, for each set of systems noted above, for example, pavements. The statement should be brief and focused on key objectives and role of each system as part of overall project intent. Note that such descriptions may also be included in a Project Design Brief.

Example of a statement of intent:

"Paving systems are intended to establish a fine-grained pedestrian scale, to distinguish the courtyard from its context. Paving also plays a role in accomplishing sustainable stormwater management objectives, including infiltration and recharge intent. As such, each of the depicted systems is designed as a porous system. Some pavements are designed to include low plants such as mosses and groundcovers, furthering stormwater management intent and establishing unique garden qualities."

Graphic image of each material or component.

Concise description of each material or component, with emphasis on design intent or characteristics, for example, "Porous Paving," "Low Albedo Paving," or "Recycled Content Furnishings." Include color, size, and/or other key attributes.

Supplemental Recommendations

Supplemental recommendations include those elements that may be documented to provide an enhanced description of the materials or components, depending upon specific project needs. For example, where the project schedule requires expedited material sourcing, material providers may be necessary.

Key performance criteria or other metrics, for example, "30 Percent Infiltration Rate," "25 percent Light Reflection," or 40 Percent Recycled Content." Note that this content should be carefully coordination with Preliminary Project Descriptions, and duplicated information should not be included on both drawings and in Specifications.

Material or component source, for example, manufacturer, supplier, or distributor, only if Preliminary Project Descriptions are not included at Schematic Design.

Detail keynote reference, if Schematic Details have been included within the Schematic documents.

Approximate unit cost, or range, defining anticipated cost, including installation.

Graphic Requirements

Graphic image of each material or component. Provide either installed material images, showing some project context, or enlarged close-up images that communicate detailed material qualities. Confirm that images accurately represent actual material colors.

Organize materials, systems, and components in categories or groups to coherently present a comprehensive program as part of an overall story. Groupings may be tied to specification organization.

Best Practices

Design

Integrated Design and Documentation

The Materials Palette should be used as a key Schematic Design review reference, and should be examined together with the Site Materials Plan, Preliminary Project Descriptions, (discussed later in this Chapter) sketch details, illustrative renderings, and any physical material samples to conduct a detailed review. The landscape architect may pair the Materials Palette with the Schematic Design Site Materials Plan and actual product samples to conduct a focused client review and approval process.

The Materials Palette should be used as the key reference for establishing Schematic Design Preliminary Project Descriptions. Utilize the plan to methodically define preliminary project descriptions requirements.

Material Selection

The process of evaluating and selecting materials requires diligence. The design and documentation process culminates with preparation of specifications and client approval. Initially, the process is a response to project objectives, principles, and performance metrics, as described within these guidelines. The landscape architect will investigate material limitations, size, color, durability, strength, and other attributes. The Materials Palette should be developed to present to the client and collaborators.

As preferred materials are determined, material availability and standard sizing should be confirmed. Durability of the selected material on existing projects and similar environmental conditions should be confirmed. In establishing material sources, note that public clients may require "approved equal" substitution flexibility or nonproprietary performance-based systems to be defined. That process allows the contractor to submit a material or product that meets specified requirements, but may not match the specified proprietary product.

Sustainable Design

The Materials Palette and the Site Materials Plan are the most practical locations within the drawings to consolidate the program of sustainable design elements. Acknowledging that sustainable design is a comprehensive and integral approach to design, these documents should be used during the SD phase to analyze and evaluate all aspects of sustainable design: economic, environmental, social, and aesthetic.

Regarding sustainable materials, the landscape architect may choose to define, highlight, or even categorize select materials, systems and components by sustainability topics. These may include reused materials, recycled material content, local materials, rapidly renewable materials, certified wood, porous pavement, low albedo pavements to mitigate urban heat island temperatures, and lights that reduce light pollution and require less energy.

Coordination

After assembling initial images, conduct an interdisciplinary work session, with architects, interior designers, civil engineers, and others to evaluate and further develop the palette in a comprehensive fashion.

Coordinate the Materials Palette with the Site Materials Plan. Verify that the same materials are shown on each document, including a precise match of material name.

Coordinate the proposed materials palette with Preliminary Project Descriptions requirements.

Coordinate the proposed materials palette with the site construction budget.

Technical

Materials study should result in proposed materials that are locally sound, durable, weather-resistant, and well-suited for intended uses. They should reflect sound installation practices, and include a warranty and reliable maintenance track record. Additional requirements such as cost and maintenance should be understood by the landscape architect so they can be conveyed to the client. Both initial and life-cycle costs of certain proposed improvements should receive consideration. Materials with longer-term life cycle may require less expenditure over time than less expensive materials with shorter life cycle that may require replacement.

Strategies

Create a story about the project. Tell that story with materials and components.

Hardscape Materials: Pavements and Curbs

Concrete Pavers

Type 1 – 4" x 8" Herringbone Pattern

Type 2 – Option 1: 4" x 6" Running Bond Pattern

Type 2 – Option 2: 8" x 8" Stacked Bond

Stone Paving

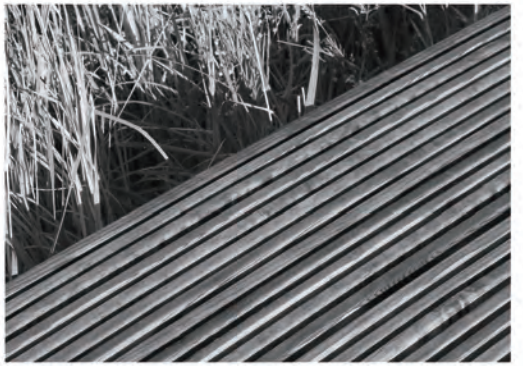
Type 1 – Random Pattern

Type 2 – 4" x 4" Stacked Bond Band

Type 3 – Random Cut Plank and Square Stone

Wood Paving

Option 1: 2" x 6" Wood Planks



Option 2: 3/4" Bamboo

CORE COMPONENTS

- Materials and Components Grouped by Type
- High-Quality Photo Images Conveying Material Character and Design Intent

Hardscape Materials: Walls and Steps

Stone Walls

Stacked Random Ashlar, Red Sandstone

Option 1: Stacked Random Ashlar, Buff Sandstone

Option 2: Random Mortar Pattern

Steps

Stone Slab Steps

Cast-in-Place Concrete Steps

CORE COMPONENTS

- Materials and Components Grouped by Type
- High-Quality Photo Images Conveying Material Character and Design Intent

Hardscape Materials: Fences and Railings

Handrails

Stainless Steel

Option 1: Painted Steel Embedded

Option 2: Stained Wood Embedded

Guardrails

Painted Aluminum

Option 1: Painted Aluminum with 1/8" Stainless Steel Cable

Fencing

Timber Rail with Stone Post

Option 1: Timber Rail with Square Post

Option 2: Timber Rail with Cylindrical Post

CORE COMPONENTS

- Materials and Components Grouped by Type
- High-Quality Photo Images Conveying Material Character and Design Intent

Hardscape Materials: Site Furnishings

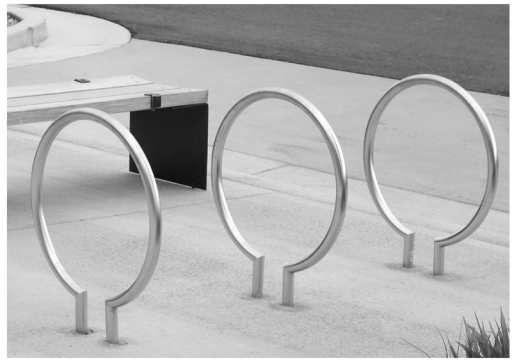
Movable Furniture

Wooden Stained Chairs

Ski Racks

8' Long Painted Aluminum

Steps

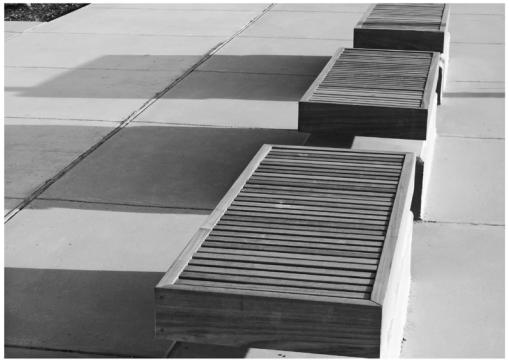


Stainless Steel Rings

CORE COMPONENTS

- Materials and Components Grouped by Type
- High-Quality Photo Images Conveying Material Character and Design Intent

Benches



Option 1: Custom Wood

Cafe Tables

4' Diameter Painted Steel Table and Chairs with Cushions

Trash Receptacles

Wood Paneled Trash Can

Option 2: Recycled Wood

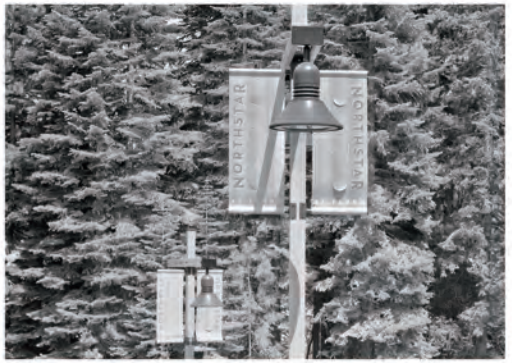
Option 1: 3' Diameter Painted Steel Bistro-Style Table and Chairs

Fire Pit

Stone Veneer Pit with Natural Logs

Hardscape Materials: Lighting

Lighting



Dark Sky Compliant Street Light with Banners

Tree Uplights

String Lights

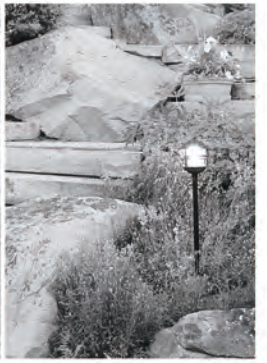
Dark-Sky-Compliant Pedestrian Light

Direct Burial / Accent Uplight

Wall Sconce

Custom Integrated Wall Lights

Option 1: Bollard-Style Path Lights


Option 2: Low-Voltage Path Lights

CORE COMPONENTS

- Materials and Components Grouped by Type
- High-Quality Photo Images Conveying Material Character and Design Intent

Hardscape Materials: Water Features

Pond

Wiers

Option 1: Custom Stone

Reflection Pool

CORE COMPONENTS

- Materials and Components Grouped by Type
- High-Quality Photo Images Conveying Material Character and Design Intent

Streams

Option 1: Angular Boulders

Option 2: Cobble Boulders

Option 2: Custom Concrete

Pop Jet Fountain

Option 1: Steel Grating

Option 2: Stone Plaza

Hardscape Materials: Miscellanous Site Features and Art

Art/Sculpture Type 1

Option 1: Subtle Entry Piece Imitating Nature

Option 2: Entry Piece Representative Natural System

Art/Sculpture Type 2

Large Focal Piece

Art/Sculpture Type 3

Option 1: Piece Imitating Mountain Wildlife

Option 2: Piece Imitating Wildlife

CORE COMPONENTS

- Materials and Components Grouped by Type
- High-Quality Photo Images Conveying Material Character and Design Intent

Site Grading and Drainage Plan

Objective

The Schematic Site Grading and Drainage Plan illustrates the role of Preliminary Design in documenting initial intent for vertical organization of the site, stormwater management, water-quality measures, and protection of natural resources.

General Requirements

The SD Site Grading Plan is the first opportunity for the landscape architect to shape the three-dimensional landscape. This is the landscape architect's most fundamental role, as grading and landform manipulation are integral design tools in shaping spaces, positioning circulation systems, directing or screening views, and mitigating noise or other undesirable impacts. Grading is used to establish building sites, parking areas, and various outdoor spaces.

The Site Grading and Drainage Plan defines primary ground plane elevations, both on pavements and in landscape areas.

The Site Grading and Drainage Plan also defines preliminary strategies for managing stormwater runoff, minimizing impacts both on- and off-site. These impacts include both flood control and water-quality concerns. These may include detention or retention basins, ponds, streams, wetlands, rain gardens, and vegetated or armored swales.

Landscape preservation and grading design are integrally related. Grading design impacts the protection of existing trees and plants, the stabilization of steeps slopes for erosion control.

As designers collaborate to achieve water-quality objectives, they also find opportunities to create aesthetic community amenities such as wetlands and other water bodies.

Specific Requirements

Survey base sheet to show all existing conditions to remain, including above-and below-grade elements. Include all existing trees to remain**,** and any other vegetation that is not to be disturbed.

Preliminary **limit of project scope of work line,** defining boundaries of proposed scope of work, if able to define at this stage.

Graphic definition of the **full program of proposed site improvements,** including simplified hardscape and softscape surfaces.

Preliminary contour grading, with 1 or 2 foot contours, at all hardscape and softscape areas.

*Preliminary **Detail Keynote List,** with references to all proposed details, components, and systems with relationships to grading, for example, drainage structures.

* Detail Keynotes may not be necessary at the SD Grading Plan.

***Preliminary Grading Reference Notes** to supplement graphic instruction and General Notes. The SD Site Grading and Drainage Plan may utilize a set of initial Reference Notes that communicate key preliminary intent.

* Preliminary Grading Reference Notes may not be necessary at the SD Grading Plan.

Example of SD Grading Reference Notes are provided below (see generic description of *Reference Notes* in Section Three: Guidelines and Best Practices, Keynoting and Reference Noting System). Note that these are only sample notes and do not represent a comprehensive list.

1. Existing trees to remain. Do not disturb.
2. Tie into existing grade. Meet smoothly and evenly.
3. Slope pavement(s) minimum 2 percent to drains to softscape.
4. Provide shoulder at roadway edge. See typical section.

All landform grading intentions, including slopes, hills, knolls, plateaus, terraces, berms, valleys, depressions, and swales, all scaled to meet spatial objectives and contextual landscape conditions.

Key spot elevations at key hardscape and softscape areas

Key spot elevations at walls, fences, and railings

Primary drainage structures, for drains within the landscape architect's work areas.

***Approximate areas of cut and fill,** including preliminary cut and fill volume summary; may be included on the SD Grading Plan, or a separate graphic.

*Cut and fill areas may not be necessary at the SD Grading Plan.

Finished floor elevation for every accessible level of each building or structure.

Slope direction (indicated with arrows) and slope percentages for all hardscape areas, for ease of review prior to Design Development documentation.

Stairs: Spot elevations at tops and bottoms of stair runs, together with a note to indicate number of risers and typical riser height, for example, "5 risers at 6" each".

Ramps: Spot elevations at tops and bottoms of ramps.

Landings: Spot elevations at each stair or ramp landing to indicate approximate level of landing.

Walls: Spot elevations at all tops of walls at each end.

Finished grade at walls: Spot elevations at finished grade of all walls at each end.

High points and low points

Ridges, with ridge line elevations carefully determined for intended purposes.

Drainage swales and channels, with centerlines, direction of flow, and longitudinal slope percentage indicated.

Erosion control or stabilization intentions for steep or other slopes requiring protection.

Detention and retention basins, with capacity requirements and volumes provided for civil review at the Design Development phase.

Stormwater infiltration and recharge devices that may clean and store water until it can percolate into the soil (refer to *Design Development Grading Plan* for additional information).

Graphic Requirements

Existing conditions, if desired may be screened back maximum 50 percent as the original unaltered survey, in order to better highlight demolition requirements.

Existing contours depicted dashed and screened, as represented in original survey document (require surveyor to provide graphics as requested).

Proposed contours represented as solid lines per landscape architect's CAD standards.

Proposed contours should be shown at both hardscape and softscape areas, together with key spot elevations as defined under *Specific Requirements* earlier in this chapter.

Work limit line represented by equally spaced dashed bold line, with "Limit of Project Scope of Work" note. Consider screening this line to distinguish from match lines that separate sheets.

Areas of cut and fill, if required, defined and distinguished with simple tone symbol and Reference Note indicating intent.

Existing spot elevations to be maintained (no adjustments to existing grades) noted within parentheses next to + defining precise location of elevation, for example, + (89.35).

Proposed spot elevations with prefix per standard abbreviations as noted under *Design Development Grading Plan*.

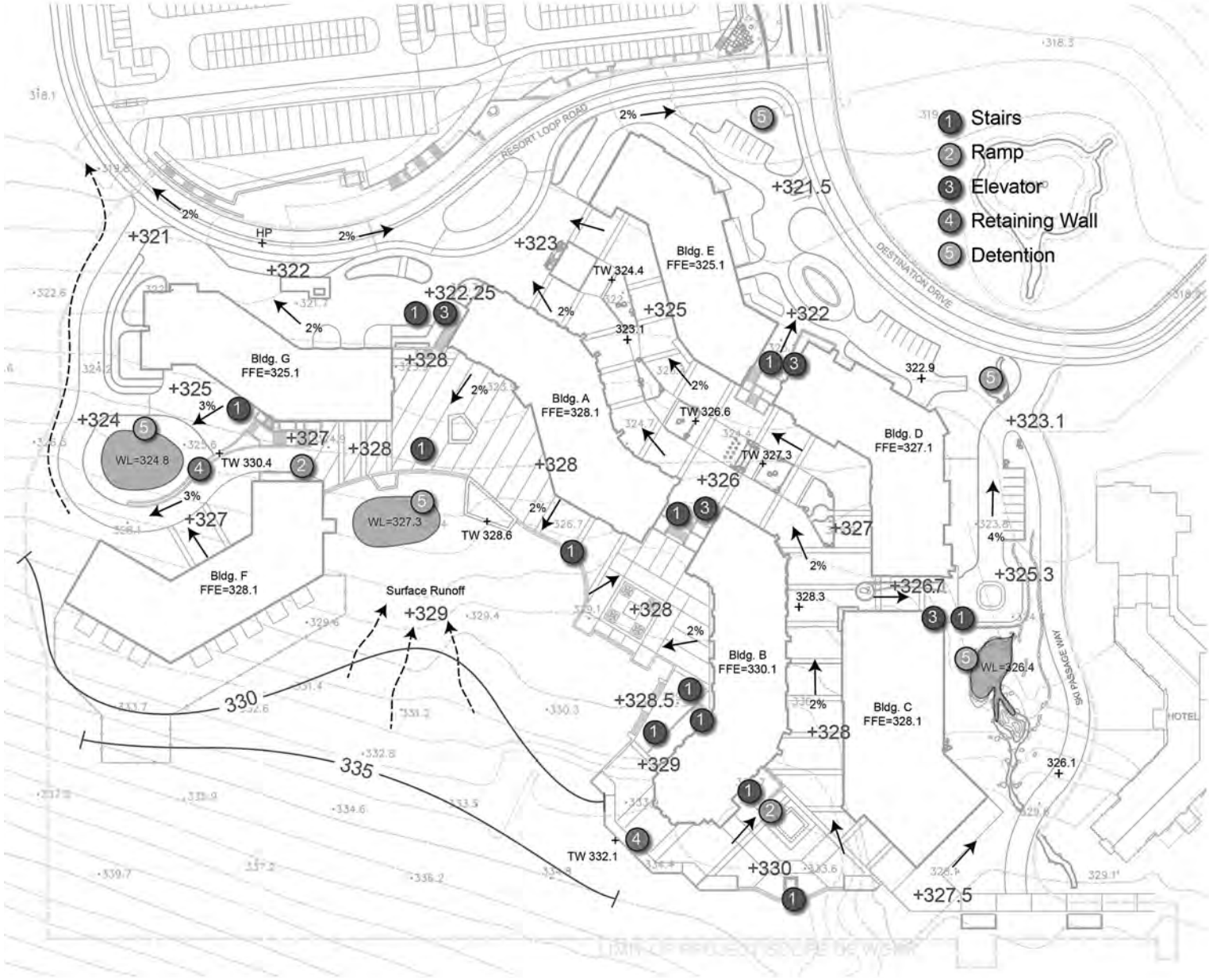
Swale centerline represented per landscape architect's CAD standards, including arrow indicating flow direction, and slope percentage indicating minimum or maximum slope.

Slope directional arrows per landscape architect's CAD standards, and requirements below, with percentage noted to tenths, for example, "1.4 percent," and the note "MIN.," "MAX." or "TYP."

Best Practices

(Refer to *Design Development Site Materials Plan Best Practices*.)

Example SD Site Grading and Drainage Plan



CORE COMPONENTS (IF APPLICABLE)

- Base Sheet (survey, aerial, illustrative site plan, or combination of these)
- Existing Trees to Remain
- Proposed Site Improvements
- Preliminary Drainage Structures
- Approximate Areas of Cut and Fill
- Finished Floor Elevations for Buildings
- Slope Direction
- Stairs, Ramps, Landings Spot Elevations
- Top of Wall Elevations
- High Points and Low Points
- Drainage Swales and Channels
- Erosion Control or Stabilization
- Detention and Retention Basins
- Stormwater Infiltration and Recharge Devices
- Limit of Work (if able to define)

Tree Planting Plan

Objective

The SD Tree Planting Plan illustrates the role of trees in accomplishing overall Schematic Site Design intent.

General Requirements

The SD Tree Planting Plan establishes a foundation of design intent for further development at Design Development. Design intent reflects the role of plants in accomplishing clear and comprehensive project objectives. Planting objectives include spatial, aesthetic, environmental, and engineering considerations. Social and community objectives deserve additional consideration. Plants are selected in response to site conditions and influences. Existing landscape conditions play an important role in the determination of the proposed landscape, especially if preservation of existing landscapes is found to be viable. See "General Requirements" defined under *Design Development Tree Planting Plan* for additional information.

Recommendations

These guidelines recommend the use of separate Tree Planting Schematic Design Plan(s) and Shrub and Groundcover Schematic Design Plan(s) to ensure clear communication of design intent. However, simple projects may allow these two plans to be combined.

Tree Planting Plans

Survey base sheet to show all existing conditions to remain, including existing plants.

Proposed hardscape site improvements, including pavements, utility structures, and other significant components that might interface with planting work.

Proposed grading relationships to planting, as illustrated by proposed grading contours, as part of the drawing base.

Primary plan labels to communicate primary content, for example, street names, buildings, adjacent context, utilities, easements, and major site program, especially as they relate to landscape and planting, for example, "event lawn," "palm court," or "meditation garden."

Enlargement plan references for detailed plantings as necessary to convey design intent.

Proposed trees, including deciduous and evergreen trees.

Plant reference system, identifying tree species and quantities in groups on plan, per graphic requirements below and landscape architect's customized system. Note that graphic symbols with a legend and various annotation methods may be used in lieu of a traditional plant reference system, as will be developed at the Design Development phase.

Plant Legend

The plant legend includes plant symbols and general classification of trees, that is, deciduous trees, evergreen trees, and so forth. Plan plant symbols and descriptions should correlate precisely with the plant palette, in order to establish clear relationships between these associated documents.

Note that this is a minimum requirement, as depicted on the example graphic on the next page. If the project requires more detailed tree information, the legend should be expanded to include the following:

- Graphic plant symbol, to distinguish each type of proposed tree
- Plant name, including both botanical and common names
- Plant size, heights, caliper, box, and the like as required to adequately specify intent
- General comments, to describe key aspects associated with installations, for example, full specimens, straight trunk, multi-stem, lowermost limb height requirements, and so on.

Graphic Requirements

Existing conditions, if desired may be screened back maximum 50 percent as the original unaltered survey, in order to better highlight proposed landscape requirements.

Proposed contour grading, also screened as necessary to illustrate intended relationships between planting design and grading and drainage plans.

Deciduous trees, illustrated with diverse but simple symbols to distinguish each tree type or species. Note that the Schematic Design Planting is inherently illustrative in order to highlight design intent at a glance. Shadows should be included on trees to reinforce three-dimensionality. Deciduous tree symbols should read differently than evergreen tree symbols.

Evergreen trees, illustrated with a simple circle with lines radiating from the center, as a default symbol. Shadows should be included on trees to reinforce three-dimensionality.

Understory plant graphics should read very lightly, and may be shown with outlines only.

Plan plant reference, if required, indicated with a leader line extending to quantity and plant abbreviation label, for example, 34 BN, at all tree and shrub groupings.

Plant abbreviation labels, if required, per landscape architect's standard CAD requirements and recommendations given previously.

Proposed hardscape improvements, illustrated at a graphic level so as to not compete with the proposed tree plantings but sufficiently to be distinguishable from existing conditions.

Limit of project scope of work line, in a light-gray tone, should be provided to ensure the extent of the project area as currently understood is clearly defined. This will allow the client to verify the order of magnitude of the project, while also allowing them to understand how the project fits into the adjacent site context.

Legends

Symbols Legend: Plant symbol identification should be incorporated and be precisely identical to that shown on plans, including size.

Best Practices

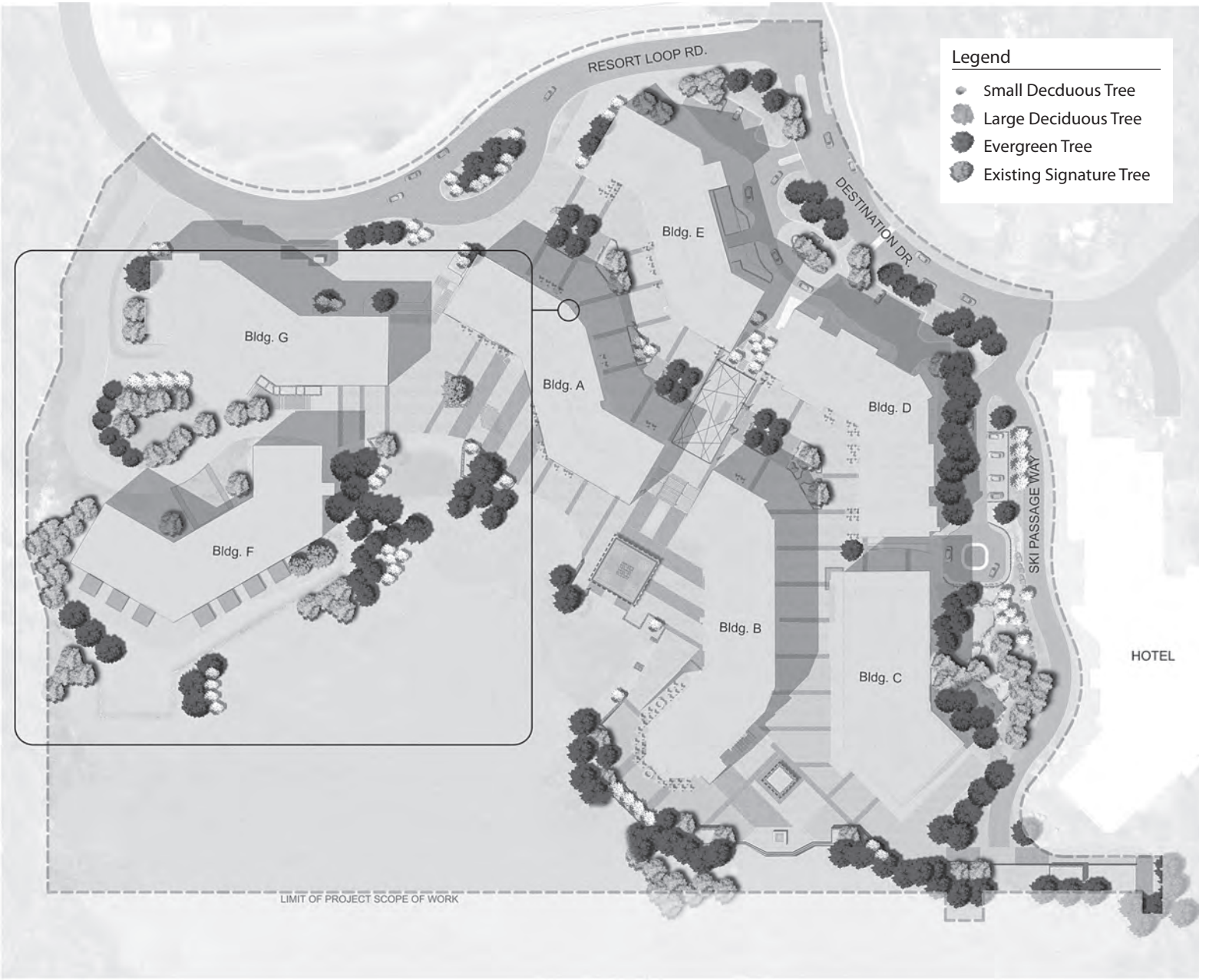
Refer to *Design Development Planting Plan Best Practices.*

Example of a Plant Legend Graphic: Deciduous and Evergreen Trees

PLANT LEGEND

SYMBOL	BOTANICAL NAME	COMMON NAME	SIZE	NOTES
DECIDUOUS TREES				
	Aesculus glabra	Ohio Buckeye	3" cal.	Full Specimens, Straight Trunk
	Catalpa bignoniodes Cornus	Southern Catalpa	3" cal.	Full Specimens, Straight Trunk
	florida	Flowering Dogwood	2" cal.	Full Specimens
	Gleditsia triacanthos inermis 'Shademaster'	'Shademaster' Honeylocaust	3" cal.	Full Specimens, Straight Trunk, Thornless
	Lagerstroemia indica x fauriei 'Natchez'	Natchez Crape Myrtle	2" cal.	Full Specimens, Straight Trunk
	Liriodendron tulipifera	Tulip Tree	2-1/2" cal.	Full Specimens, Straight Trunk
	Populus tremuloides	Quaking Aspen White	4" cal. 2"	Full Specimens, Field Collected, Multi-stem
	Salix alba	Willow	cal.	Full Specimens
EVERGREEN TREES				
	Picea pungens	Colorado Spruce	12'-18' ht.	Full Specimens, No shearing, Green only
	Picea pungens 'Glauca'	Colorado Blue Spruce	12'-18' ht.	Full Specimens, No shearing
	Pinus ponderosa	Ponderosa Pine White	14'-20' ht.	Full Specimens, No shearing
	Pinus strobus	Pine	10'-16' ht.	Full Specimens, No shearing
	Pseudotsuga mensieii 'Glauca'	Rocky Mountain Douglas Fir	12'-16' ht.	Full Specimens, No shearing

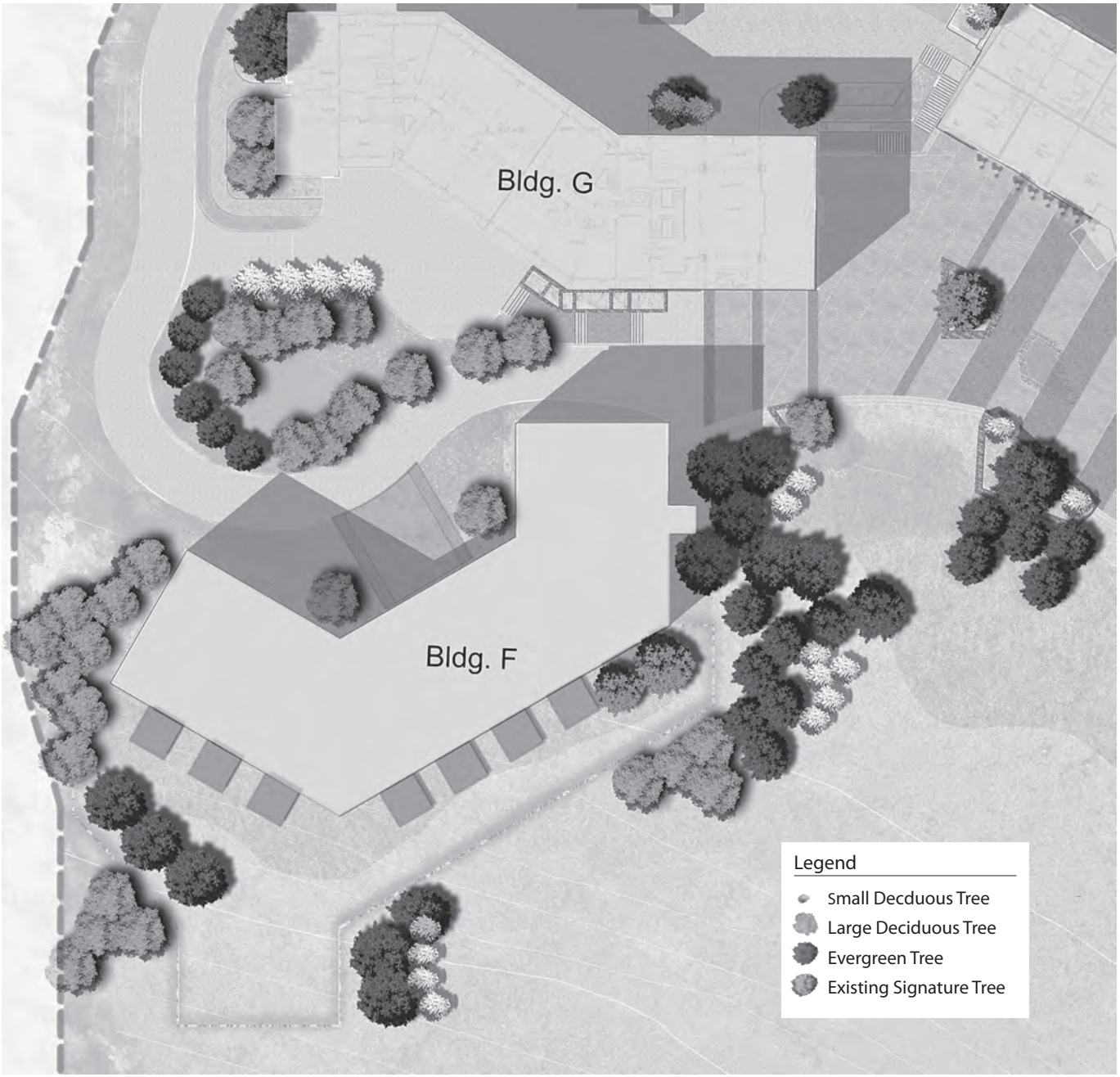
Example SD Tree Planting Plan



CORE COMPONENTS (IF APPLICABLE)

- Base Sheet (survey, aerial, illustrative site plan, or combination of these)
- Proposed Hardscape Improvements
- Proposed Trees
- Proposed Tree Legend
- Limit of Work (if able to define)

Example SD Tree Planting Plan Enlargement



Note: This graphic is an enlargement from the sample graphic provided on the preceding page. Where required, the landscape architect should determine if Enlargement Plans are required for their project to adequately convey the design intent and character of the proposed design in certain areas of the site. Otherwise, drawings should be scaled sufficiently in order to do so.

Shrub and Groundcover Planting Plan

Objective

The SD Shrub and Groundcover Planting Plan illustrates the role of shrub and groundcover plants in accomplishing the overall Schematic Site Design intent.

General Requirements

The SD Shrub and Groundcover Planting Plan establishes a foundation of design intent for further development at Design Development. Design intent reflects the role of plants in accomplishing clear and comprehensive project objectives. Planting objectives include spatial, aesthetic, environmental, and engineering considerations. Social and community objectives deserve additional consideration. Plants are selected in response to site conditions and influences. Existing landscape conditions play an important role in the determination of the proposed landscape, especially if preservation of existing landscapes is found to be viable.

See "General Requirements" defined under *Design Development Shrub and Groundcover Planting Plan* for additional information.

Recommendations

The standards here recommend the development of separate Tree Planting Plan(s) and Shrub and Groundcover Planting Plan(s) to ensure adequate conveyance of design intent. However, simple projects may allow these two plans to be combined.

Shrub and Groundcover Planting Plans

Survey base sheet to show all existing conditions to remain, including existing plants.

Graphic definition of the full program of proposed site improvements, including simplified hardscape and softscape surfaces, utility structures, and other significant components that may interface with proposed planting.

Proposed grading relationships to planting, as illustrated by proposed grading contours, as part of the drawing base.

Primary plan labels to communicate primary content, for example, street names, buildings, adjacent context, utilities, easements, and major site program, especially as it relates to landscape and planting, for example, "event lawn," "palm court," or "meditation garden."

Erosion control plants, either temporary during construction, or permanent.

Wetland plants, that is, those plants positioned in permanent or intermittently wet conditions.

Bioretention plants, that is, those plants that are used as part of a designed system to both retain and cleanse stormwater runoff via natural microbial processes.

Coastal planting, that is, those plants that are used as part of a coastal ecosystem to protect or restore habitat, control erosion, or accomplish other objectives.

Graphic Requirements

Existing conditions, distinguished from proposed improvements by screening existing conditions to a degree that allows proposed improvements to read distinctly from existing conditions.

Proposed contour grading, also screened as necessary to illustrate intended relationships between planting design and grading and drainage plans.

Limit of project scope of work line, in a light-gray tone, should be provided to ensure the extents of the project area as currently understood are clearly defined. This will allow the client to verify the order of magnitude of the project, while also allowing them to understand how the project fits into the adjacent site context.

Proposed trees can be depicted but should be screened or have a subdued color or rendering quality to clearly communicate proposed shrub and groundcover planting.

Specialty Plants

Proposed hardscape improvements, provided at a graphic level so as to not compete with the proposed shrub and groundcover planting but sufficient enough to be distinguishable from existing conditions to remain.

Erosion control plants, either temporary during construction or permanent, illustrated with the landscape architect's standard CAD hatch symbols for each type of specialty plant. Graphically distinguish temporary from permanent plants.

Groundcovers, perennials, ornamental grasses, and turf area represented on plans with diagrammatic symbols, each distinct per landscape architect's standard CAD symbols.

Proposed hardscape improvements, provided at a graphic level so as to not compete with the proposed shrub and groundcover planting but sufficient enough to be distinguishable from existing conditions to remain.

Plant Legend

Include a plant legend with plant symbols and general classifications of shrubs and groundcover, that is, deciduous shrubs, evergreen shrubs, perennials, and so forth. This classification should correlate with the plant palette to follow so symbols on the plan can be easily referenced to associated imagery for the proposed trees. Plant symbols should be identical to those shown on plans, including size.

Note that this is a minimum requirement and depicted on the example graphic on the next page. If the project requires a more intensive tree planting layout, the legend should be expanded to include the following:

- Graphic plant symbol, to distinguish each type of proposed plant
- Plant name, including both botanical and common names
- Plant size, heights, container size, flats, and so on as required to adequately specify intent
- General comments, to describe key aspects associated with installations, for example, full plants, include espalier, and so forth.

Best Practices

Refer to *Design Development Tree Planting Plan Best Practices.*

Example of Plant Legend Graphic: Shrubs, Perennials, Vines, Groundcovers, and Grasses

PLANT LEGEND

SYMBOL	BOTANICAL NAME	COMMON NAME	SIZE	NOTES
SHRUBS				
	Acer palmatum 'Omurayama'	Weeping Japanese Maple	5 gal.	Full Plants
	Cornus alba 'Sibirica'	Red Twig Dogwood	7 gal.	Full Plants
	Hydrangea macrophylla 'Lady in Red'	'Lady in Red' Hydrangea	3 gal.	Full Plants
	Nandina domestica 'Compacta'	Dwarf Heavenly Bamboo	3 gal.	Full Plants
	Rhododendron 'Fashion'	Fashion Azalea	5 gal.	Full Plants
	Rosmarinus officinalis 'Prostratus'	Creeping Rosemary	1 gal.	Full Plants
PERENNIALS				
	Aegopodium podagraria 'variegatum'	Variegated Bishop's Weed	1 gal.	Full Plants, 9" O.C.
	Galium odoratum	Sweet Woodruff	4" pots	Full Plants, 6" O.C.
	Iris sanguinea	Blood Iris	1 gal.	Full Plants, 18" O.C.
	Lantana camara	Lantana	1 gal.	Full Plants, 18" O.C.
	Rudbeckia hirta	Black-eyed Susan	1 gal.	Full Plants, 24" O.C.
	Vitex agnus-castus	Monk's Pepper	1 gal.	Full Plants, 12" O.C.
VINES AND GROUNDCOVER				
	Parthenocissus quinquefolia	Virginia Creeper	1 gal.	Full Plants, Train to espalier
	Potentilla neumanniana 'Nana'	Alpine Cinquefoil	1 gal.	Full Plants
	Thymus serpyllum	Creeping Thyme	1 gal.	Full Plants
GRASSES				
	Native Grass Mix			
	Manicured Turf-Sod			

Example of an SD Shrub, Perennial, and Groundcover Planting Plan

CORE COMPONENTS (IF APPLICABLE)

- Base Sheet (survey, aerial, illustrative site plan, or combination of these)
- Proposed Hardscape Improvements
- Proposed Plants
- Proposed Plant Legend
- Limit of Work (if able to define)

Example of an SD Shrub and Groundcover Planting Plan Enlargement

Note: This graphic is an enlargement from the sample graphic provided on the previous page. Where required, the landscape architect should determine if Enlargement Plans are required for their project to adequately convey the design intent and character of the proposed design in certain areas of the site. Otherwise, drawings should be scaled sufficiently in order to do so.

Planting Palette

Objective

Establish a unified and coordinated depiction of proposed plants, to fulfill design intent and reflect site conditions.

General Requirements

Establish both a graphic depiction and narrative description of proposed plants, and define the collective and individual role of these plants in supporting the project mission and vision.

Establish performance objectives (metrics) for plant systems. Note that plants address a range of broader objectives. Metrics should include LEED and similar requirements, such as protecting or restoring habitat, stormwater management for both quantity and quality, addressing the heat island effect, water efficient landscaping, and other objectives.

As a Schematic Design exercise, plant species alternatives or options deserve consideration and may be represented with the plant palette and in the SD Planting Plans. During the Design Development phase, specific species should be selected.

Recommendations

PRIMARY RECOMMENDATIONS

Primary recommendations include those core elements that should be documented to provide a baseline description of plants.

Broad statement of intent, defining the role of plants in serving the project's mission and vision. Note that such descriptions may also be included in a Project Design Brief.

Example: *"The site includes a fragile set of ecosystems, including forest, wetland, and riparian habitats. Some of these environments have been damaged by historic development patterns. The proposed planting palette plays a key role in restoring the health of these habitats and ecosystems. Plant species have been selected due to their historic and current position on the site. Healthy plant communities also play a role in water quality improvement and returning wildlife to the site."*

Plants grouped by major plant types, potentially as organized on the plan plant legend. Focus on plants that are important to accomplishing design intent.

- Deciduous Trees
- Ornamental Trees
- Specimen Trees
- Evergreen Trees
- Shrubs
- Groundcovers
- Perennials and Annuals
- Grasses and Sedges
- Cacti and Succulents

Alternative plant groupings may be derived from major plant types, that is, under broad headings. Subheadings, such as those identified previously, may also be used. Here, the focus may be on plant systems as they serve both ecological and functional intent.

- Existing Plants to Remain
- Historical Plants
- Native Plants
- Restoration Plants
- Erosion Control Plants
- Special Habitat Plants
- Wetland Plants
- Specimen Plants
- Meadow Plants

Alternative plants groupings may be derived from major plant communities, for example, native communities. Subheadings, such as those identified earlier, may also be used, for example, shrubs and groundcovers. Here, the focus is maintained on plant systems as they serve broad ecological and organizational intent.

PLANT COMMUNITIES[7]

- Alluvial Fan Sage Scrub
- Chaparral
- Southern Coast Live Oak Riparian Forest
- Coast Live Oak Woodland
- Coastal Sage Scrub
- Southern Cottonwood-Willow Riparian Forest
- Southern Sycamore Riparian Woodland
- Valley Oak Woodland

[7] http://ladpw.org/wmd/watershed/LA/LAR_planting_guidelines_webversion.pdf. In *Los Angeles River Master Plan Landscaping Guidelines and Plant Palettes*, pp 110-132. Los Angeles, California: County of Los Angeles Department of Public Works, 2004.

Statement of Intent, for each set of plant systems noted above, for example, deciduous trees. The statement should be brief and focused on key objectives and the role of each plant type as part of overall project intent. Note that these statements may also be included in the Project Design Brief.

> "Deciduous trees are fundamental to the project mission—'extending the usable life of the public realm' as they provide shade and ambiance in the retail environment, allowing pedestrians to spend more time in a comfortable micro-climate. A continuous (uninterrupted) canopy is desired, in order to accomplish 70 percent shade cover objective and maintain continuously protected pedestrian walkways. Heavy dense shade is desirable; as is branching structure that allows ample winter sunlight after leaves have dropped. Strong, straights trunks, with a 6-foot minimum lowermost branch height are desired to allow an unencumbered pedestrian circulation realm."
>
> **Another Statement of Intent example:**
>
> The Plant Palette: Why Native Plant Associations for the Los Angeles River?
>
> "These naturalistic native plant associations emulate the historic landscapes of the Los Angeles Basin, helping to restore a special 'sense of place' and visual identity to the river environment. Moreover, they can provide habitat for indigenous and migratory wildlife. Successful establishment of these native associations along the river can expand vital habitat opportunities for wildlife species, as well as provide them with potential corridors for movement between natural areas adjacent to the river. Expansion of these wildlife habitats and historic landscapes will help reconnect the human population with our natural heritage."[6]

Graphic image of each plant, plant type, or plant community (photograph).

Genus, Species, and Common Name of each plant option, for example, *Quercus berberidifolia* (*Q. dumosa*), scrub oak.

[8] http://ladpw.org/wmd/watershed/LA/LAR_planting_guidelines_webversion.pdf. In *Los Angeles River Master Plan Landscaping Guidelines and Plant Palettes*, p. 3. Los Angeles, California: County of Los Angeles Department of Public Works, 2004

Supplemental Recommendations

Supplemental Recommendations include those elements that may be documented to provide an enhanced description of plants, depending upon specific project needs. For example, where the project schedule requires expedited plant sourcing, plant material providers may be necessary.

Plan position or general/typical location of each plant, plant type, or plant community on the site. This should be completed by establishing plan relationships between the Planting Palette and the SD Planting Plans.

Concise description of each plant type, with emphasis on design intent or characteristics, for example, "Large Shade Tree," "Flowering Ornamental Tree," or "Flowering Groundcover." Include form, color, size, and other key attributes.

Key plant attributes for example, form, water needs, sun exposure, average height and spread, color, and unique ornamental characteristics.

Seasonal color or bloom chart across the year.

Key performance criteria or other metrics, for example, "70 percent Shade/Cover," "100 percent Native or Adapted Species," or "40 percent Low-Water-Needing Plants."

Performance Criteria may also be expressed as goals and objectives, for example, Goal: "Establish a native plant landscape," and Objectives: "Select plant species that do not require artificial irrigation," and "Select plant species from existing natural habitats on-site and in vicinity of site."

Plant source, if applicable, for example, nursery or supplier.

Graphic Requirements

Graphic image of each plant or plant type, preferably color photograph. Provide both full-scale images, showing plant in its entirety and enlarged close-up images that communicate detailed plant qualities.

Keyed reference of each plant or plant type to plan location. Various graphic means are available to communicate plan references, including numbering, color-coding and thumbnail images.

Best Practices

Refer to *Tree and Shrub and Groundcover Planting Plan Best Practices.*

Example of an SD Plant Palette

CORE COMPONENTS

- Plants Grouped by Type
- Description of Each Plant Type
- Botanical Name, Common Name
- High-Quality Photo Image Conveying Plant's Character

Deciduous Trees

Large Tree, 20'-40' ht.
Aesculus glabra, Ohio Buckeye
Size: 2" cal. and 3" cal.
Notes: Full specimens, straight trunk

Large Tree, 50'–70' ht.
Salix alba, White Willow
Size: 2" cal.
Notes: Full specimens, strong central leader

Large Tree, 30'–70' ht.
Gleditsia triacanthos inermis, Thornless Honeylocust
Size: 3" cal.
Notes: Full specimens, straight trunk, limb up 7'

Large Tree, 30'–40' ht.
Catalpa bignonioides, Southern Catalpa
Size:3" cal.
Notes: Full specimens, straight trunk

Large Tree, 70'–90' ht.
Liriodendron tulipifera Tulip Popular
Size: 2" cal. and 3" cal.
Notes: Full specimens, straight trunk

Small Tree, 40'–50' ht.
Populus tremuloides, Quaking Aspen
Size: 3" cal. and 4" cal.
Notes: Full specimens, multi-stem

Small Tree, 20'–40' ht.
Cornus florida, Flowering Dogwood
Size: 2.5" cal.
Notes: Full specimens

Small Tree, 20'–25' ht.
Lagerstroemia x, 'Natchez' Crape Myrtle Natchez
Size: 2.5" cal.
Notes: Full specimens

Example of an SD Plant Palette

CORE COMPONENTS

- Plants Grouped by Type
- Description of Each Plant Type
- Botanical Name, Common Name
- High-Quality Photo Image Conveying Plant's Character

Evergreen Trees

Large conifer, 30'–60' ht.
Picea pungens 'glauca', Colorado Blue Spruce
Size: 12', 14', and 16' ht.
Notes: Full dense specimens, no shearing

Large conifer, 30'–60' ht.
Picea pungons, Colorado Spruce
Size: 12', 14', and 16' ht.
Notes: Full dense specimens, no shearing

Large conifer, 50'–100' ht.
Pinus ponderosa, Ponderosa Pine
Size: 12', 16', and 20' ht.
Notes: Full dense specimens

Large conifer, 40'-80' ht.
Pinus flexilis, Limber Pine
Size: 10' and 12'
Notes: Full dense specimens, no shearing

Small conifer, 10'–20' ht.
Pinus edulis, Pinon Pine
Size: 8', 10', and 12' ht.
Notes: Full dense specimens, no shearing

Example of an SD Plant Palette

Shrubs, Perennials, and Groundcovers

CORE COMPONENTS

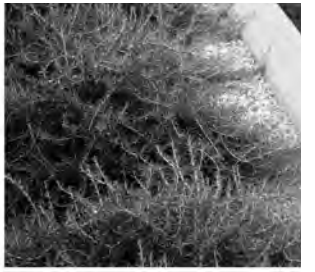
- Plants Grouped by Type
- Description of Each Plant Type
- Botanical Name, Common Name
- High-Quality Photo Image Conveying Plant's Character

Large Shrub, 7' ht.
Cornus alba, Siberian Dogwood
Size: 3'-4' ht. B&B
Notes: Full plants

Large Shrub, 10'–15' ht.
Acer palmatum 'Omurayama,' Weeping Japanese Maple
Size: 6'-8' ht. B&B
Notes: Full plants

Medium Shrub, 2'–5' ht.
Rhododendron 'Fashion' Fashion Azalea
Size: 5 gal.
Notes: Full plants

Medium Shrub, 4'–5' ht.
Nandina domestica 'Compacta,' Dwarf Heavenly Bamboo
Size: 5 gal.
Notes: Full plants



Low Shrub, 2' ht.
Rosmarinus officinalis 'Prostratus,' Creeping Rosemary
Size: 3 gal.
Notes: Full plants

Yellow Perennial, 3'–4' ht.
Rudbeckia hirta, Black-Eyed Susan
Size: 1 gal.
Notes: Full plants

Perennial Groundcover
Galium odoratum, Sweet Woodruff
Size: 1 gal.
Notes: Full plants

Lavender-Blue Perennial, 3'–5' ht.
Vitex agnus-castus, Monk's Pepper
Size: 1 gal.
Notes: Full plants

Yellow, Orange, Red Perennial, 6' ht.
Lantana camara, Lantana
Size: 1 gal.
Notes: Full plants

Violet Perennial, 4' ht.
Iris sanguinea, Blood Iris
Size: 1 gal.
Notes: Full plants

Creeping Groundcover, 3' spread
Thymus serpyllum, Creeping Thyme
Size: 1 gal.
Notes: Full plants

Vine Groundcover, 30'–50' climb
Parthenocissus quinquefolia, Virginia Creeper
Size: 4" pots
Notes: Full plants

Creeping Groundcover, 6"–12" spread
Potentilla neumanniana, 'Nana' Alpine Cinquefoil
Size: 4" pots
Notes: Full plants

ILLUSTRATIVE VISUALIZATIONS

This section outlines three primary illustrative visualizations types used by the landscape architect to convey three-dimensional design intent and character at the schematic phase. They are as follows:

- Perspective Renderings
- Illustrative Sections and Elevations
- Sketch Details

Each is described in further detail here and followed by a graphic example.

Perspective Renderings

Two types of perspective renderings may be utilized by the landscape architect. They are as follows:

> **3D Site Aerial/Bird's-Eye Perspectives or Renderings:** These are high-level views that establish a broad perspective of the proposal. The rendering should generally include a collection of proposed spaces and improvements in order to convey relationships between these elements.
>
> **3D Perspectives—Detailed Views:** These drawings selectively capture the essence and character of key individual spaces and components, for example, the project entry, building arrival and drop-off, building plaza, outdoor pool area, or dining terrace.

Perspective Renderings

Objective

Schematic Design Perspective Renderings vividly illustrate principal design intent, both as a means of developing support for the project and to evaluate the proposal.

General Requirements

- Highlights the primary design principles, addressing aesthetic, environmental, social, and economic strategies.
- Illustrates the intended physical character and quality of the development, as part of an overall strategy for visual and physical quality.
- Is well-coordinated with plan organization and schematic detail development.
- Identifies any problematic or unappealing aspects of the proposed design solution through the process of modeling and studying the proposal from varied vantage points.

Recommendations

Interdisciplinary content should be included, as it supports the overall design mission.

Graphic Requirements

> **Medium,** coordinated with other illustrative documents as part of an overall graphic strategy.
>
> The rendering medium and style should be strategically selected to portray and coincide with intended mood and character of the built outcome. The technique can range from abstract to precise. For example, a festive public gathering space may utilize a loose and colorful medium to convey the blur of a crowded urban experience, like the work of LeRoy Nieman and his "stunningly energetic" style. Or, the media may be selected to convey a well-resolved level of craftsmanship, utilizing a crisper medium.
>
> **Vantage(s),** carefully selected to convey primary ideas and principles.

Best Practices

Design

Determine key people activities, those intended to be supported by the proposed design solution. Include people engaged in these activities in the perspective rendering.

Coordination

Develop perspective renderings together with the consultant team, namely architects and others whose work is portrayed in the renderings. Utilize an interdisciplinary work session, together with the rendering professional, to develop content.

Technical

Utilize Sketch-up or another "wire-frame" three-dimensional construction as a base for the rendering. Select perspective vantage with rendering professional and other consultants by exploring various vantages by "moving around" the proposed design.

Strategies

Where opposition may be anticipated for a project, seek to use the rendering to address potential concerns. For example, if environmentalists are concerned about the project's impact, select and develop a vantage that encompasses a broad context, much of which may be preserved.

Example SD Bird's-Eye Perspective Rendering
Songhua Resort, Songhua, China

Example of an SD Detailed Perspective Rendering
Songhua Resort, Songhua, China

Illustrative Sections and Elevations

Objective

Schematic Design elevations and sections illustrate the spatial organization and key features of the project, with the emphasis on scale and interdisciplinary relationships.

General Requirements

Utilize sections and elevations to define all proposed spaces and major program elements.

Communicate the primary message, storyline, and strategic intent for each section, as part of the overall mission of the project.

Include all key building-site relationships, with the emphasis on typical user experiences.

Identify preliminary interdisciplinary relationships and coordination needs.

Recommendations

Illustrative sections and elevations should include the following elements, as required for the project:

Primary hardscape elements, for example, pavements, walls, stairs, ramps, landings, and railings.

Site architecture, including shade structures, shelters, restrooms, and other small-scale buildings.

Primary landscape systems, for example, existing and proposed topography, drainage, and plants.

Site furnishings and lighting, including elements such as seating, tables, umbrellas, trash receptacles, signs, bollards, pots, and kiosks.

Art elements, including fountains and sculpture.

Subgrade conditions where they exert significant impact to the Schematic Design, for example, subgrade parking or other buildings, subgrade transit, major utilities, prohibitive rock, or other geological constraints, or impacting subterranean hydrological conditions such as a high water table.

Existing and proposed buildings, including interior relationships where important to site development.

Scale references and elements, for example, cars, people, plants.

Annotation to communicate primary spaces, program or other intentions.

Graphic Requirements

"Illustrative," illuminating and expounding the life of the proposed spaces with people, activities, and owner-provided furnishings and supporting elements.

Color, as an expression of the intended built color palette.

Less technical than Design Development sections, but with sketchy detail depiction, including below-grade structures.

Elongated as much as possible to convey a full "run" through the site.

Existing and proposed ground lines (grades) clearly depicted and distinguished.

Minimum scale: 1" = 10', or preferably 1/8" = 1'0" or larger. 1/4" = 1'-0" allows architectural definition.

Annotation, organized as either an aligned "string" of notes with associated dimensions, or an alternative form of well-organized notes. Detail Keynotes may be included, if required to direct the reader to details within the set.

Best Practices

Design

Consider organizing sections along an "experiential" line, as a choreography of a typical visitor experience, for example, from the approach road to the arrival court, through the lobby, emerging into courtyards, and so on.

Utilize the SD sections and elevations as a design tool to study and further develop ideas to achieve a consensus direction.

Strategically determine section "cut lines" in a fashion that maximizes the depiction of proposed spaces and program. That may result in a section cut line that "jogs," rather than occurs along a straight line.

Example of an SD Illustrative Section Elevation
Songhua Resort, Songhua, China

Coordination

Conduct interdisciplinary work sessions to define drawing content and design intent.

While utilities are not necessary at this stage of the design process, these drawings can be used as an entrée into Design Development, where primary schematic utility intent may be introduced.

Technical

Utilize digital modeling such as Sketch-up to "cut" sections from model through automated processes for more accurate representation of the proposed plan.

Strategies

Create a story about the project. Tell that story with sections and elevations. Organize sections on sheets to present a logical sequence of thought.

Sketch Details

Objective

Schematic sketch details are dedicated to the exploration and conception of the built site language as it supports the project mission. Schematic design ideas are developed through landscape detail study.

General Requirements

"The process of developing details [should be] integral with the design process. Landscape detail[ing] is a design activity, not an afterthought or embellishment. We cannot design well if the way detail is conceived is not considered an active part of how we envision, organize and achieve the original aesthetic intentions of any landscape design proposal."[7]

Key general requirements are defined for schematic sketch details, suggesting their broad role in the initial development of a design approach. These requirements act as principles and include the role of schematic details in addressing performance objectives, establishing project identity and conceptual transparency, telling stories, and establishing the quality of the project. Theoretical perspectives establish a basis for each of the requirements.

Address Performance Objectives

Prior to or concurrent with the development of plan studies, utilize introductory knowledge of the project program and site conditions to preview the role of details in accomplishing project performance objectives. Details often work together to create operational systems, and these systems "work" to accomplish performance.

Detail systems that address multiple objectives yield the most sustainable outcomes, where synergies between systems reinforce their value. Synergies may occur between environmental performance, community appeal, financial performance, and the associated project aesthetic. The detail aesthetic of the project is most meaningful when serving multiple performance objectives.

An example illustrates the strategic role that details can play in serving multiple project objectives. In this case, environmental performance, community engagement, and art are interwoven, resulting in a detail language that is both consequential and expressive. The hypothetical role of details in addressing these goals is itemized below.

[9] Kirkwood, Niall. "Landscape and Detail." In *The Art of Landscape Detail: Fundamentals, Practices, and Case Studies*. New York, New York: John Wiley and Sons, 1999.

Cross-Purpose Performance Objectives

Objective: Reduce potable water use by capturing, cleaning, reusing, and recharging groundwater with all on-site stormwater.

Objective: Utilize art in natural and constructed site systems to enlighten the community about the role of water in our lives, in order to promote water stewardship. Tell a story.

DETAILS SERVING PERFORMANCE OBJECTIVES[8]

- Impervious Pavement Systems
- Street Drainage
- Parking Lot Drainage
- Drainage Structures and Check Dams
- Tree Trench
- cBio-swales and Bio-filters
- Many Small Infiltration Basins
- Recharge Beds
- Erosion Control
- Planting Details
- Low Water Use Plants
- Graywater Irrigation Details
- Architectural Water Harvesting Devices
- Cisterns and Water Storage Facilities
- Dry wells
- Trails
- Interpretive Signs
- Interactive Art
- Educational Amphitheater

Project Identity and Conceptual Transparency

Define the proposed character and identity of the place with three-dimensional details. Explore the role of landscape detail as an art form. Acknowledge that details are not merely details, but details are everything; our man-made world is fully and solely comprised of details, components of larger environments.

[10] "Site Design and Landscape Details." Bay Area Stormwater Management Agencies Association. http://strawberrycreek.berkeley.edu/pdfs/Start@Source/sats6sitedesign&land.pdf.

While built form should indeed be derived from performance and function, the art of the detail may also be more metaphorically derived from the seminal idea for the proposed design. This approach is referred to as conceptual transparency, a process used by a share of architects to instill each building with a "retrievable idea" that is derived from the project thesis position. Here, the architecture and art of the architecture respond to basic questions or dilemmas dictated by the most fundamental conditions of the project. These answers are collectively applied to the aesthetic personality of the project.

The work of Herzog and De Meuron exemplifies this approach. As architects, the firm acclaims its search for the raison d'etre for each project as a means of determining the project aesthetic and detail design. They describe this process as a search for a "coherent totality." Each detail plays a role in building this totality, which will result in a built outcome unique to the project.

At the Ricola Factory and Storage Center in Mulhouse, France, Herzog and De Meuron established a thesis that suggests a beneficial relationship between worker productivity and comfort and nature, beauty, light, and life. That single idea established the aesthetic and detailed form of the building, with wall details designed to provide the work area with a steady, "pleasantly filtered" daylight. That light filtering was detailed by printing silkscreen plant motifs on translucent polycarbonate industrial panels. When viewed from interior workspaces, the panels [evoke] a serene, temperature- and light-moderating "curtain-like relationship to the site's trees and natural conditions."[9]

While many architects, landscape architects and other designers subscribe to the fundamental role of details in fulfilling conceptual intent, few commit to schematic processes where relationships between details and the whole are rigorously exposed. The architect Carlo Scarpa understood this process as "a fundamental inquiry into any aspect of reality between the part and the whole, the fragment and the complete, the detail and the invisible unity of a deed, of an object, of a thought." For Scarpa, that inquiry was informed by context, history, culture, and materiality and is stunningly evident in the built outcome of his work. In this way, project identity and conceptual transparency are most vividly demonstrated in the details.[10]

[11] Mori, Toshiko. *Immaterial/Ultramaterial: Architecture, Design, and Materials*. Cambridge, MA: Harvard University Graduate School of Design, 2002.
[12] "Carlo Scarpa, Architecture in Detail." NBM Media. www.nbmcw.com/articles/architects-a-project-watch/708-carlo-scarpa-the-visionary.html

Storytelling

Landscapes tell stories with natural and built artifacts. Natural conditions such as topography, vegetation, and water provide surficial evidence of millennia-long processes. Attributes such as rock striations, watermarks, and talus represent historic or ongoing chapters of the site's natural history. Man-made interventions are layered upon natural systems as records of our occupation. These interventions tell the story of our role on the site. That role could involve selling, playing, competing, celebrating, seeking shelter, or other elemental human activities.

The most durably built details can suggest what was most important to us at the time of initial occupation. Those details may include elements such as cisterns, alters, or game boards.

It is these details, and the relationship between natural and built systems that represent our values at the time of construction. These values collectively define, in part, the culture of societies. This is an important premise, suggesting the importance of landscape architecture and site construction in defining, promoting and promulgating a public way of life.

In contemporary application, details represent the "set pieces" of a designed environment, and as such should be conceived and arranged to convey the narrative intent of the project. That intent, again, speaks to our highest values and aspirations for that particular built work and its occupants. In that sense, physical priorities should be determined in order to tell that story most vividly.

In developing initial character or detail sketches, the landscape architectural team should gather to define notions concerning the story that the built landscape will evoke. That story should resonate through the voice of primary details, prevalent attributes or common materials.

Establish the Quality of the Project

Sketch details should be developed with an understanding of intended quality, and should follow the development of a site cost model and associated construction budget. While cost models are not exhaustively defined here, budget and cost determinations are implicit in any design and documentation exercise. For these purposes, cost models may be defined as any measurable strategy for establishing the intended program and associated quality, before design work is initiated. That suggests that cost models are distinguished from cost estimates, where actual design proposals are quantified and assigned unit costs. Note that in the design industries, cost models are defined variously, and in many cases, are associated with specific design proposals and construction cost estimates.

As noted, cost models will define material and component quality and programmatic intent of the project. These intentions must be evident in schematic sketch details, used together with character images, program, and other drawings to visually highlight specific attributes.

The landscape architect will need to determine processes for aligning illustrated quality with the proposed cost model and associated construction budget. This can be accomplished by drawing from comparable projects or historic data for construction types or systems. For example, cost data from comparable over-structure plazas may be used to establish comparable quality intent, as illustrated materially and programmatically. These data will need to be adjusted for inflation and translated into composite unit costs.

As part of the quality-setting exercise, the landscape architect will need to determine how to best apply the client's funds. That is an important skill, both strategically and technically, as designers are expected to bring value to their clients. Consequently, broad quality strategies should be evident in the initial detailing exercise. Various quality-setting strategies are typically used to apply project budgets and include the following approaches:

- **Consistency,** applying quality uniformly across the site, to maximize value and durability across the project,
- **Make the money visible**, by concentrating higher quality in most visible areas, to suggest hierarchical importance, limit overall expense, or
- **Life-cycle quality**, where visible quality is less important than underlying sustainability over time.

Recommendations

Focus on key character details, a select collection of three-dimensional components that, for reasons of prominence, scale, or omnipresence, establish the primary identity of the project. These elements may include entry monuments, architectural features, prevalent furnishings, walls, or pavement systems.

Function or performance studied and defined in the detail exploration, simply as a means to determine how systems might work. Determine the relationship between how something works and how it looks.

Environmental systems, defining how they work and what they look like.

Art or interpretive components, included as components of project storyline.

The role of plants in accomplishing project objectives.

Descriptive title for each detail or multiple detail drawing. The title might speak to intent or function of the component or system, for example, "Recycled Concrete Retaining Walls," "Low Impact Lighting," or "Interactive Site Furniture."

Annotation, incorporating notes that focus on intent and logic, rather than construction requirements. For example, notes on a water feature sketch might read "Lighted water wall on textured stone, with minimal water volume to wet surface."

Graphic Requirements

Graphic medium that allows quick exploration rather than refined, precise, or highly rendered styles. Utilize a single medium, and preferably, the same drawing style, for each detail.

Hand-drawn, or schematic digital format, with emphasis on scale, form, and material qualities.

Three-dimensional emphasis, in order to most effectively understand form, scale and proportion.

Details organized by **system,** type or geographical organization on the site.

Supplemental Recommendations

Consider one of the following sheet layout formats:

- Detail sheet blocked out resembling Design Development and Construction Document sets
- Sketch Details positioned on an associated site plan, to readily illustrate relationships between details and plan position
- Sketch Details consolidated in a composite "scene," a portion of the project where key details and components interface

Best Practices

Design

Design details are often developed as the final step of the design and documentation process. An alternative, holistic design approach is proposed, where plan, sectional, and detail studies are developed together from the outset. Plan forms and associated detail components

can be understood together as a set of related and interdependent decisions.

"Working from the detail or the particular to the general reverses the traditional way in which the landscape design process is generally taught and carried out. The relationship between part and whole, the fragment and the completed work, the detail and the landscape, therefore becomes more significant in the landscape architect's creative process."[11]

Characterize the total design proposal with a set of adjectives and characteristics, then work to carry these descriptions through the detailing exercise.

Coordination

Sketch details are crafted to quickly understand the relationships between interdisciplinary materials and components and to allow for initial coordination with other consultants on the design team.

[13] Kirkwood, Niall. "Landscape and Detail." In *The Art of Landscape Detail: Fundamentals, Practices, and Case Studies*. New York, New York: John Wiley and Sons, 1999.

Sketch details may be used to depict specific connections to items such as existing and proposed architecture, roadways, utilities, and water bodies that require interdisciplinary coordination.

Include specialized features, for example, art, water features, and environmental systems that may require specialized consultant coordination.

Sketch details provide the contractor with an initial understanding of the proposed systems and may promote discussion and coordination regarding installation and cost.

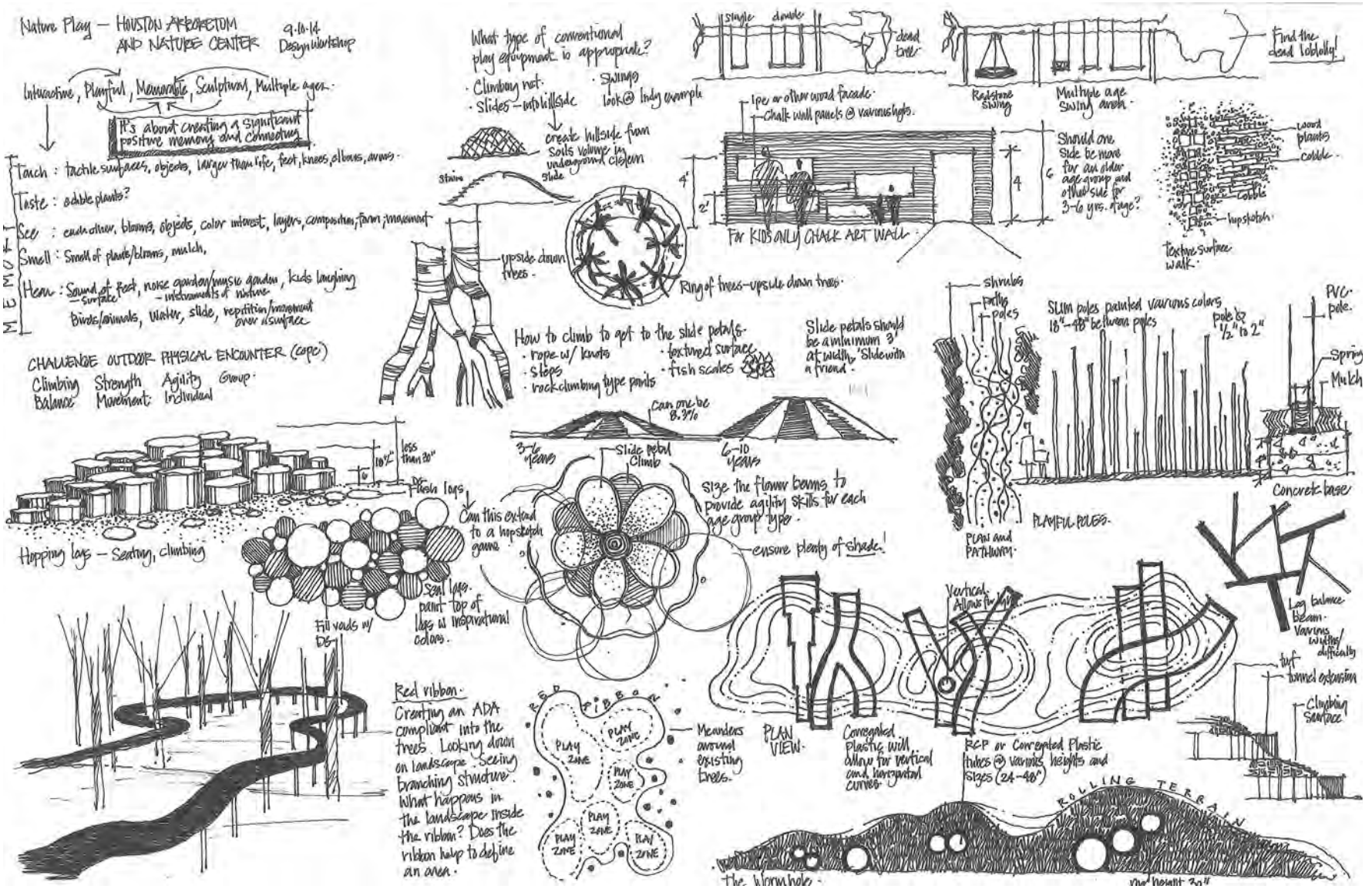
Technical

Utilize research processes to innovate and ensure aspects of sustainability are incorporated and adequately detailed. For example, do illustrative composite sections depict systems that comply with the metric goals established earlier in the sustainable design process?

Strategies

Utilize Sketch Details to communicate the vision, focusing on scale, form, proportion, and aesthetic. Select the content and drawing medium to showcase the essence of that vision.

Example of SD Sketch Details



Preliminary Project Descriptions

Objective

Preliminary Project Descriptions (PPDs) define early design ideas and initially proposed construction systems in a pre-specification, nontechnical format that is easily understandable by owners, lenders, and the general public, but specific enough for contractors to use in evaluating projects.

General Requirements

PPDs describe building systems and assemblies by function and performance rather than by construction products and materials. Instead of listing bricks and mortar, for example, PPDs describe the exterior wall by aesthetic function and weather resistance performance, allowing for design options to meet the project's goals.

PPDs provide an opportunity to explore options for design and cost impact before committing to a single solution. PPDs help narrow the many design options to arrive at the best solution through the rigor of an industry accepted format—the same format used for preliminary construction estimating and Revit model assembly codes.[14]

The Construction Specifications Institute (CSI) helped develop the concept of the Preliminary Project Description [PPD] organized around UniFormat™ for written documents provided with Schematic Design phase drawings and has published recommendations for such documentation in *The Project Resource Manual: CSI Manual of Practice.*

Basic Underlying Ideas[15]

Written descriptions of the schematic design should be organized around systems and assemblies that correlate to prevailing industry methods of cost estimating for this phase.

Written descriptions should allow design professionals to provide sufficient information for cost estimating without the necessity of making final design decisions.

Using an industry-standard organizational format (CSI UniFormat™ is the baseline) provides a checklist to help design teams ensure that all appropriate subjects are included.

[14] "Preliminary Project Descriptions." Conspectus, Inc. www.conspectusinc.com/services-specifications-ppd.htm.

[15] Majority of PPD content derived from notes taken from presentation made by Louis Medcalf, FCSI, CCS titled "Preparing Preliminary Project Descriptions," CONSTRUCT 2009 Conference: June 16-19, 2009, Indiana Convention Center, Indianapolis, IN.

AUDIENCES

- Owners, Lenders, Public Funding Agencies
- Design Team
- Construction Team
- Estimators

DOCUMENT USES

- Design Documentation
- Cost Estimating
- Integrated Practice
- Integration with Building Information Modeling [BIM]

DIFFERENCES FROM SPECIFICATIONS

- Narrative Language versus Technical Terminology
- Outline Specifications for Design Development Phase
- Construction Documentation Specifications
- Performance Specifications for design-build or lease/build-to-suit projects
- Primary Difference: Majority of final products to be incorporated into the project have not been made

Requirements

Organizational Methods

Design Narratives are organized by design discipline.

Preliminary Project Descriptions are organized by systems and assemblies using CSI/CSC UniFormat™.

WHAT IS UNIFORMAT™?

- It is an organizational tool that allows construction projects to be described by functional elements that comprise systems and assemblies.
- Elements can be described in terms of function without having to make final design decisions on their components.
- Functional descriptions are easier to understand by readers who are outside the A/E/C industry and by other design disciplines.

BASIC UNIFORMAT™ ORGANIZATION

Element A – Substructure

Element B – Shell

Element C – Interiors

Element D – Services

Element E – Equipment and Furnishings

Element F – Special Construction and Demolition

Element G – Site Construction

Element Z – General

ADVANTAGES

- PPDs use the same organizational structure as prevailing industry methods for cost estimating at Schematic Design phase.
- PPDs provide industry-standard format free of regional, local, or individual firm variations and facilitate information retrieval.
- By using UniFormat™, a detailed checklist allows design teams to ensure that all essential systems and assemblies have been considered in the design.
- PPDs are more readable and easy to understand by the owner, lending institutions and other lay audiences.
- PPDs provide a method for describing construction in sufficient detail for cost estimating without the necessity of making final design and product decisions.
- PPDs provide a method in which alternative solutions can be described and compared for value analysis.
- PPDs allow written descriptions to correspond to and potentially be linked with the objects in BIM software because they share a common organizational methodology.

DISADVANTAGES

- No standard structure for narrative language.
- Wide variations in format between firms and even between disciplines within firms.
- No industry-standard checklist to ensure completeness.
- No correspondence to industry-standard cost-estimating procedures for Schematic Design phase.
  - Not recommended by professional societies.
  - Not fully aligned or integrated with BIM.
  - Difficult to coordinate content with the drawings.
  - Difficult to move directly from the drawings to corresponding information about specific materials in the design narratives.

Content Guidelines

Analysis of Controlling Attributes

For each element, it is necessary to determine what attributes will communicate design intent, govern final product selection, and affect cost estimating.

Controlling Attributes

Design Intent: Element descriptions must communicate to the owner the nature of the project, including quality level, so that the owner can evaluate whether the proposed design meets its expectations and can provide informed approval.

- Functional or operational requirements
- Appearance
- Quality level
- Service life
- Sustainability and maintenance factors

Final Product Selection: Element descriptions should form the basis for final product selection and the Preliminary Project Description should be available to all members of the design team as they proceed during the next design phase.

- As the design progresses in the next phase, the design team will select components to be specified for each element.
- Because the owner has given formal approval of the PPD, changes in element requirements must be presented to the owner for approval.

Cost Estimating: Element descriptions must provide sufficient information for the desired level of accuracy.

- Level of detail in element descriptions important in order to clearly understand what is being proposed.
- Submittal and other administrative requirements not needed unless they affect cost.
- Testing, inspecting, and performance verification procedures should be described.
- Most installation requirements that do not affect cost need not be included, unless needed for full understanding of the element.

LEVEL OF DETAIL FOR NARRATIVE LANGUAGE

- Preliminary project descriptions should be brief, readable, and free of irrelevant information.
- The primary goal suggests that the PPD and the drawings it accompanies should be complementary documents developed at the same general level of detail, and coordinated with each other to provide a coherent, unified description of the project.
- The definition of schematic design may vary between firms and may vary even within a single firm, depending on the nature of the project. Consequently, associated level of detail in plans and PPDs should complement each other.
- When budgets or schedules are tight or when accuracy of the schematic design cost estimate is critical, more detail should be provided.
- The relationship of owner and contractor or nature of the project may allow simplified detail.
- Element descriptions within a PPD will vary in detail.
- Description detail level may vary amongst disciplines, for example, concrete walks for a high-rise building need not be as detailed as the description of the curtain wall.
- Sufficient detail must be provided in both the drawings and the PPD for the design team or an independent code consultant to verify compliance with regulatory requirements.

Relationship to BIM

Major BIM software providers use UniFormat™ categories and numbering for objects in the model.

PPD elements can provide written information for each object category in BIM and share numbering and terminology.

Structure of a Preliminary Project Description

Introductory Information

PROJECT INFORMATION:

- Project name and location.
- Owner name and address.
- Design team information, including consultants.
- Consultants or other participants employed by the project owner, with brief descriptions of their contribution to the project.
- Descriptions of project elements that are not designed by the design team are essential for accurate estimating of total costs.
- Construction team information.
- Identification of zoning agencies, design review boards, code enforcement agencies, insurers, and funding agencies.
- Special security requirements and procedures, such as those for airports, embassies, courthouses, and correctional facilities that affect overall project design and construction procedures.

PROJECT DESCRIPTION:

- Very brief description of the project for the purpose of clarifying scope of responsibilities of various participants.
- In some cases, a brief history of the determination of a need for the project may be useful.
- Statement of owner's goals for the project, including sustainability considerations.
- Project program, if required by the owner.

PROPOSAL, BIDDING AND CONTRACTING:

- Methods of project delivery can affect both design and construction costs.
- Proposed contract forms.
- For traditional methods, a simple summary statement may be sufficient. For newer, integrated methods where the owner, architect, and contractor work together under a single contract, it will be necessary to summarize the scope of responsibilities of each party.

- For projects utilizing BIM, include statements about ownership of the model and how and when information will be transferred between participants.

COST SUMMARY:

- In some cases, the design team will prepare a cost estimate that can be documented here, as either a major element summary or more detailed version.
- If alternative schemes are being considered, cost information for each scheme should be included.
- In cases where the cost estimate will be prepared by a separate consultant or by the contractor team at a later date, provide statements describing responsibility and procedures for obtaining the cost estimate.

ELEMENTS A THROUGH G

Element Numbering and Titles

- Titles at UniFormat™ Level 3 usually work best to describe multiple types of the same element, because they correspond with preliminary cost estimate line items.
- Most projects have more than one type of some functional elements, such as exterior walls.
- Element names should be coordinated with drawing notes.
- Element numbering should be coordinated with BIM software.

Multiple Instances

Multiple instances of a given element should be distinguished by appending additional digits to the basic Level 3 UniFormat™ number.

By Name:

B2010.001 Exterior Masonry Wall: Masonry cavity wall with . . .

B2010.002 Exterior Timber Wall: Wood Timber wall with . . .

By Location:

B2010.001 Lower Level Exterior Wall: Masonry cavity wall with . . .

B2010.002 Upper Level Exterior Wall: Corten Steel Veneer wall with . . .

By Type:

B2010.001 Exterior Wall Type 1: Masonry cavity wall with . . .

B2010.002 Exterior Wall Type 2: Dry-stack boulder wall with.....

Graphic Requirements

FORMAT

The level of detail to be used in the text may influence which format is selected.

- Outline Format
- Tabular Format

OUTLINE FORMAT

Xnnn.nnn Element Name

A. Description: [brief generic description of the element]

B. Functional Requirements: [requisites for the element as a whole]

1. Performances: [factors relating to what the assembly does within the project]
   a. Code requirements
   b. Assembly thermal or acoustical requirements
   c. Aesthetic requirements
   d. Service life
   e. Assembly operational requirements
2. Characteristics: [factors that may affect cost, but are not attributes of the physical components of the assembly]
   a. Delegated design requirements
   b. Single source responsibility
   c. Activities to verify performance
   d. Sustainability or LEED requirements
   e. Historical requirements

C. Components: [descriptions of the parts that comprise the element, whether they come from a single source or multiple sources]

1. Component 1:
   a. Component Attribute
   b. Component Attribute
2. Component 2:
   a. Component Attribute
   b. Component Attribute

Outline Format Example

B2010 EXTERIOR WALLS

B2010 Masonry Veneer Walls

A. Description: Face brick veneer with architectural precast concrete trim, insulated cavity, air and water barrier membrane, sheathing, and cold-formed metal framing back-up.

B. Functional Requirements:

1. Thermal Performance: Minimum assembly U-value of 0.06 per International Energy Conservation Code.
2. Aesthetic Requirements: Match appearance of existing building.

C. Components:

1. Brick: Match existing jumbo size brick.
2. Precast Trim: Match existing. Portions will have decorative moldings with multi-color finish to match existing building.
3. Cavity Insulation: Extruded polystyrene, R-10
4. Weather-Resistive Barrier: Liquid-applied air and water barrier membrane vapor permeable.
5. Sheathing: Glass-mat faced gypsum sheathing.
6. Framing: 4-inch cold-formed metal framing, delegated design.
7. Framing Space Insulation: R-13 unfaced fiberglass batts.

Tabular Format-Example

A tabular format may be preferable for projects where descriptions of functional and component requirements are simpler.

B20 EXTERIOR ENCLOSURE

B2010 EXTERIOR WALLS

Thermal Performance: Minimum assembly U-value of 0.06 per International Energy Conservation Code.

Aesthetic Requirements: Match appearance of existing building.

Exterior Wall Exterior Skin: Aluminum-faced composite metal panel cladding system with face sealed joints; 4 mm thickness, factory-applied fluorocarbon coating in metallic color.

Sealant: Medium modulus silicone.

Best Practices

Design

Incorporate site materials and components that have proven long-term success in similar climate and maintenance conditions. Define desired project material attributes and assess performance of similar materials in the local project area.

Coordination

PPDs should focus on site-specific landscape architecture components but should also include work prepared by subconsultants, for example, civil engineer, irrigation consultant, and lighting designer. The PPDs should represent a comprehensive depiction of site development, for design and technical coordination.

Technical

Product information included in PPDs should be specific enough to convey material attributes such as type, color, finish, and texture but also convey construction-related attributes, for example, embedded, surface mount, reinforced, salt-spray resistant, and so on.

Schedules, for example, Materials, Lighting, Furniture, Plants, and the like, are not typically provided but can be if the project requires. Incorporate within the respective articles within PPDs.

Strategies

The PPDs establish the foundation for technical specifications to be developed in the next phases of design. The core "product" and "execution" information required to adequately implement the proposed element should be obtained and recorded. An exhaustive account is not required at this stage of design, but sufficient information to describe intent should be conveyed in the PPD narrative.

G BUILDING SITEWORK

G1010 Site Clearing

G1010.1 Stripping and Stockpiling of Topsoil

Site topsoil to be stripped to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials and stockpiled on site away from edge of excavations without intermixing with the subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Remove subsoil and nonsoil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.

G1030 Earthwork

G1030.1 Rough Grading

Uniformly grade areas to create a smooth surface, free of irregular surface changes. Comply with compaction requirements in the Geotechnical Report and grade to cross sections, lines, and elevations indicated on the drawings. Slope grades to direct water away from buildings and to prevent ponding.

G1030.2 Finish Grading

Finish subgrades to required elevations within a minimum tolerance of 13mm. Provide a smooth transition between adjacent existing grades and new grades.

G1030.3 Slope Protection and Erosion Control

Provide slope protection and erosion control measures (Biodegradable wood excelsior, straw, or coconut-fiber blankets or cellular, non-biodegradable matting) on all slopes in excess of 3:1. Acceptable products shall be Slopetame 2, as manufactured by Invisible Structures, Inc. or equal.

G20 SITE IMPROVEMENTS

G2030 Pedestrian Paving

G2030.1 Granular Base Courses

Prepared and compacted granular layers placed prior to the installation of pedestrian paving and in accordance with the Geotechnical Report. Provide positive drainage and ensure there aren't any soft pockets or areas of excess yielding. Provide subsurface PVC sleeves as required for irrigation system, lighting, utilities, etc.

G2030.2 Flexible Pedestrian Pavement

Finished pedestrian pavement of locally quarried, compactable, granular materials, 75mm in depth, held true to line with metal edge restraints. Finish surface shall be flush and meet smoothly and evenly with adjacent surfaces. Provide positive drainage.

1. For porous paving surfaces, provide locally quarried, crushed stone or gravel materials, free of granular fines, 18mm in size and 225mm in depth, with compatible crushed aggregate subbase to allow water to permeate through surface.
2. Acceptable metal edge restraint products shall be as manufactured by Sure-Loc Edging Corporation or equal.

G2030.3 Rigid Pedestrian Pavement

Finished pedestrian pavement with high bending resistance concrete. Finish surface shall be flush and meet smoothly and evenly with adjacent surfaces. Provide positive drainage.

1. Natural/Gray concrete with medium broom finish.
2. Integrally colored concrete with medium broom finish, color to be determined by Owner from manufacturer's full range of samples. Acceptable manufacturer shall be Scofield Systems or equal.
3. Integrally colored concrete with 13mm seeded aggregate finish, color to be determined by Owner from manufacturer's full range of samples. Acceptable manufacturer shall be Scofield Systems or equal.

G2030.4 Exterior Steps and Ramps

Cast-in-place integrally colored concrete steps with medium broom finish, color to be determined by Owner from manufacturer's full range of samples. Finish surface shall be flush and meet smoothly and evenly with adjacent pavement surfaces. Provide positive drainage on treads – 2 percent slope/pitch. Provide 50mm O.D. metal handrails, 900mm in height, with high performance paint finish, color to be determined by Owner from manufacturer's full range of samples. Finish shall be smooth to touch with no rough edges.

Cast-in-place integrally colored concrete ADA ramps with medium broom finish, color to be determined by Owner from manufacturer's full range of samples. Finish surface shall be flush and meet smoothly and evenly with adjacent pavement surfaces. Ramps shall not exceed 8.33 percent slope/pitch and 1.6m x 1.6m landings shall be provided every 10m in length or at changes in direction. Maximum slope/pitch of landings shall be 2 percent in all directions. Provide 38mm O.D. metal handrails, 900mm in height, with high performance paint finish, color to be determined by Owner from manufacturer's full range of samples. Finish shall be smooth to touch with no rough edges.

1. Acceptable manufacturer for colored concrete admixtures shall be Scofield Systems or equal.
2. Acceptable manufacturer for high performance paint finish shall be Benjamin Moore & Company or equal.

G2040 Site Development

G2040.1 Fountains

Exterior fountains with water basin. Plumbing, waterproofing and system equipment shall be by Mechanical Engineer or Contractor on "Shop Drawing" basis.

Pools

Water basins as indicated in parks and plaza spaces. All finishes, plumbing, waterproofing, and recirculating equipment shall be by Mechanical Engineer or Contractor on "Shop Drawing" basis. Basins are designed to hold no more than 18" of water that may include water tolerant plant material and aquatic animal species.

Swimming Pool

The swimming pool identified as part of the country club. All finishes, plumbing, waterproofing, lighting, and re-circulating equipment shall be by Mechanical Engineer or Contractor on "Shop Drawing" basis.

G2040.2 Fences and Gates

Exterior fences and gates.

G2040.3 Site and Street Furnishings

Exterior manufactured site furniture and fixtures.

1. Acceptable manufacturer and product for benches shall be Landscape Forms, model 35 Stay or equal. Color and Finish to be selected by Owner from manufacturer's full range of samples.
2. Acceptable manufacturer and product for bicycle racks shall be Urban Accessories, Model D Bike Rack or equal. Color and Finish to be selected by Owner from manufacturer's full range of samples.
3. Acceptable manufacturer and product for planter pots shall be Concrete Creations LA, model Dan or equal. Color and Finish to be selected by Owner from manufacturer's full range of samples.
4. Acceptable manufacturer and product for trash and ash receptacles shall be Landscape Forms, model Petoskey or equal. Color and Finish to be selected by Owner from manufacturer's full range of samples.

G2040.4 Exterior Signs

Entry Identification Monuments will be integrally colored stucco over a CMU block wall on a poured-in-place concrete footing. Horizontal "banding" will be local red/orange sandstone. Logo (Ludhiana) letters are fabricated dimensional metal with internal warm white LED illumination for a halo lighting effect at night. Lighting to be controlled via a concealed photo cell. Niche with accent light (type and manufacturer to be determined by owner)

Dimensions of the Entry Sign: Left Wall: 1.8m, Right Wall: 2.5m, Length: 7.6m, Width: .5m, Letter height: 30 cm

G2040.5 Retaining Walls

Cast-in-place concrete or concrete masonry unit core retaining walls with finish/veneer to match architecture. Provide structural engineering, dampproofing and subsurface drainage as required by structural and civil engineers.

G2050 Landscaping

G2050.1 Irrigation Systems

In-ground, automatic-control irrigation system, as manufactured by Rainbird, Toro or equal, including excavation and backfill, piping, equipment and accessories, including but not limited to: backflow preventer, controllers, evapotranspiration (ET) monitors and moisture sensors.

1. For irrigation systems using recycled wastewater, captured rainwater, or other locally approved non-potable water sources, provide equipment and accessories, especially filters, compatible with these water sources.

G2050.2 Soil Preparation

Provide preparation of planting soil for lawns and planting in accordance with the recommendations set forth in the Soils Analysis Report (provided by a locally certified/qualified soils testing laboratory), including application and mixing of soil amendments.

G2050.3 Lawns and Grasses

Provide for the seeding of native grass areas and sodding of lawn areas. Grass seed shall be fresh, clean, dry crop-seed with not less than 95 percent germination, 85 percent pure seed and not more than ½ percent weed seed. Sod shall be viable, of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.

G2050.4 Trees, Plants and Groundcovers

Provide full, dense, healthy specimen trees, shrubs, perennials, ornamental grasses, annuals, vines and bulbs in accordance with the American Association of Nurserymen's "American Standards for Nursery Stock" or Indian equivalent.

Provide full, dense, healthy specimen wetland plants, including wet-cultured stock, dormant herbaceous propagule, including bulbs, tubers and rhizomes, bareroot herbaceous plants, peat-potted herbaceous nursery stock and plugs.

G2050.5 Plant Maintenance

Provide one year of plant maintenance for all newly planted areas including mowing, pruning, watering and fertilizing.

G2050.6 Planting Accessories

Provide the following accessories for the exterior plants:

1. For all trees: wood or metal stakes and guying. Acceptable products shall be ArborBrace Tree Guying System and ArborBrace Palm Bracing as manufactured by Arborbrace or equal.
2. For all shrub planting areas: nonwoven, polypropylene or polyester fabric geotextile weed-barrier. Acceptable products shall be Mirascape as manufactured by Mirafi or equal.
3. Between all planting areas and lawn/grass areas: metal edging. Acceptable metal edging products shall be as manufactured by Sure-Loc Edging Corporation or equal.
4. For all planting beds: 75mm thick, pea-gravel mulch, color to be selected by Owner from Manufacturer's full range of samples.

G30 SITE IMPROVEMENTS

G3010 Water Supply

G3030.1 Water Wells

Provide water wells, including digging, drilling, jetting and well head pumps, for each property/plot.

G3030.1 Storm Water Collection

Provide system for collecting and transmitting water from the site and building rain water. Incorporate vegetated bio-filtration swales and rain gardens to absorb and infiltrate runoff from impervious surfaces. Minimize the use of subsurface pipe systems.

G3030.2 Storm Water Ponds and Reservoirs

Provide storm water detention and retention ponds, including excavating, grading and impermeable liners. Ponds shall include the amenity lake, detention ponds, and constructed wetlands.

G40 SITE ELECTRICAL UTILITIES

G4020 Site Lighting

G4020.1 Street Lighting

Provide exterior street lighting systems for all streets including underground electric feeders and branch circuits, transformers, wire, conduits, ductbanks, manholes, controls, grounding system and installation. Poles and luminaires shall be as manufactured by LUMEC, model Domus Small Series DOS-DBB-2 with 4.88m ht. AM63 poles for the boulevards, DOS-LR-DBC with 4.27m ht. AM63 poles for the secondary streets, and DOS-LD-YM with 3.05m ht. AM3 poles for the residential streets or equal. Color and Finish to be selected by Owner from manufacturer's full range of samples.

G4020.2 Area Lighting

Provide exterior area lighting systems for pedestrian walkways including underground electric feeders and branch circuits, transformers, wire, conduits, ductbanks, manholes, controls, grounding system and installation. Poles and luminaires shall be as manufactured by LUMEC, model Domus Small Series DOS-LD-YM with 3.05m ht. AM3 poles or equal. Color and Finish to be selected by Owner from manufacturer's full range of samples.

G4020.3 Feature Lighting

Provide exterior lighting for site features, i.e. sculpture, stairs, walls and ramps, including transformers, wire, conduits, ductbanks, manholes, controls, grounding system and installation. Luminaires shall be as manufactured by Bega or equal. Color and Finish to be selected by Owner from manufacturer's full range of samples.

Provide exterior underwater lighting for site water features, i.e. ponds, pools and fountains, including transformers, wire, conduits, ductbanks, manholes, controls, grounding system and installation. Underwater luminaires shall be as manufactured by Nexxus Lighting or equal.

G4020.4 Landscape Lighting

Provide exterior lighting to illuminate feature planting areas, including transformers, wire, conduits, ductbanks, manholes, controls, grounding system and installation. Luminaires shall be as manufactured by Louis Poulsen, SPR Series or equal. Color and Finish to be selected by Owner from manufacturer's full range of samples.

Site Cost Model/Construction Budget/Estimate of Probable Construction Costs Pre-Design, SD, DD, and CD Phases

Note that the recommendations that follow encompass the Pre-Design Construction Budget and the SD, DD, and CD Estimates of Probable Construction Costs. Cost estimating is required for each phase of the design and documentation process, and on multiple occasions at each of these phases. While an exhaustive tutorial on cost estimating is not provided within this publication, the importance of completing a cost estimate at each phase cannot be overemphasized. The recommendations are positioned with the Schematic Design documents to reinforce the importance of confirming that the Schematic Design meets the budget established for the work, prior to advancing into the rigors of Design Development.

Objective

The SD Site Cost Model and the associated Construction Budget define total costs necessary to construct all site improvements to fulfill the mission and quality level objectives for the project.

The Estimate of Probable Construction Costs defines the total built cost of the proposed design in order to be compared to the Construction Budget.

General Requirements

Prior to design, explicitly and comprehensively define the project construction budget for work under contract by the landscape architect.

A construction budget is not a cost estimate. Construction budgets are generally allocated prior to any significant design work. Cost estimates are prepared with quantity takeoffs, details and specifications to define the current opinion of probable cost for an existing design proposal.

As projects progress through each design phase, cost estimates evolve in approach, from budgeting upcoming design work to quantifying and estimating current design work.

That evolution is characterized by the following attributes:

- Increasing amount of information available
- Increasing design detail level
- More precise quantities
- Unknowns and associated assumptions reduced

Distinctions between each phase of the design budgeting and estimating process are defined:[12]

[16] " Manfredonia, Bill, Joseph P. Majewski, and Joseph J. Perryman. "Cost Estimating." In Whole Building Design Guide, A Program of the National Institute of Building Sciences. May 28, 2010. www.wbdg.org/design/dd_costest.php.

Pre-Design: *Order of Magnitude Budget*

Purpose:

Establish preliminary Pre-Design budget, in order to evaluate feasibility of program, targeted improvements, and quality level.

KEY INFORMATION NEEDED:

- Approximate area sizes for major types of site development.
- Historic (recent or inflation-adjusted) composite cost data from similar projects, for example, square foot unit costs for typical areas such as plazas, sports fields, gardens, or parking.

DOCUMENTATION FORMAT:

- Plan diagram designating major types of site development.
- Program and quality level imagery.
- Simple spreadsheet designating composite costs per target area.

Schematic Design: *Order of Magnitude Estimate*

PURPOSE:

Establish approximate estimate of construction costs, in order to compare proposed improvements to previously established budget. SD estimates may also be used to compare alternative design solutions.

KEY INFORMATION NEEDED:

- Specific area sizes for detailed types of site improvements, for example, stone plaza over waterproofed structure, water fountain, playground, and amphitheater.
- Historic (recent or inflation-adjusted) composite cost data from similar projects for detailed site improvements.

DOCUMENTATION FORMAT:

- Site Materials Plan designating detailed types of site improvements.
- Program, material and quality level descriptions, as defined by PPDs, plans, details, and imagery.
- Spreadsheet organized to coincide with PPDs, designating composite costs per proposed improvements, or UniFormat™ estimating system.

Design Development: *Detailed Estimate of Probable Costs*

Purpose:

Establish precise estimate of probable construction costs, in order to make final adjustments to design program and materials to meet budget requirements.

KEY INFORMATION NEEDED:

- Quantification of all materials, systems, components, and costs.
- Current market unit pricing for all materials, systems, and components.
- Complete and coordinated Design Development Plans and details.
- In-progress specifications.
- Soil and geotechnical conditions.
- Infrastructural needs.

DOCUMENTATION FORMAT:

- Program, material, and quality level descriptions as defined by Outline Specifications, plans, details, and imagery.
- Spreadsheet organized to coincide with either Site Detail Keynote List or specification content and organization.

Construction Documentation: *Pre-Bid Estimate of Probable Costs*

Purpose:

Complete final verification that proposed design meets budget requirements. Define opportunities for value engineering if necessary.

KEY INFORMATION NEEDED:

- Quantification of proposed improvements

DOCUMENTATION FORMAT:

- Bid Tab spreadsheet

Specific Requirements

ESTIMATE OF PROBABLE CONSTRUCTION COSTS

- Materials, Elements, Systems, and/or Work Requirements
- Permitting
- Contractor Mobilization
- Surveying/Engineering Layout
- Inspections and Testing
- Contractor Overhead and Profit
- Site Demolition
- Site Remediation
- Site Preparation
- Grading (including Cut, Fill, and Hauling)
- Walls and Other Retaining Devices
- Drainage Infrastructure (including Pipes and Structures)
- Hardscape, for example, Pavements by Type
- Railings and Other Metal Work
- Landscape Materials (for example, Topsoil, Edging)
- Plants, (that is, Trees, Shrubs, Groundcovers)
- Irrigation
- Site Furniture
- Lighting
- Signage
- Art
- Specialties
- Unit of Measurement (for example, each, square foot, ton)
- Quantity
- Installed Unit Price (including Material, Labor, Equipment)
- Total Cost per Material, Element, System, or Work Requirement

Graphic Requirements

Estimate of Probable Construction Costs

Use organization of PPDs as baseline for SD Estimate of Probable Construction Cost spreadsheet. Items numbers and descriptions should match.

Titles and headings should be represented in bold text.

Use Site Detail Keynote List or Specification Sections for DD and CD.

Section items and titles should be in all capitals.

Subtotal and section total amount tallies should be represented in bold text.

Best Practices

Construction Budget

Usually provided by Client to guide design process. However, may be generated during the design process.

Upon completion of a Concept Site Plan, highlight and quantify the site area to be designed under the landscape architect's contract. Exclude all projected building footprint areas. If possible, define a range of quality zones within the overall site area by assigning a unit cost to each of these areas. These areas may be very preliminary and generic in reference but will help to more effectively define an initial site budget.

Consider the following types of definitions:

- Existing Landscape Not to Be Disturbed ($*XX* per Square Foot)
- Proposed Landscape, Highest Quality Level ($*XX* per Square Foot)
- Proposed Landscape, Middle Quality Level ($*XX* per Square Foot)
- Proposed Landscape, Lowest Quality Level ($*XX* per Square Foot)
- Proposed Hardscape, Highest Quality Level ($*XX* per Square Foot)
- Proposed Hardscape, Middle Quality Level ($*XX* per Square Foot)
- Proposed Hardscape, Low Quality Level ($XX per Square Foot)
- Proposed Water Feature ($*XX* per Square Foot)
- Proposed Art Element or other Feature ($*XX* Lump Sum Allocation)
- Proposed Site Architectural Element ($*XX* Lump Sum Allocation)

Composite unit costs are assigned for each area. These costs include any site demolition, site preparation, mobilization, general conditions, and actual construction necessary to deliver the project.

Best Practices

Design

Develop a site budget based on proposed program and quality level for the project by calculating a total budgeted cost based upon targeted square foot unit costs. The square foot unit cost will be derived from historic project data, adjusted for inflation, to match intended quality and program for the project.

Utilize images to convey intended quality level(s) for the project. Organize these images by categories to coincide with zones as defined with the plan.

Technical

Historic Data and Inflation: Cost data should be based upon the latest industry pricing either available through recent estimating or bidding proposals, multiyear cost data, or by engaging a reputable estimator or contractor to provide pricing. Should the project be phased or delayed for future (six months or greater) implementation, costs for inflation should be incorporated.

> **BIM:** Currently used by architects and contractors, this technology has been slow to emerge in landscape architecture. BIM for site work allows contractors to receive data directly from the landscape architect's digital base models and incorporate these data directly into estimates, expediting the information transfer.
>
> **LEED Cost Implications:** Although typically associated with building-related projects, LEED certified site projects are increasing in frequency. Potential cost premiums associated with materials, systems, record keeping, certification process, if desired, should be incorporated within the cost model.

Coordination

Coordinate budgeting and estimating with a professional cost estimator and/or contractor. It is preferable for these professionals to lead the development of budgets and estimates. At a minimum, these professionals should be used to check quantities, unit costs, and the completeness of the estimate.

Coordinate quality levels between building development and site development in order to establish desired relationships.

Quantify landscape architecture budget separate from work completed by civil engineers. Include all other costs from face of building to back of curb at streets and parking areas. Include all components within this area, including site walls, signs, lighting, and site furnishings.

Strategies

Solicit the site construction budget from the client prior to beginning work in order to develop a fee proposal. Advance, further develop, and document that site construction budget as defined earlier.

Example of an SD Cost Estimate

2/8/2013

COA Republic Square
City of Austin Republic Square
Design Workshop
Conceptual Dwgs Dated 11-5-2012

EUDACORP

Item	Description	Takeoff Qty		Total Unit Cost		Total Amount
	204 ROW 5TH STREET CORRIDOR					
G	**BUILDING SITEWORK**					
G10	*SITE PREPARATION*					
G1030	*EARTHWORK*					
70-0100-0100	Airspade for decompaction, assumed 6" depth, amend with compost	2,403.00	SF	5.00 /SF		12,015
	G1030 EARTHWORK					*12,015*
	G10 SITE PREPARATION					*12,015*
G20	*SITE IMPROVEMENTS*					
G2031	*PAVING & SURFACING*					
70-0200-0100	Charcoal Unit Paver (Pedestrian)	685.00	SF	12.50 /SF		8,563
70-0200-0100	Charcoal Unit Paver (50% pervious)	1,604.00	SF	12.50 /SF		20,050
70-0200-0100	ADA Ramp and Truncated Domes	80.00	SF	15.00 /SF		1,200
70-0200-0100	Leuder Limestone Paving	80.00	SF	14.00 /SF		1,120
70-0200-0100	Charcoal Unit Paver (Vehicular), North Drive	216.00	SF	16.00 /SF		3,456
70-0100-0400	Cut & Remove Curb, at North Drive Entryway	20.00	LF	6.00 /LF		120
70-0100-0400	Curb & Gutter along 5th Street	225.00	LF	20.00 /LF		4,500
70-0100-0400	Remove & Replace Pavement	340.00	SY	75.00 /SY		25,500
70-0100-0100	Light Pole Base	4.00	EA	650.00 /EA		2,600
	G2031 PAVING & SURFACING					*67,109*
G2040	*SITE DEVELOPMENT*					
70-0100-0400	Parking Spaces, Standard Striping	7.00	EA	30.00 /EA		210
	G2040 SITE DEVELOPMENT					*210*
G2042	*RETAINING WALLS*					
XX-0000-X001	Tube Steel Rail- 1 1/2" diameter tube	252.00	LF	65.00 /LF		16,380
	G2042 RETAINING WALLS					*16,380*
G2044	*SIGNAGE*					
XX-0000-X001	Cap Metro Signage Program	1.00	EA	750.00 /EA		750
XX-0000-X001	Kiosk Parking Regulatory Sign	1.00	EA	750.00 /EA		750
XX-0000-X001	Banner Program Supports	4.00	EA	600.00 /EA		2,400
XX-0000-X001	Parking Pay Station	1.00	EA	2,500.00 /EA		2,500
XX-0000-X001	Downtown Austin Wayfinding Program (DAWP) Pedestrian Directional	1.00	EA	1,500.00 /EA		1,500
XX-0000-X001	Valet Parking Regulatory Sign	2.00	EA	750.00 /EA		1,500
	G2044 SIGNAGE					*9,400*
G2045	*SITE FURNISHINGS*					
70-0100-0100	Park ATM- A free-standing ATM, kiosk west, Infrastructure Only, Kiosk by Vendor	1.00	EA	1,500.00 /EA		1,500
70-0100-0100	Trash Can (Per Great Streets or Cap Metro Standard)	1.00	EA	1,200.00 /EA		1,200
70-0100-0100	Bike Rack (Per Great Streets Standard)	4.00	EA	1,200.00 /EA		4,800
70-0100-0100	Removable Bollard (Bollard Solutions), stainless steel tube, at North Drive Entryway	1.00	EA	1,500.00 /EA		1,500
70-0100-0100	Bench (Per Great Streets Standard)	1.00	EA	2,000.00 /EA		2,000
70-0100-0100	Parking Meter (Per City Standard), by CITY	1.00	EA			

2/8/2013

COA Republic Square
City of Austin Republic Square
Design Workshop
Conceptual Dwgs Dated 11-5-2012

EUDACORP

Item	Description	Takeoff Qty		Total Unit Cost		Total Amount
	G2045 SITE FURNISHINGS					*11,000*
G2050	*LANDSCAPING*					
200	Mulch, 4", at airspaded areas	2,403.00	SF	0.50 /SF		1,202
X001	Hardy Foundation Plantings, 1 gal	840.00	SF	6.00 /SF		5,040
10-0000-0400	Plant Bed Preparation	840.00	SF	0.45 /SF		378
200	Root Pruning	196.00	LF	25.00 /LF		4,900
	G2050 LANDSCAPING					*11,520*
G2057	*IRRIGATION SYSTEM*					
XX-0000-X002	Subsurface Drip line at 4" below surface for shrub beds, installed by airspade	840.00	SF	0.55 /SF		462
	G2057 IRRIGATION SYSTEM					*462*
	G20 SITE IMPROVEMENTS					*118,080*
G30	*CIVIL/MECHANICAL UTILITIES*					
G3010	*WATER SUPPLY*					
10-0000-0400	New Potable Water Service Connections	2.00	EA	3,500.00 /EA		7,000
10-0000-0400	Future Connection to a reclaimed water line	1.00	EA	2,500.00 /EA		2,500
10-0000-0400	1.5" Potable Water Line to Kiosk Meter	30.00	LF	16.00 /LF		480
10-0000-0400	Proposed Reclaimed Water line to irrigation Meter	40.00	LF	14.00 /LF		560
10-0000-0400	1" Water Line to Irrigation Meter	10.00	LF	14.00 /LF		140
10-0000-0400	Irrigation Meter	1.00	EA	800.00 /EA		800
10-0000-0400	Kiosk Meter	1.00	EA	500.00 /EA		500
10-0000-0400	Restroom Meter	1.00	EA	400.00 /EA		400
10-0000-0400	Potable Water Service to Restaurant Kiosk from Meter	20.00	LF	14.00 /LF		280
10-0000-0400	Potable Water Service to Support Building	30.00	LF	14.00 /LF		420
70-0400-0100	Street Cut & Patch	1.00	LS	5,000.00 /LS		5,000
	G3010 WATER SUPPLY					*17,680*
G3060	*GAS DISTRIBUTION*					
XX-0000-X001	New Gas Service to Food Kiosk	10.00	LF	14.62 /LF		146
	G3060 GAS DISTRIBUTION					*146*
	G30 CIVIL/MECHANICAL UTILITIES					*18,026*
G40	*ELECTRICAL UTILITIES*					
G4000	*ELECTRICAL UTILITIES*					
70-0200-0100	Street Lights- Great Streets pole light w/ painted black & 2 banner arms w/ optional pedestrian light	4.00	EA	7,500.00 /EA		30,000
70-0200-0100	Police Call Box Lights, blue LED	1.00	EA	850.00 /EA		850
70-0200-0100	Architectural Building Lighting, west of Kiosk	1.00	EA	4,300.00 /EA		4,300
70-0400-0100	Street Light Circuits	290.00	LF	30.00 /LF		8,700
	G4000 ELECTRICAL UTILITIES					*43,850*
	G40 ELECTRICAL UTILITIES					*43,850*
	G BUILDING SITEWORK					**189,971**
Z	**GENERAL REQUIREMENTS**					
Z10	*GENERAL REQUIREMENTS*					

11 DESIGN DEVELOPMENT AND CONSTRUCTION DOCUMENTS

Phase Checklist:

- ☐ Title Block
- ☐ Cover Sheet
- ☐ General Sheets
  - Site Reference Plans
  - Key Plans
  - General Information Sheets
- ☐ Plant Protection and Removal Plans
- ☐ Site Demolition Plans
- ☐ Site Materials Plans
- ☐ Site Layout Plans
- ☐ Site Grading and Drainage Plans
- ☐ Site Lighting Plans
- ☐ Site Details
- ☐ Tree Planting Plans
- ☐ Shrub and Groundcover Planting Plans
- ☐ Site Soils Plans
- ☐ Planting Details

This section continues with a detailed description of recommended practices for the Design Development (DD) and Construction Documents (CD), placing emphasis on representative graphic examples with associated itemization of recommended components.

The *Objective* or purpose of every component, or sheet within each phase is first defined. *General Recommendations* for each sheet are defined in order to establish broad needs. After the general recommendations, *Specific Recommendations* for each sheet are provided. *Graphic Recommendations* for each component or sheet are also defined. Finally, *Best Practices* are defined for each of the landscape architecture sheets. These practices are organized by category: design, technical, coordination, and strategies.

This section is organized to directly compare individual sheets within the Design Development and Construction Document sets. Distinctions between specific DD and CD sheets are important and vary per sheet series. DD and CD sheets are paired, for example, DD and CD Site Materials Plans, DD and CD site details. There are varied and widespread views on what defines Design Development and Construction Documentation documents. This publication seeks to clarify these distinctions, but may be subject to some debate within the industry.

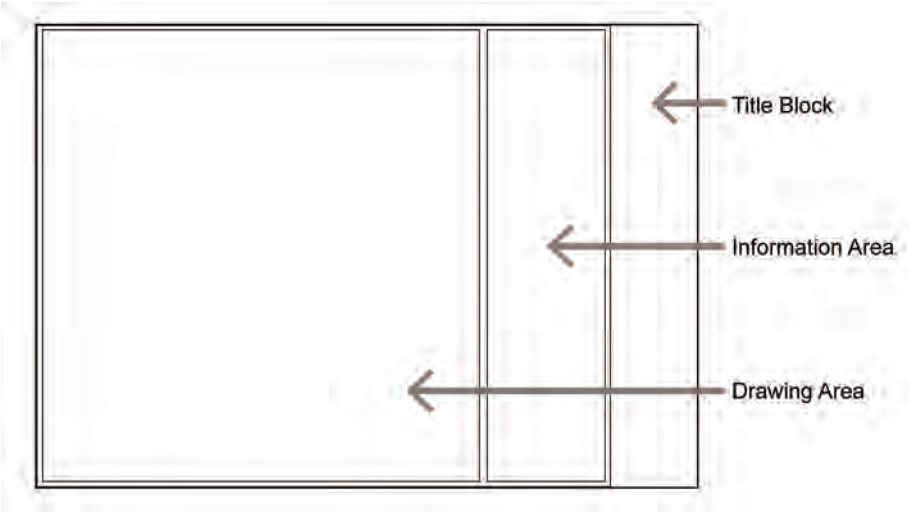
Purpose

If Schematic Design is used to frame clear and comprehensive design intent, Design Development must give substance to that intent, resolving all design decisions. During the Design Development phase, the proposed scheme is advanced and further developed to become the final design. In previous phases, the focus has been on the project as a whole. During Design Development, it becomes important to give individual attention to each system, each space, each component, and each detail of the project.

The primary purpose of landscape architectural Construction Documents is to provide a clear, concise, and complete description of the contractual work scope between the owner and contractor. The contractual work scope includes all information necessary to organize and construct the work to precise standards of quality and workmanship. These are legal stipulations and, therefore, one must avoid conflicting or ambiguous requirements. Accordingly, Construction Documents are referred to as Contract Documents because they are exhibits to the legal contract.

DESIGN DEVELOPMENT TITLE BLOCK

The title block is a standardized heading and information reference for all drawings sets, developed by each landscape architect or landscape architecture firm. Although unique to each firm, a number of elements should consistently reflect industry protocols. City, town, state, and federal jurisdictions may have title block format requirements. The landscape architect should become familiar with these standards and requirements while developing the firm's standard title block.



Landscape Architect's Standard Title Block

The Site Reference Plan is typically the first sheet in the document set to include a title block, as the Cover Sheet does not incorporate a title block.* Typical components of the landscape architect's title block are listed here. The landscape architect should provide his subconsultants with an electronic file of the entire sheet border and title block for their use in developing sheets to match the landscape architect's format. If the landscape architect is not acting as the prime design consultant, and is a subconsultant to a prime design consultant such as an architect or engineer, the prime design consultant may establish title block and sheet layout formats or guidelines.

The title block should include the following elements:

- Landscape architect's project reference number
- Copyright notice, if applicable
- Project name
- Project address
- Prime consultant name and contact information
- Consultant name and contact information, for consultant who prepared the sheet
- Space allocated for landscape architect's licensure stamp
- Title of included documents
- Revision block
- Date of issuance
- Sheet title**
- Sheet number**

*Note: Some city, town, state, or federal projects may require a specific title block for all sheets. The landscape architect should become familiar with these requirements.

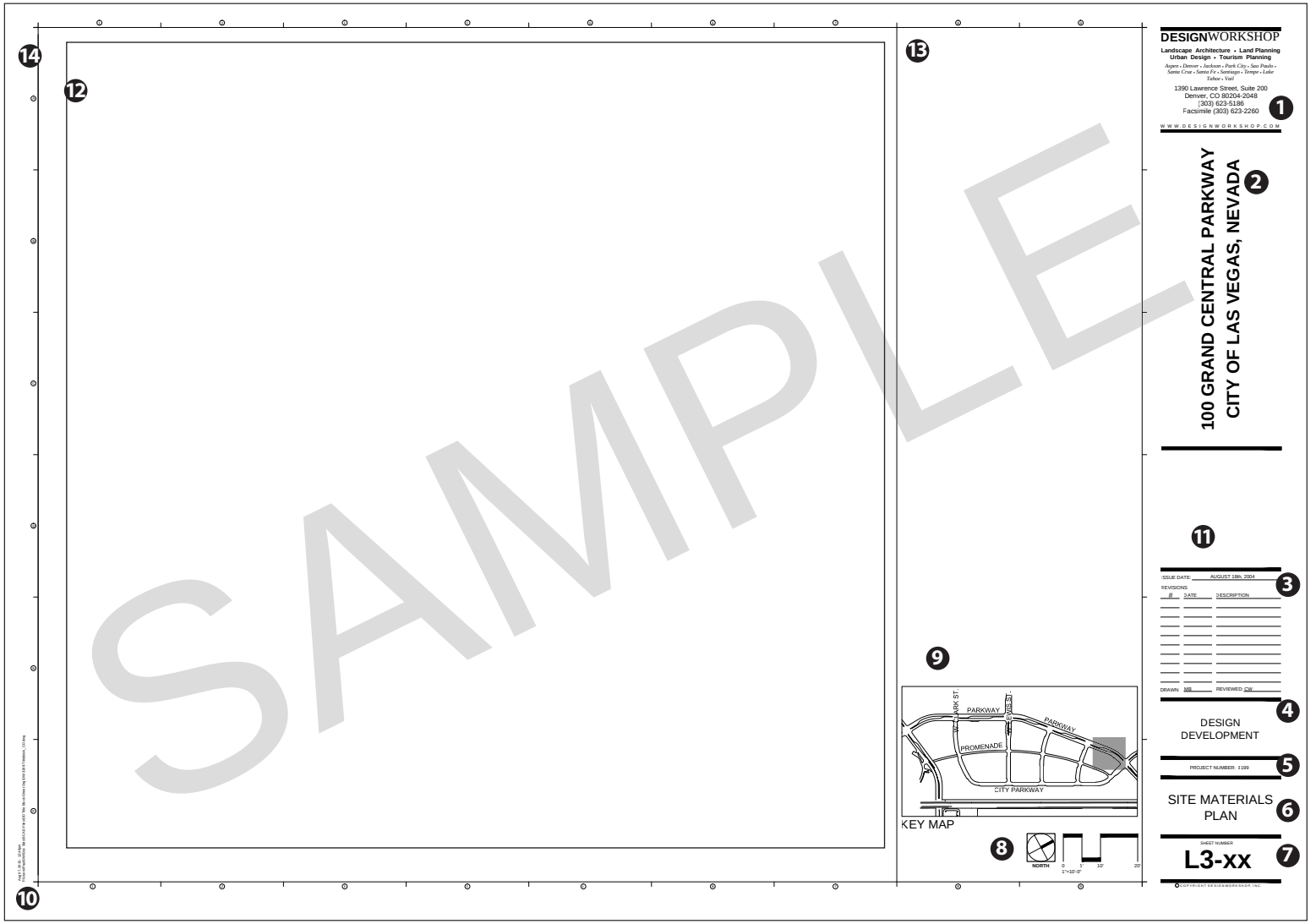
**Refer to landscape architect's CAD standards for protocols.

Example: DD Title Block and Sheet Organization

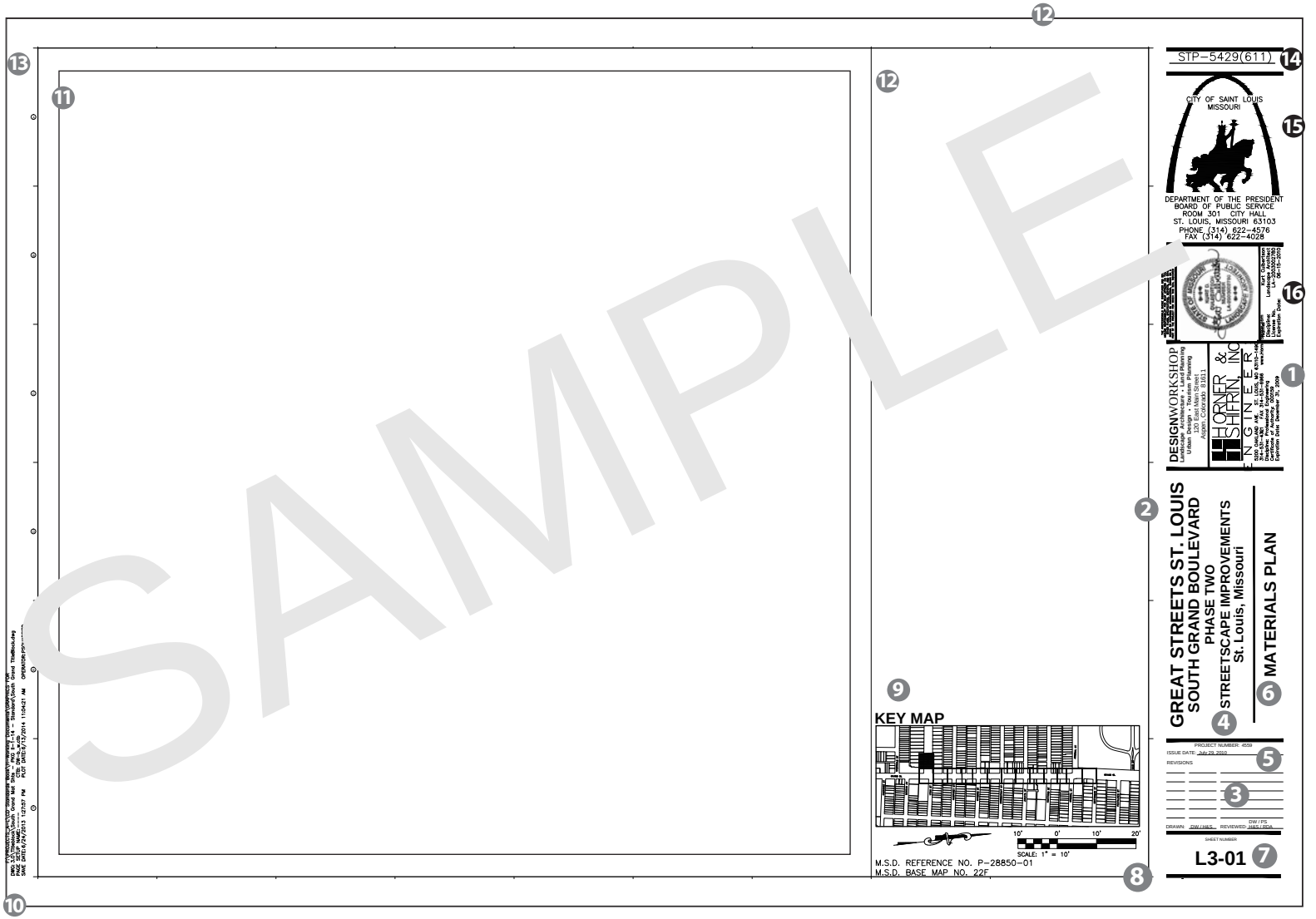
LEGEND

1. Company/Firm Information
2. Project Title*
3. Date and Revision Block
4. Set Title*
5. Project Number
6. Sheet Title
7. Sheet Number
8. North Arrow and Scale*
9. Key Map and Street Indicator Box*
10. File Location Path
11. Designated Space for Licensure Stamp
12. Drawing Boundary Box
13. Notes Area
14. Drawing Coordinate System

**Refer to landscape architect's CAD standards for protocols*



Example: CD Title Block and Sheet Organization



LEGEND

1. Company/Firm Information
2. Project Title*
3. Date and Revision Block
4. Set Title*
5. Project Number
6. Sheet Title
7. Sheet Number
8. North Arrow and Scale*
9. Key Map and Street Indicator Box*
10. File Location Path
11. Drawing Boundry Box
12. Notes Area
13. Drawing Coordinate System
14. Municipal/ Federal Project Number
15. Municipal/ Federal Information
16. Signature Block

**Refer to landscape architect's CAD standards for protocols*

DESIGN DEVELOPMENT COVER SHEET

Objective

The Design Development (DD) Cover Sheet succinctly communicates key project identification information in order to orient the reader to the design proposal and associated contents of the document set.

General Requirements

- Convey the primary design emphasis of the project, including location, scale, and scope, with required text and selected image.
- Communicate the components and organization of the documents.
- Communicate project team information.

Key Distinctions between DD and Construction Document (CD) Cover Sheets

The landscape architect should be strategic in making content decisions for the Design Development documents. These guidelines suggest individual strategies for each of the DD sheets, subject to the unique role of that sheet in the design and documentation process.

Primary relationships between the DD and CD Cover Sheet are summarized here:

- The DD Cover Sheet should be established as an in-progress version of the Construction Document Cover Sheet, almost fully developed to fulfill the requirements of the Construction Document Cover Sheet.
- The DD Cover Sheet may include both an illustrative graphic and site location map, while the CD Cover Sheet includes only the site location map(s).
- The Project Description on the DD Cover Sheet is focused more on design intent, rather than construction-related language as described on the CD Cover Sheet.
- The Sheet Index on the DD Cover Sheet is simpler than the Sheet Index on the CD Cover Sheet in that it does not include a drawing issue or revision block.

Specific Requirements

The Requirements listed below are listed in recommended order of presentation on the Cover Sheet, generally from top to bottom and left to right.

- **Project owner or developer's name, as legally recorded should be included.** For example, a company should be listed as "Forest City Enterprises, Inc." rather than "Forest City." For public projects, the owner may be a governmental entity, and should be officially noted, such as "The City and County of Denver." Note that the landscape architect may not be directly contracted with the owner or developer, so this reference does not necessarily reflect a client's relationship with the landscape architect. Also note that the project's owner is also referenced with detailed contact information at the bottom of the Cover Sheet, together with the full consultant team.
- **Project Title:** Official project name as referenced by client and other consultants. Precisely match title included on Project Manual cover and title blocks and sheets within the documents.
- **Site Address:** If there is no official address, use street names. Include the city and state names. City and state, or other jurisdictional identifier, may be used without a street address if the site is not readily identified with street address.
- **Community, District, or Other Area Reference**, if applicable: For example, if a park is being completed in a subdivision that is separate from the city name, such as "Legacy Ridge Neighborhood Park, Westminster, Colorado."
- **Title of the Included Work:** For example, "Landscape Construction Documents," "Landscape Architecture Improvement Package" or "Site Construction Documents," if civil engineering documents are included within the set. Note that this title is intended to be a general heading, to be used together with the Document Set Description described next.
- **Document Set Description:** Include the document set description, if applicable, or another description to denote document status; for example, "Final Design Development," "Progress Set—Design Development," or "*X*% Design Development." Note that this also applies to CD sets.

Note that assigning percentage complete titles such as "50 percent Design Development or Construction Documents" represents an inexact determination and may not present an ideal titling system. Another approach suggests the use of simple adjectives to define relative status of documents. For example a series of several consecutive Design Development or Construction Documentation sets might be titled "Preliminary Construction Documents," "Progress 1 Construction Documents," "Progress 2 Construction Documents," and "Construction Documents."

- **Official Date of Issuance:** Verify that individual sheets and consultants show the same date within title block on each sheet. Include the word "Issued:" prior to the date. Verify that date matches that included on the Project Manual cover.
- **Set Number:** This is used for projects where contractor pricing or bidding is anticipated; drawing sets should be numbered in succession. This is usually applicable only during the Construction Documentation phase, when addenda may be formally issued and tracked for each registered bidder. Set numbers may be included at the DD phase when formal tracking is necessary; for example, when a contractor is pricing the documents as part of a negotiated contract. In this case, addenda will be recorded also.
- **Project Location or Vicinity Map:** The map should be scaled for legibility and site boundary identification, documented for accuracy, and completeness—including highly legible (that is, bold) street names. Include scale, a north arrow, and project site boundaries with a hatched area identifying project site. Utilize a scale that allows project site limits to be clearly understood (see *Graphic Requirements* below).
- **Project Illustration:** Include a project illustration or model photo to readily highlight essential project work scope and three-dimensional character. Note that the illustration may be used to supplement the Project Location or Vicinity Map, if the landscape architect desires to emphasize the design intent. As the transition is made to Construction Documentation, the design illustration should be eliminated.
- **Approvals/Authorization** of Public Agencies: Include this only if it is required by the approving agency. Conform to agency requirements for content and graphic organization.

  Consider including a client signature block to record the approval of dated documents, if that is in the interest of the consultant team or required by the client. Signatures that formally acknowledge design and documentation at key progress points are important in order to gain the detailed attention of the client and confirm his or her approval of the project's direction.

  Label this block "Review and Approval." Include the number of signature lines required for approving individuals or designated positions. Note that client signatures will be included only on record sets and that many clients are reluctant to sign documents as records of their approval.
- **Design-Oriented Project Description:** The description should be limited to a paragraph or two and address design-related topics such as site and context conditions, primary design intent, program, and environmental and community issues (see the DD examples below and the CD examples that follow).

  Note that the Design Development project description should place more emphasis on design intent, whereas the Construction Documentation project description should place more emphasis on construction-related issues such as existing conditions, work scope overview, related or adjoining projects, and any unique circumstances such as phasing. The language should closely match that included in Outline specification Division 01, General Requirements, Section 011000—Summary.

  Each project description is intended to provide an overview of the project for a targeted audience. The DD audience is most interested in the design solution as a response to specific intent; the CD audience is less interested in design intent and is more focused on the construction program and the type of work to be performed, how the project will be built, and what the expectations are for quality.

Project Description—Example 1 (DD Private Urban Project)

Republic Plaza is an existing office property in Denver. While the project is technically a renovation project, the proposed work scope reflects a comprehensive redesign of two existing plazas. The plazas straddle the building tower, one on the west at the 16th Street Mall and one on the east at 17th Street. The plazas were originally constructed in 1983 as part of the original building tower construction. Over the last two decades, the plazas have suffered deterioration and leaking into retail space below, primarily due to freeze–thaw conditions in Denver.

The proposed design is intended to accomplish several primary objectives: improve technical deficiencies to extend the life of the plaza, improve the identity of the public space to establish consistency with the building and elevate the overall real estate value, and improve the destination quality of the space for tenants and guests.

The primary improvement program consists of new plaza waterproofing, granite paving, steps and planters, lighting, furnishings, and signage.

Project Description—Example 2 (DD Private Residence)

The Smith Residence is situated on a heavily wooded riparian site along Aspen Creek. Therefore, the site is environmentally sensitive and includes prime wildlife habitat for several regional species. The proposed landscape architecture design responds to these conditions with a carefully positioned program, including a minimal-impact access road leading to a small-scale auto arrival court. An overlook patio and pool area are positioned to maximize relationships to natural and off-site assets, and provide the Smith family with a private entertainment space. These spaces are designed to minimize grading intervention, maintain natural drainage patterns, and minimize erosion.

The environmental intentions for the project are supported by a hydrologist and wildlife expert. Lighting and water feature designers are collaborating with the landscape architect, as is an artist who is developing interpretive art to tell stories about the local geology and cultural evolution.

Sheet Index: The Sheet Index should be fully developed to organize and define contents of the document set. Sheets are typically grouped by type and occur within these groups as drawing series. For example, within the landscape architecture drawings, one finds Site Materials Series, Site Layout Series, and so on. The ordering of the series should attempt to follow a chronological construction sequence, such as recommended herein.

The Sheet Index includes (1) series headings, (2) sheet numbers, and (3) sheet titles. Note that referenced sheet titles must precisely match those titles found on actual sheets. For example, a plan sheet labeled

"Site Materials Plan" should not be called "Materials Plan" on the Sheet Index.

Note that a Revisions Index accompanies the Sheet Index at the CD phase but is not required at the DD phase, except under unique circumstances such as when a contractor submits pricing to the owner as part of a negotiated contract. Refer to the CD Cover Sheet for additional information.

The design disciplines below are commonly included within the landscape architect's contractual responsibilities either as direct subconsultants or collaborating team consultants. A sheet-numbering system has been described in more detail elsewhere within this document for instances when these discipline sheets are to be included with the landscape architect's document package.

Organize the sheet index with disciplines included in the following order:

1. Landscape (see below for specific sheets)
2. Civil Engineering
3. Irrigation System
4. Electrical Engineering/Lighting Design
5. Mechanical Engineering/Water Features
6. Architectural
7. Structural Engineering

(Note: For purposes of these guidelines and as described in other sections, landscape architecture projects are described in two categories: small projects and large projects. The respective requirements for the Sheet Index are described next.)

Small Projects

For the purpose of these guidelines, a small project is defined as a project whose scope of landscape architecture improvements requires six sheets or less for each plan series.

L0-00*	Cover Sheet
L0-01*	Site Hardscape Reference Plans
L0-02*	Site Softscape Reference Plans
L0-03*	Site Key Plan
L0-04*	General Information Sheet
L1-xx	Plant Protection and Removal Plan
L2-xx	Site Demolition Plan (May be completed by Civil Engineer)
L3-xx	Site Materials Plan
L4-xx	Site Layout Plan
L5-xx	Site Grading and Drainage Plan (May be completed by Civil Engineer)
L6-xx	Site Lighting Plan (May be completed by Electrical Engineer or Lighting Designer)
L7-xx	Composite Sections
L7-xx	Site Details (Includes Sections, Elevations, 3D Drawings, and Detail-Related Enlargement Plans)
L8-xx	Tree Planting Plan
L9-xx	Shrub and Groundcover Planting Plan
L10-xx	Site Soils Plan
L11-xx	Planting Details

Large Projects

For the purpose of these guidelines, a large project is defined as a project whose scope of landscape architecture improvements requires seven sheets or more for each plan series.

L-00*	Cover Sheet
L0-01*	Site Hardscape Reference Plans
L0-02*	Site Softscape Reference Plans
L0-03*	General Information Sheet
L1-00*	Plant Protection and Removal Key Plan and General Information Sheet
L1-xx	Plant Protection and Removal Plan
L2-00*	Site Demolition Key Plan and General Information Sheet
L2-xx	Site Demolition Plan (Series may be completed by Civil Engineer)
L3-00*	Site Materials Key Plan and General Information Sheet
L3-xx	Site Materials Plan
L4-00	Site Layout and Dimensioning Key Plan and General Information Sheet
L4-xx	Site Layout and Dimensioning Plan
L5-00*	Site Grading and Drainage Key Plan and General Information Sheet
L5-xx	Site Grading and Drainage Plan (Series may be completed by Civil Engineer)
L6-00	Site Lighting Key Plan and General Information Sheet
L6-xx	Site Lighting Plan (Series may be completed by Electrical Engineer or Lighting Designer)
L7-xx	Composite Sections, Elevations, Enlargement Plans
L7-xx	Site Details (Includes Sections, Elevations, 3D Drawings, and Detail-Related Enlargement Plans)
L8-00*	Tree Planting Key Plan and General Information Sheet
L8-xx	Tree Planting Plan
L9-00*	Shrub and Groundcover Planting Key Plan and General Information Sheet
L9-xx	Shrub and Groundcover Planting Plan
L10-00*	Site Soils Key Plan and General Information Sheet
L10-xx	Site Soils Plan
L11-xx	Planting Details
*General Sheets	

Sub Consultant Drawings

(Include other specialty consultant series plans and details as required by the project.)

C-xx	Civil Plans and Details
IR-xx	Irrigation Plans and Details
E-xx	Site Lighting and Electrical Plans and Details
M-xx	Site Mechanical Plans and Details
WF-xx	Water Feature Design and Engineering Plans and Details
SP-xx	Swimming Pool Design and Engineering Plans and Details
A-xx	Architectural Plans and Details
S-xx	Structural Plans and Details

Note: Include other specialty design and engineering drawings at the end of the index and use a drawing prefix to logically describe the content of those drawings.

Supplemental Drawings

For both small and large projects, the following supplementary drawings and information are not typically included in document sets, but are provided as a Resource Drawing supplement to the Procurement (or Bid) Documents:

- Existing Conditions/Site Survey
- Geotechnical Investigation and Report

These drawings and documents are usually contracted by the owner and consultant directly and information is provided to the design team to produce their work. The information is typically reformatted into each consultant's drawings. To avoid legal implications, it is best to ensure contractors contact the owner for original copies or reproductions.

Additional Drawings as Required for Project

For both small and large projects, the following additional drawings may be produced by the landscape architect and included in the drawing set should they be required for the project. They should be labeled as L-series drawings and located within the drawing set as indicated below.

- Summary of Quantities Sheet(s)—L0-xx
- Site Materials Schedule Sheet(s)—L0-xx
- Site Preparation Plan(s)—L0-xx
- Soil Erosion and Sedimentation Control Plan(s)—L0-xx
- Site Furnishings Plan(s)—L0-xx

Project Team

Organize consultant team members at the bottom of sheet in the order listed below and per project requirements, from left to right. Include a heading for each consultant team member that represents the firm's discipline. Precisely match that heading to disciplinary headings listed on the Sheet Index, for example, "Civil Engineer" rather than "Civil" or "Civil Engineering."

Project team information should include the following:

- **Owner and/or client full legal name**, address, telephone number and fax number, if necessary. Include individual contact name (individual person), with permission only.
- **Landscape architect of record,** including the full legal name of firm, address, and telephone and fax number, if necessary. Do not include individual contact names because issues that relate to liability, staff turnover, and inaccessibility may exist.
- **Consultants' full legal names,** discipline responsibility, addresses, and telephone and fax numbers, if necessary. Do not include an individual contact name for each firm. Note that the consultant references here are only for those who completed work within the attached documents. Separate document sets should have their own master Cover Sheet and associated project team.

Organize the consultant team members in the following order:

1. Owner/client
2. Landscape architect
3. Civil engineer
4. Irrigation system designer
5. Electrical engineer or lighting designer
6. Mechanical engineer
7. Water feature/swimming pool designer
8. Architect
9. Structural engineer
10. Others

- **Owner's project reference number,** if a number is utilized by the owner. Public agencies typically include a project number. Utilize abbreviated owner reference. For example, a project for the City and County of Denver may be noted as "CCD Project Number: *xxxx*."
- **Landscape architect's project number**, using an abbreviated landscape architect company reference. For example, Green Landscape Architects would be referenced GLA. Note as "GLA Number: *xxxx*" or "GLA No.: *xxxx*."
- **Designated space for licensure stamp**, only if required by Client or local jurisdiction. Typically, no stamp is required at the DD phase. However, during the DD phase a space (square outline) with the words "Landscape architect's license" may be provided in anticipation of the need to provide the actual stamp at the CD phase.

In states where licensure is required for landscape architectural work, a licensure stamp may be required on the Cover Sheet within a designated square. Municipal requirements vary for location and original condition of stamp. Stamps may be required on each sheet within the set. The stamp will be provided when the bid sets are issued or during other required jurisdictional submittals.

Graphic Requirements

The DD Cover Sheet should be graphically clear but not extravagant. Hierarchy, symmetrical balance and centering are important organizing principles.

Consider a vertical axis for symmetrically organizing text and graphic components.

Font Sizes

Font size determinations will partly depend upon sheet size and extent of content, and consequently may vary per project. The landscape architect should establish CAD standards for these and similar requirements.

One approach would establish a descending font hierarchy as listed here:

1. Project Title
2. Site Address/Location
3. Client Name and Project Team
4. Project Reference Numbers
5. All other text, typically 12-point minimum.

Project Illustration

As noted under "Specific Requirements," an illustration may be appropriate to use on the DD Cover Sheet in addition to a Site Location Map, if a design emphasis is desired. Graphically, the image should focus on key or defining attributes, spaces or project components. While there is much flexibility in the medium and character of the image, if a color image is used, it should be selected to work in black and white copy format also.

Project Location Map

Project Location Maps may include a regional "Vicinity Map" and a more site specific "Project Location Map" to help the reviewer and contractor easily identify the location of the project site. The complexity and local familiarity of the project will determine the type of maps required. When in doubt, include both maps. Project Location Maps should:

- Be scaled for legibility and to allow site boundary identification.
- Include a project site boundary if the plan's scale allows.
- Include arterial street names and local streets that adjoin site.
- Include city, neighborhood, or other area references.

Include drawing scale and a north arrow. Orient the plan to match the plan orientation within the document set.

It is the landscape architect's responsibility to verify current accuracy and completeness of maps(s).

Project Team

Space client and consultant firm names evenly across bottom of sheet, with left and right justification.

Best Practices

Design

Consider the organization and layout of the Cover Sheet as a first impression graphic design exercise. Effective graphic design requires attention to principles such as hierarchy, proportion, density, negative space, typeface relationships, and readability.

Coordination

Project Master Cover Sheet

In most cases, only one Cover Sheet should be developed for each project. If the landscape architecture drawings are issued as part of a larger set of documents, for example, with an architect or civil engineer prime consultant, then the architect or civil engineer will develop a master Cover Sheet. It is the landscape architect's responsibility to coordinate with the prime consultant to ensure that drawing sheet numbers and title information are accurately conveyed and not redundant with work from other team members.

In some cases where a prime consultant prepares a master Cover Sheet, the landscape architect may be asked to issue his or her documents separately, either for review, cost estimating, or a phased bid process. In this case, the landscape architect should coordinate the relationship of the landscape architectural Cover Sheet to the project master Cover Sheet. Check for consistency items such as project title, document set title, consultant references, and the like. Verify need for potentially redundant components such as location map and sheet index.

Client

Coordinate client or agency requirements for Cover Sheet. Encourage the use of the landscape architect's standard, from which content and layout changes may be made.

Technical

Consider the use of a well-developed digital CAD template, one that fulfills the standard requirements of the firm, and that can be adapted to specific project needs.

Strategies

Document Set Mock-Up

The development of the Cover Sheet should create the first opportunity to develop the document set graphic mock-up, whereby the full Design Development and potential Construction Documentation sets can be graphically mapped out using the Sheet Index.

Using a Landscape Architecture Cover Sheet

Use a landscape architecture Cover Sheet prepared by the landscape architect if (1) the landscape architect is the prime design consultant, (2) landscape architecture work is being bid separately from prime contract, or (3) if separating or highlighting the landscape documents from the remainder of the set is directed by the prime consultant.

LEGEND

1. Project Vicinity Map
2. Design-Oriented Project Description
3. Project Team
4. Project Owner or Developer's Name
5. Project Title
6. Title of Included Work
7. Site Address
8. Document Set Description
9. Official Date of Issuance
10. Set Number
11. Project Illustration
12. Sheet Index
13. Owner's Project Reference Number
14. Landscape Architect's Project Number
15. Approvals/Authorization

Another item that may be provided, but is not currently depicted, if the project requires it, is:

–Community, District, or Other Area Reference.

Legend for Central Park Design on facing page.

❹ **ENDEAVOR REAL ESTATE GROUP**

❺THE DOMAIN
❻CENTRAL PARK DESIGN

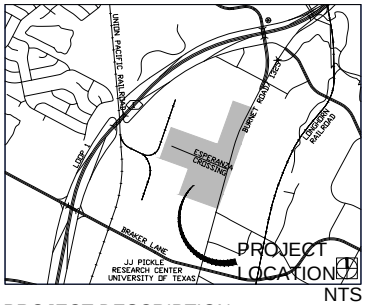
❼CITY OF AUSTIN, TEXAS

❽100% Design Development

❾ **ISSUED: APRIL 27, 2007**

❿ **SET NO. _____**

❶ VICINITY MAP



NTS

❷ PROJECT DESCRIPTION

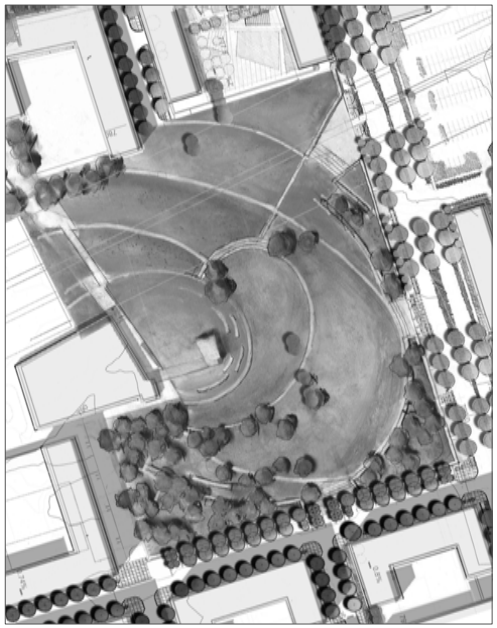
The Domain is a high-density, mixed-use destination a few miles from downtown Austin, Texas with over 7 million square feet of proposed development, including 2,000 residential units. The Central Park Design Project, approximately 12 acres in size, is one of the signature public open spaces within this development.

The intent is to create a multi-functional central park for day and nighttime use. The park will be programmed for passive activities as well as structural events and concerts. The design character shall be more contemporary with primary use of concrete and steel. Natural boulders and native plant material will also be incorporated to create softer edges and to be more sensitive to water use.

Work includes, but is not limited to, installation of new paving, walls, art/sculpture, ornamental metal work, site furnishings, shade structures, site lighting, landscape boulders, landscape drains, planting and irrigation system. Drawings and Specifications include the required design and engineering including information from consultants - Civil Engineer and Irrigation System Designer.

Contractor shall coordinate with Drawings and Specifications produced under separate package(s) by the Architect, Structural Engineer and Electrical Engineer.

❶❶



NORTH

❶❷ SHEET INDEX

Sheet No.	Sheet Title
Landscape Drawings:	
L0-00	Cover Sheet
L0-01	Hardscape Site Reference Plan
L0-02	Softscape Site Reference Plan
L0-03	Key Plan
L0-04	General Information Sheet
PLANT PROTECTION AND REMOVAL SERIES	
L1-01	Plant Protection and Removal Plan
SITE DEMOLITION SERIES	
L2-00	Not Used at this Time
SITE MATERIALS SERIES	
L3-01	Site Materials Plan
L3-02	Site Materials Plan
L3-03	Site Materials Plan
L3-04	Site Materials Plan
L3-05	Site Materials Plan
L3-06	Enlargement Plan: Community Plaza
L3-07	Enlargement Plan: Gabion Wall and Overlook
L3-08	Enlargement Plan: Kramer Plaza and South Steps
L3-09	Enlargement Plan: West Steps
SITE LAYOUT SERIES	
L4-01	Site Layout Plan
L4-02	Site Layout Plan
L4-03	Site Layout Plan
L4-04	Site Layout Plan
L4-05	Site Layout Plan
L4-06	Enlargement Plan: Community Plaza
L4-07	Enlargement Plan: Gabion Wall and Overlook
L4-08	Enlargement Plan: Kramer Plaza and South Steps
L4-09	Enlargement Plan: West Steps
SITE LIGHTING SERIES AND ELECTRICAL SERIES	
L6-00	Not Used at this Time
SITE DETAILS	
L7-01	Composite Site Sections
L7-02	Composite Site Sections
L7-03	Composite Site Sections
L7-04	Composite Site Sections
L7-05	Composite Site Sections
L7-06	Site Details
L7-07	Site Details
L7-08	Site Details
TREE PLANTING SERIES *(Combined with Shrub & Groundcover Series to create Planting Series)*	
L8-01	Tree Planting Plan
L8-02	Tree Planting Plan
L8-03	Tree Planting Plan
L8-04	Tree Planting Plan
L8-05	Tree Planting Plan
SHRUB and GROUNDCOVER PLANTING SERIES	
L9-00	Not Used at this Time - Combined with Tree Planting Series to create Planting Plans
PLANTING DETAILS	
L10-01	Planting Details
CIVIL ENGINEERING DRAWINGS	
C1-00	General Note
C1-01	Site Grading Plan and Drainage Plan
C1-02	Site Grading Plan and Drainage Plan
C1-03	Site Grading Plan and Drainage Plan
C1-04	Site Grading Plan and Drainage Plan
C4-01	Civil Details
IRRIGATION SYSTEM DRAWINGS	
IR-01	Irrigation System Plan
IR-02	Irrigation System Plan
IR-03	Irrigation System Plan
IR-04	Irrigation System Notes and Details

❶❺

IF APPROVALS/AUTHORIZATION REQUIRED, PROVIDE HERE IN ACCORDANCE WITH GOVERNING AUTHORITY GUIDELINES.

❸ **OWNER / DEVELOPER**
ENDEAVOR REAL ESTATE GROUP
221 West 6th Street
Suite 1300
Austin, TX 78701
Tel: (512) 682-5525
Facsimile: (512) 682-5505

LANDSCAPE ARCHITECT I
DESIGNWORKSHOP
1390 Lawrence Street
Suite 200
Denver, CO 80204
Tel: (303) 623-5186
Facsimile: (303) 623-2260

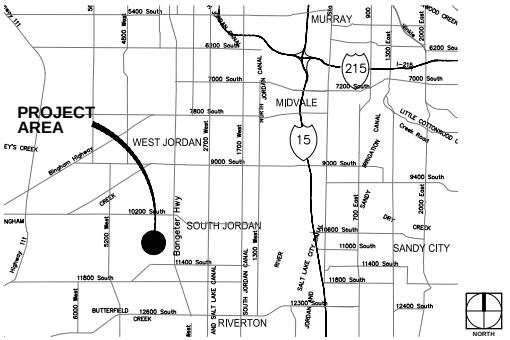
LANDSCAPE ARCHITECT II
TBG PARTNERS
901 South MoPac
Building 2, Suite 350
Austin, TX 78746
Tel: (512) 327-1011
Facsimile: (512) 327-0488

CIVIL ENGINEER
BURY + PARTNERS, INC.
3345 Bee Caves Road, Suite 200
Austin, TX 78746
Tel: (512) 328-0011
Facsimile: (512) 328-0325

❶❸ Client Project Number: xxxx
❶❹ DW Proiect Number: 3879

Example of a DD Cover Sheet—Large Project

VICINITY MAP ❶



PROJECT DESCRIPTION ❷

Oquirrh Lake is an 85-acre, man-made lake within the larger, 4500-acre planned-unit development community of Daybreak located in South Jordan, Utah. Two large man-made islands are located within the lake and each contain residential neighborhoods with boat docks, roadway and trail systems, and useable open space. The lake and islands are located between the North and South Village Centers in Daybreak.

The proposed design scheme successfully blends economic concerns, community values, environmental issues and the art of design into a cohesive whole. The lake and 100-acre open space functions as an ecosystem, irrigation storage system and visual and recreational amenity for the residents and visitors. The project incorporates constructed wetlands, trails, natively planted open spaces, manicured multi-use play areas, wildlife and biological habitats, and employs environmental design techniques to lower maintenance costs.

Phase I Oquirrh Lake is a landscape architecture improvement project associated with the construction of the southern island. The Drawings and Specifications describe the following: rough and fine grading, pond and bridge design, planting of trees, seeding, asphalt pathways, crushed stone pathways, placement of top soil and bark mulch, new irrigation system, and site lighting, including the associated requirements for engineering and irrigation design.

❶❺

IF APPROVALS/AUTHORIZATION REQUITED, PROVIDE HERE IN ACCORDANCE WITH GOVERNING AUTHORITY GUIDELINES.

❹ **KENNECOTT LAND**
SOUTH JORDAN, UTAH ❼

❺ OQUIRRH LAKE

❻ PHASE I

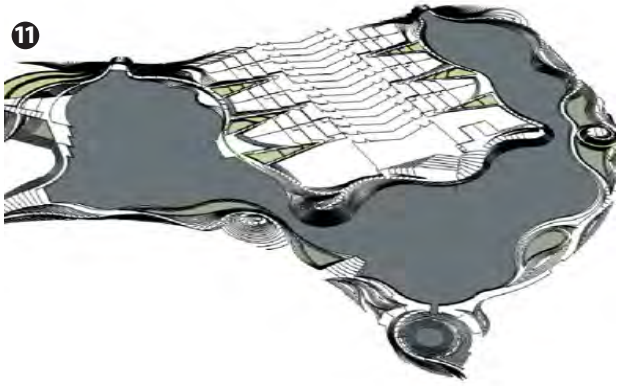
❽ Landscape Architecture

Progress Design Development

❾ **ISSUED: December 9, 2004**

❿ **SET NO. _____**

❶❶



❶❷ **SHEET INDEX**

Sheet No. Sheet Title

Landscape Drawings:

L0-00 Cover Sheet
L0-01 Hardscape Site Reference Plan
L0-02 Softscape Site Reference Plan
L0-03 General Information Sheet

PLANT PROTECTION AND REMOVAL SERIES
L1-00 Not Used at this Time

SITE DEMOLITION SERIES
L2-00 Not Used at this Time

SITE MATERIALS SERIES
L3-00 Site Materials Key Plan and General Information Sheet
L3-01 Site Materials Plan
L3-02 Site Materials Plan
L3-03 Site Materials Plan
L3-04 Site Materials Plan
L3-05 Site Materials Plan
L3-06 Site Materials Plan
L3-07 Site Materials Plan
L3-08 Site Materials Plan
L3-09 Site Materials Plan
L3-10 Site Materials Plan
L3-11 Site Materials Plan
L3-12 Site Materials Plan
L3-13 Site Materials Plan
L3-14 Site Materials Plan
L3-15 Site Materials Plan
L3-16 Site Materials Plan

SITE LAYOUT SERIES
L4-00 Site Layout Key Plan and General Information Sheet
L4-01 Site Layout Plan
L4-02 Site Layout Plan
L4-03 Site Layout Plan
L4-04 Site Layout Plan
L4-05 Site Layout Plan
L4-06 Site Layout Plan
L4-07 Site Layout Plan
L4-08 Site Layout Plan
L4-09 Site Layout Plan
L4-10 Site Layout Plan
L4-11 Site Layout Plan
L4-12 Site Layout Plan
L4-13 Site Layout Plan
L4-14 Site Layout Plan
L4-15 Site Layout Plan
L4-16 Site Layout Plan

SITE GRADING SERIES
L5-00 Site Grading Key Plan and General Information Sheet
L5-01 Site Grading Plan
L5-02 Site Grading Plan
L5-03 Site Grading Plan
L5-04 Site Grading Plan
L5-05 Site Grading Plan
L5-06 Site Grading Plan
L5-07 Site Grading Plan
L5-08 Site Grading Plan
L5-09 Site Grading Plan
L5-10 Site Grading Plan
L5-11 Site Grading Plan
L5-12 Site Grading Plan
L5-13 Site Grading Plan
L5-14 Site Grading Plan
L5-15 Site Grading Plan
L5-16 Site Grading Plan

SITE LIGHTING SERIES
L6-00 Site Lighting Key Plan and General Information Sheet
L6-01 Lighting Diagram
L6-02 Lighting Details
L6-03 Lighting Details

SITE DETAILS
L7-00 Composite Sections/Elevations Ref. Plan
L7-01 Composite Sections/Elevations
L7-02 Composite Sections/Elevations
L7-03 Composite Sections/Elevations
L7-04 Composite Sections/Elevations
L7-05 Composite Sections/Elevations
L7-06 Composite Sections/Elevations
L7-07 Composite Sections/Elevations
L7-08 Composite Sections/Elevations
L7-09 Composite Sections/Elevations
L7-10 Site Details
L7-11 Site Details
L7-12 Site Details
L7-13 Site Details
L7-14 Site Details
L7-15 Site Details
L7-16 Site Details

TREE PLANTING SERIES *(Combined with Shrub & Groundcover Series to create Planting Series)*
L7-00 Planting Key Plan and General Information Sheet
L7-01 Planting Plan
L7-02 Planting Plan
L7-03 Planting Plan
L7-04 Planting Plan
L7-05 Planting Plan
L7-06 Planting Plan
L7-07 Planting Plan
L7-08 Planting Plan
L7-09 Planting Plan
L7-10 Planting Plan
L7-11 Planting Plan
L7-12 Planting Plan
L7-13 Planting Plan
L7-14 Planting Plan
L7-15 Planting Plan
L7-16 Planting Plan

SHRUB and GROUNDCOVER PLANTING SERIES
L9-00 Not Used at this Time - Combined with Tree Planting Series to create Planting Plans

PLANTING DETAILS
L10-01 Planting Details
L10-02 Planting Details
L10-03 Planting Details

Lake and Liner Drawings:

CW1-1 Phase 1 CW Site Plan
CW1-2 Phase 1 Lake Section Master
CW1-3 Section Plan A0+00-A14+00
CW1-4 Lake Section B0+00-B14+00
CW1-5 Lake Section C0+00-C14+00
CW2-2 Stormwater Wetlands
CW2-3 Infiltration System
CW2-4 Infiltration System
CW2-5 Infiltration System
CW4-1 Waterfall Plunge Pool
CW4-2 Pump and Control Station
CW4-3 Operable Weir
CW5-2 Aeration Details
CW6-2 Stop Log Gate and Details
CW7-1 Lake Management Mech./Electrical

Irrigation System Drawings:

IR-01 Irrigation Plan

Dam and Bridge Structure Drawings:

CD0-1 Overall Site Plan
CD2-1 Site Plan
SD4-1 Dam Structure Plan and Profile
SD5-1 Typical Cross Sections of Dam Structure
SD5-2 Drain Line Plan and Profile
SD5-3 Drain Line Details
SD6-1 Regulating Pond Outlet Profile and Details
SD6-2 Geologic Map of Dam Site and Reservoir
SD6-3 Geologic Bore Hole Plan and Profile
SD6-4 Boring Logs
SP4-1 West Pedestrian Bridge
SP4-2 East Pedestrian Bridge
CV4-1 West Vehicular Bridge
CV4-2 East Vehicular Bridge

Electrical Engineering Drawings

L9-1 Site Lighting & Power Plan
L9-2 Site Lighting & Power Plan
L9-3 Site Lighting & Power Plan
L9-4 Site Lighting & Power Plan
L9-5 Site Lighting & Power Plan
L9-6 Site Lighting & Power Plan
L9-7 Site Lighting & Power Plan
L9-8 Site Lighting & Power Plan
L9-9 Site Lighting & Power Plan
L9-10 Site Lighting & Power Plan
L9-11 Site Lighting & Power Plan
L9-12 Site Lighting & Power Plan
L9-13 Site Lighting & Power Plan
L9-14 Site Lighting & Power Plan
L9-15 Site Lighting & Power Plan
L9-16 Site Lighting & Power Plan
L10-1 Light Schedule & Details

OWNER: ❸
KENNECOTT LAND 5295
South 300 West Suite 475
Murray, Utah 84107
Tel: (801) 743-4624
Facsimile: (801) 743-4659

LANDSCAPE ARCHITECT:
DESIGNWORKSHOP
1796 Prospector Avenue
Suite 200
Park City, Utah 84060
Tel: (435) 655-0915
Facsimile: (435) 655-9372

CIVIL ENGINEER:
NOLTE Associates, Inc.
6671 South Redwood Road,
Suite 101
West Jordan, Utah 84084
Tel: (801) 743-1326
Facsimile: (801) 743-0300

IRRIGATION DESIGN:
Dale Winchester & Associates
2215 East Pinecrest Lane
Sandy, Utah 84092
Tel: (801) 571-6060
Facsimile: (801) 572-4726

ELECTRICAL ENGINEER:
Spectrum Engineers
175 South Main Street
Suite 300
Salt Lake City, Utah 84111
Tel: (801) 328-5151
Facsimile: (801) 328-5155

STRUCTURAL ENGINEER:
NOLTE Associates, Inc.
6671 South Redwood Road,
Suite 101
West Jordan, Utah 84084
Tel: (801) 743-1326
Facsimile: (801) 743-0300

Client Project Number: xxxx ❶❸
DW Project Number: 3337 ❶❹

LEGEND

1. Project Vicinity Map
2. Design-Oriented Project Description
3. Project Team
4. Project Owner or Developer's Name
5. Project Title
6. Title of Included Work
7. Site Address
8. Document Set Description
9. Official Date of Issuance
10. Set Number
11. Project Illustration
12. Sheet Index
13. Owner's Project Reference Number
14. Landscape Architect's Project Number
15. Approvals/Authorization

Another item that may be provided, but is not currently depicted, if the project requires it, is:

–Community, District, or Other Area Reference.

Legend for Oquirrh Lake Design on facing page.

CONSTRUCTION DOCUMENTATION COVER SHEET

Objective

The Construction Documentation Cover Sheet succinctly communicates key project identification information in order to orient the contractor to the contractual work scope and associated contents within the document set.

General Requirements

The Construction Documentation Cover Sheet is directly derived from a well-developed Design Development Cover Sheet, with only minor edits to adapt it to CD status, as described below.

Specific Requirements

The requirements below represent any distinct improvements to the Design Development Cover Sheet, and are defined to complement those DD requirements, as defined on the previous pages. Refer to these requirements in order to review and confirm the overall completeness of the CD sheet.

- **Set Number:** Set numbers are used when contractor pricing or bidding is anticipated, and drawing sets shall be numbered in succession. Set numbers will normally correlate with registered bidders for tracking during the procurement process, including any issued addenda.
- **Project Location Map:** This map should be provided to identify project locational attributes, for example, adjoining relationships such as streets and land uses. If a project illustration was used for DD set, it should be removed completely for the Construction Documentation set.
- **Vicinity Map:** This map should provide regional context, while the Project Location Map should be selected at a more detailed scale to highlight the immediate surroundings and assist with wayfinding to the project site.
- **Construction-Oriented Project Description:** The description should be limited to a paragraph or two and address construction-related topics such as such as existing conditions, work scope overview, related or adjoining projects, and any unique circumstances such as phasing.

  The CD project description is focused on the construction program and the type of work to be performed, how the project will be built, and what the expectations are for quality.

  The CD project description should complement, summarize or highlight the description written in Specifications: Division 1 General Requirement Section 01100—Summary.

Project Description—Example 1 (CD Private Urban Project)

The Republic Plaza Renovation project is located in downtown Denver on Tremont Street between the 16th Street Mall and 17th Street, and includes the renovation of two plazas, one on each side of the existing building tower. The Owner and project Client is Brookfield Properties. The primary work consists of the elements listed below. Additional detail is provided within Division 1 Specifications—General Requirement Section 01100—Summary /Section 011000—Summary.

1. Establish required protections and access to maintain operational building and subgrade parking structure.
2. Demolish existing pavements, waterproofing, and other existing plaza conditions.
3. Install waterproofing system over full extent of plazas.
4. Install granite paving, planters, steps, ramps, and bollards.
5. Install and renovate existing plaza storm drainage systems.
6. Install lighting and associated electrical system.
7. Install plants and irrigation system.
8. Install site signage.
9. Relocate existing statue.
10. Provide site furnishings.
11. Coordinate all work with associated disciplines and trades, for example, civil engineering, architecture, and electrical engineering, including plans and specifications included within separate document sets.

Project Description—Example 2 (CD Private Residence)

The Smith Residence project is located along Aspen Creek, with proposed driveway access off State Road 82. An existing residence has recently been renovated and that work is not part of this contract. The site is heavily wooded and is environmentally sensitive, and requires strict protection of these conditions by all contractors. The work contained within these documents consists of the primary elements listed below. Additional detail is provided within Division 1—General Requirement Section 01100—Summary. Refer to American Institute of Architects Master Spec 2004 for detailed requirements.

1. Plant protection and erosion control.
2. Limited grading work.
3. Installation of auto court and patio/pool area pavements, curbs, walls, and steps.
4. Installation of swimming pool, hot tubs, and water features.
5. Install lighting and associated electrical system.
6. Install plants and irrigation system.
7. Install interpretive art work provided by others.
8. Provide site furnishings.
9. Coordinate all work with associated disciplines and trades, for example, civil engineering, architecture, and electrical engineering, including plans and specifications included within separate document sets.

- **Final Sheet Index:** The Final Sheet Index should be fully developed to organize and define the contents of document set.

  Note that a *Revisions Index* accompanies the Sheet Index at the CD phase. Revisions are recorded during the CD phase only after an initial cost estimate or preliminary bid price has been developed by a contractor or set of contractors. By recording any revisions made in the Construction Documents after the estimate or bid price has been established, it will be clear to the contractor what additional changes to make in the construction cost estimate. In some cases, an owner will negotiate a contract with a general contractor. In that case, the contractor will likely work with the consultant team to achieve a project that is on budget and may begin estimating during the early stages of the Construction Documentation process, or even based upon the final Design Development package. In some cases where a large number of complex changes are made to Construction Documents, use of the revision block may be unrealistic. In that case, the entire document set used to establish pricing should be recorded as the basis of the price.

  The graphic below illustrates two options for communicating revisions on the Cover Sheet and within the documents. An updated Cover Sheet should always be issued with every revision, and revised sheets should be collated and attached to contractor's field sheet for construction, so they can be easily referenced and verified by the landscape architect.

- **Licensure Stamp:** In states where licensure is required for landscape architectural work, a licensure stamp should be included on the Cover Sheet within a designated square outline. Most local jurisdictions will define requirements for licensure stamping but at a minimum the designated square should include the words "Landscape Architect's License" either above or below the stamp.

Example Index Sheet Revision Blocks for CD Cover Sheet

Sheet Index

Sheet No.	Sheet Title	Set Name - Month, Date, Year	Rev. 1 - Month, Date, Year	Rev. 2 - Month, Date, Year	Rev. 3 - Month, Date, Year
Drawings:					
L0-00	Cover Sheet	●	●	●	●
L0-01	General Notes, Legends and Abbreviations	●			
TREE PROTECTION AND DEMOLITION SERIES					
L1-00	Not Used at this Time (See Civil Engineering Drawings)				
SITE DEMOLITION SERIES					
L2-00	Not Used at this Time (See Civil Engineering Drawings)				
MATERIALS SERIES					
L3-00	Key Plan, Notes and Symbols	●	●		
L3-01	Materials Plan	●	●	●	●
L3-02	Materials Plan	●	●	●	
L3-03	Materials Plan	●			
L3-04	Materials Plan	●		●	
L3-05	Materials Plan	●	●		
L3-06	Materials Plan	●			●
L3-07	Materials Plan	●			●
L3-08	Materials Plan	●			●
L3-09	Materials Plan	●	●	●	
LAYOUT SERIES					
L4-00	Key Plan, Notes and Symbols	●		●	
L4-01	Layout Plan	●			
L4-02	Layout Plan	●	●		
L4-03	Layout Plan	●	●		
L4-04	Layout Plan	●			
L4-05	Layout Plan	●	●		
L4-06	Layout Plan	●			●
L4-07	Layout Plan	●		●	●
L4-08	Layout Plan	●		●	
L4-09	Layout Plan	●			

Sample Sheet Index Option 1

Sheet Index

Sheet No.	Sheet Title	Set Name - Month, Date, Year	Revision No.		
Drawings:					
L0-00	Cover Sheet	●	A	A	B
L0-01	General Notes, Legends and Abbreviations	●			
TREE PROTECTION AND DEMOLITION SERIES					
L1-00	Not Used at this Time (See Civil Engineering Drawings)				
SITE DEMOLITION SERIES					
L2-00	Not Used at this Time (See Civil Engineering Drawings)				
MATERIALS SERIES					
L3-00	Key Plan, Notes and Symbols	●	A		
L3-01	Materials Plan	●	A	A	B
L3-02	Materials Plan	●	A	A	
L3-03	Materials Plan	●			
L3-04	Materials Plan	●		A	
L3-05	Materials Plan	●	A		
L3-06	Materials Plan	●			B
L3-07	Materials Plan	●			B
L3-08	Materials Plan	●			B
L3-09	Materials Plan	●	A	A	
LAYOUT SERIES					
L4-00	Key Plan, Notes and Symbols	●		A	
L4-01	Layout Plan	●			
L4-02	Layout Plan	●	A		
L4-03	Layout Plan	●	A		
L4-04	Layout Plan	●			
L4-05	Layout Plan	●	A		
L4-06	Layout Plan	●			B
L4-07	Layout Plan	●		A	B
L4-08	Layout Plan	●		A	
L4-09	Layout Plan	●			

Sample Sheet Index Option 2

Sheet Index revision options: Revised sheets should be reflected only with a "cloud and delta" at those areas associated with the change. All previous revision notations should be removed as they can be easily referenced by looking up prior issuances.

Graphic Requirements

The CD Cover Sheet should be graphically clear but not extravagant. Hierarchy, symmetrical balance and centering are important organizing principles.

Refer to DD Cover Sheet graphic requirements.

Best Practices

Strategies

Transition from DD to CD

Adapt the Design Development Cover Sheet, with Specific Requirements changes to reflect transition from design to technical and bid documents. A primary change is the elimination of an illustrative graphic and the further development of the Sheet Index.

Example CD Cover Sheet—Small Project

LEGEND

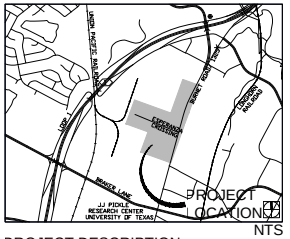
1. Project Vicinity Map
2. Construction-Oriented Project Description
3. Project Team
4. Project Owner or Developer's Name
5. Project Title
6. Title of Included Work
7. Site Address
8. Document Set Description
9. Official Date of Issuance
10. Set Number
11. Project Location Map
12. Sheet Index
13. Owner's Project Reference Number
14. Landscape Architect's Project Number
15. Approvals/Authorization
16. Licensure Stamp

Another item that may be provided, but not currently depicted, if the project requires it, is:

–Community, District, or Other Area Reference.

*Note: **Bold face** items represent key distinctions between Construction Documents and Design Development documents.*

1 VICINITY MAP



NTS

2 PROJECT DESCRIPTION

Work includes, but is not limited to, installation of new paving, walls, art/sculpture, ornamental metal work, site furnishings, shade structures, site lighting, landscape boulders, landscape drains, planting and irrigation system. Subconsultant Drawings for landscape architecture related items are included herein - Civil Engineering, Site Lighting and Electrical Design, Structural Engineering and Irrigation System Design and Engineering. Specifications are complementary to the Drawings herein and implied as a requirement for successful implementation of the Project.

Contractor shall also coordinate with Drawings and Specifications produced under separate package(s) by the Architect, Structural Engineer and Electrical Engineer for site architecture/structure elements.

Contractor shall provide construction management plan and submit to Owner's Representative prior to construction for review and approval.

15 IF APPROVALS/AUTHORIZATION REQUIRED, PROVIDE HERE IN ACCORDANCE WITH GOVERNING AUTHORITY GUIDELINES.

4 **ENDEAVOR REAL ESTATE GROUP**

5 **THE DOMAIN**

6 **CENTRAL PARK DESIGN**

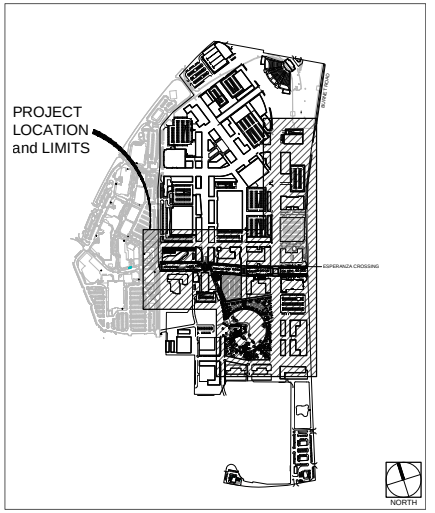
7 **CITY OF AUSTIN, TEXAS**

8 **PROGRESS CONSTRUCTION DOCUMENTS**

9 **ISSUED: SEPTEMBER 12, 2008**

10 **SET NO.** 1

11 LOCATION MAP



12 Sheet Index

Sheet No.	Sheet Title	Issue Date	Rev. 1 - Date, Description	Rev. 2 - Date, Description	Rev. 3 - Date, Description
Landscape Drawings:					
EP-00	Cover Sheet	■			
LS-01	Hardscape Reference Plan	■			
LS-02	Softscape Reference Plan	■			
LS-03	Key Plan	■			
LD-01	General Information Sheet				
PLANT PROTECTION AND REMOVAL SERIES					
L1-00	Not Used at this Time				
SITE DEMOLITION SERIES					
L2-00	Not Used at this Time				
SITE MATERIALS SERIES					
L4-01	Site Materials Plan - SW	■			
L4-02	Site Materials Plan - NW	■			
L4-03	Site Materials Plan - SE	■			
L4-04	Site Materials Plan - NE	■			
L4-05	Site Materials Plan - Alterra Parkway	■			
L4-06	Enlargement Plan	■			
L4-07	Enlargement Plan	■			
L4-08	Enlargement Plan	■			
SITE LAYOUT SERIES					
L4-10	Site Layout Plan - SW	■			
L4-09	Site Layout Plan - NW	■			
L4-11	Site Layout Plan - SE	■			
L4-08	Site Layout Plan - NE	■			
L4-12	Site Layout Plan - Alterra Parkway	■			
L4-06	Enlargement Plan: Secondary Walks	■			
L4-07	Enlargement Plan: Secondary Walks	■			
L4-08	Enlargement Plan: Walks	■			
L4-09	Enlargement Plan: Ponds	■			
L4-10	Enlargement Plan: seating	■			
L4-11	Enlargement Plan: Walls	■			
SITE GRADING AND DRAINAGE SERIES					
LG-00	Refer to Civil Engineer's Drawings				
SITE LIGHTING SERIES					
LE-00	Refer to Site Electrical Engineer's Drawings				
SITE DETAILS					
L7-01	Site Details	■			
L7-02	Site Details	■			
L7-03	Site Details	■			
L7-04	Site Details	■			
L7-05	Site Details	■			
L7-06	Site Details: ADA ALTERNATE #1	■			
INDIA PLAN (INU SERIES) *(Combined with Shrub & Groundcover Series Details Planting Series)*					
L8-01	Planting Plan - SW	■			
L8-02	Planting Plan - NW	■			
L8-03	Planting Plan - SE	■			
L8-04	Planting Plan - NE	■			
L8-05	Planting Plan - Alterra Parkway	■			
L8-06	Planting Plan Enlargement	■			
L8-07	Planting Plan Enlargement	■			
L8-08	Planting Plan Enlargement	■			
L8-09	Planting Plan Enlargement	■			
SHRUB AND GROUNDCOVER PLANTING SERIES					
L9-00	Not Used at this Time - Combined with Tree Planting Series to create Planting Plans				
PLANTING DETAILS					
L10-01	Planting Details	■			
L10-02	Planting Details	■			

Sheet No.	Sheet Title	Issue Date	Rev. 1 - Date, Description	Rev. 2 - Date, Description	Rev. 3 - Date, Description
Civil Engineering Drawings:					
C1-00	General Notes	■			
C4-01	Site Grading Plan - NW	■			
C4-02	Site Grading Plan - NW	■			
C4-03	Site Grading Plan - SE	■			
C4-04	Site Grading Plan - NE	■			
C4-05	Site Erosion and Sediment Control Plan	■			
C4-06	Site Utilities Plan	■			
C4-07	Civil Details	■			
Irrigation Designer Drawings:					
IR1-01	Irrigation Plan - NW	■			
IR1-02	Irrigation Plan - NW	■			
IR1-03	Irrigation Plan - SE	■			
IR1-04	Irrigation Plan - NE	■			
IR1-05	Irrigation Plan - Alterra Parkway	■			
IR2-01	Irrigation Details and Notes	■			
Site Electrical Engineering Drawings:					
E1-01	Lighting Plan - NW	■			
E1-02	Lighting Plan - NW	■			
E1-03	Lighting Plan - SE	■			
E1-04	Lighting Plan - NE	■			
E2-01	Lighting Details and Notes	■			
Structural Engineering Drawings:					
S1-00	Structural Notes	■			
S2-00	Deck Foundation Plan	■			
S3-00	Structural Details	■			
S3-00	Structural Details	■			

Licensure Stamp

16 If Required

NOTE: As part of this project , the Contractor shall maintain a complete, up-to-date set of all Drawings and Technical Specifications available for review at the construction site by the Owner's Representatives. In addition, the Contractor shall ensure all installations and coordination by all trades occurs in accordance with the above revisions.

3 **OWNER / DEVELOPER**
RREEF DOMAIN, LP
CONTACT: Bryan Smith
221 West 6th Street
Suite 1300
Austin, TX 78701
Tel: (512) 682-5525
Facsimile: (512) 682-5505

LANDSCAPE ARCHITECT I
DESIGNWORKSHOP
CONTACT: Fenglin Du
801 Congress Avenue
Suite 330
Austin, TX
Tel: (512) 4999-0222
Facsimile: (512) 499-0229

CIVIL ENGINEER
BURY + PARNERS, INC.
CONTACT: Brad Lingvai
3345 Bee Caves Road, Suite 200
Austin, TX 78746
Tel: (512) 328-0011
Facsimile: (512) 328-0325

IRRIGATION DESIGNER
JAMES POLE IRRIGATION
CONTACT: James Pole
100 W. Oak Street, Suite 101
Denton, TX 76201
Tel: (940) 243-2364
Facsimile: (940) 328-2475

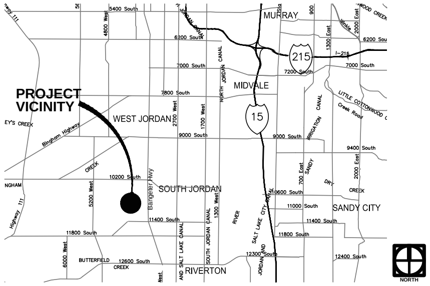
MEP
JOHNSON CONSULTING ENGINEERS, Inc.
CONTACT: David Johnson
2102 Blalock Drive, Suite 101
Austin, TX 78758
Tel: (512) 990-9550
Facsimile: (512) 990-9552

STRUCTURAL ENGINEER
STRUCTURES
CONTACT: Dante Angelini, P.E.
1018 W. 11th St., Suite 100
Austin, TX 78703
Tel: (512) 499-0919
Facsimile: (512) 320-8521

Client Project Number: xxxx 13
DW Project Number: 3879 14

Example CD Cover Sheet—Large Project

1 VICINITY MAP



2 PROJECT DESCRIPTION

Oquirrh Lake Phase I is a continuation of the Daybreak new community development. These Construction Documents explain the integration of lake systems and mechanisms such as blowers, weirs, dams, stop logs and liner with the proposed landscape architecture components which include, but are not limited to, rough and fine grading, placement of top soil, pedestrian circulation amenities (asphalt trails, concrete walks, crushed stone paving and boardwalks), lake edge treatments, inlake wetlands, stormwater detention, open space planting (seeding, shrubs, trees, perennials, groundcovers and placement of bark mulch), site amenities (trash receptacles, benches and drinking fountains), site walls (gabion and welded wire retaining), new boat ramp (concrete and gravel pave), irrigation system and exterior site lighting.

The Drawings and Specifications associated with this Project also provides the required consultant design and engineering information, including civil engineering, irrigation system, electrical engineering, biology, and structural engineering. Soil Erosion and Sedimentation Control and Construction Management shall be per the Contractor and submitted to Owner's Representative prior to construction for review and approval.

15

IF APPROVALS/AUTHORIZATION
REQUITED, PROVIDE HERE IN
ACCORDANCE WITH GOVERNING
AUTHORITY GUIDELINES.

4 **KENNECOTT LAND**
SOUTH JORDAN, UTAH 7

5 # OQUIRRH LAKE

6 **PHASE I**

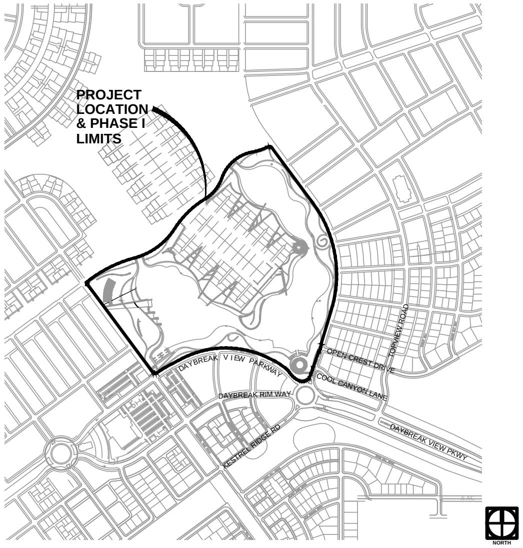
Landscape Architecture

8 **Construction Documents**

9 **ISSUED: April 29, 2005**

10 **SET NO. 1**

11 LOCATION MAP



12 **Sheet Index**

Sheet No.	Sheet Title	Issue Date	Rev. # - Date, Description	Rev. # - Date, Description	Rev. # - Date, Description
Landscape Drawings:					
L0-00	Cover Sheet	◆			
L0-01	Hardscape Reference Plan	◆			
L0-02	Softscape Reference Plan	◆			
L0-03	Genercal Information Sheet	◆			
PLANT PROTECTION AND DEMOLITION SERIES					
L1-00	Not Used at this Time				
SITE DEMOLITION SERIES					
L2-00	Not Used at this Time				
SITE MATERIALS SERIES					
L3-00	Site Materials & Layout Key Plan and General Information Sheet	◆			
L3-01	Site Materials & Layout Plan	◆			
L3-02	Site Materials & Layout Plan	◆			
L3-03	Site Materials & Layout Plan	◆			
L3-04	Site Materials & Layout Plan	◆			
L3-05	Site Materials & Layout Plan	◆			
L3-06	Site Materials & Layout Plan	◆			
L3-07	Site Materials & Layout Plan	◆			
L3-08	Site Materials & Layout Plan	◆			
L3-09	Site Materials & Layout Plan	◆			
L3-10	Site Materials & Layout Plan	◆			
L3-11	Site Materials & Layout Plan	◆			
L3-12	Site Materials & Layout Plan	◆			
L3-13	Site Materials & Layout Plan	◆			
L3-14	Site Materials & Layout Plan	◆			
L3-15	Site Materials & Layout Plan	◆			
L3-16	Site Materials & Layout Plan	◆			
L3-17	Site Materials & Layout Plan Enlargement	◆			
L3-18	Site Materials & Layout Plan Enlargement	◆			
L3-19	Site Materials & Layout Plan Enlargement	◆			
L3-20	Site Materials & Layout Plan Enlargement	◆			
SITE LAYOUT SERIES					
L4-00	Not Used at this Time - Combined with Site Materials Series				
SITE GRADING SERIES					
L5-00	Site Grading Key Plan and General Information Sheet	◆			
L5-01	Site Grading Plan	◆			
L5-02	Site Grading Plan	◆			
L5-03	Site Grading Plan	◆			
L5-04	Site Grading Plan	◆			
L5-05	Site Grading Plan	◆			
L5-06	Site Grading Plan	◆			
L5-07	Site Grading Plan	◆			
L5-08	Site Grading Plan	◆			
L5-09	Site Grading Plan	◆			
L5-10	Site Grading Plan	◆			
L5-11	Site Grading Plan	◆			
L5-12	Site Grading Plan	◆			
L5-13	Site Grading Plan	◆			
L5-14	Site Grading Plan				
L5-15	Site Grading Plan	◆			
L5-16	Site Grading Plan	◆			
L5-17	Site Grading Plan Enlargement	◆			
L5-18	Site Grading Plan Enlargement	◆			
L5-19	Site Grading Plan Enlargement	◆			
L5-20	Site Grading Plan Enlargement	◆			
L5-21	Site Grading Plan Fine Grading				
SITE LIGHTING and ELECTRICAL SERIES					
L6-00	Site Lighting & Electrical Key Plan and General Information Sheet	◆			
L6-01	Site Lighting & Electrical Plan	◆			
L6-02	Site Lighting & Electrical Plan	◆			
L6-03	Site Lighting & Electrical Plan	◆			
L6-04	Site Lighting & Electrical Plan	◆			
L6-05	Site Lighting & Electrical Plan	◆			
L6-06	Site Lighting & Electrical Plan	◆			
L6-07	Site Lighting & Electrical Plan	◆			
L6-08	Site Lighting & Electrical Plan	◆			
L6-09	Site Lighting & Electrical Plan	◆			
L6-11	Site Lighting & Electrical Plan	◆			
L6-12	Site Lighting & Electrical Plan	◆			
L6-13	Site Lighting & Electrical Plan	◆			
L6-14	Site Lighting & Electrical Plan	◆			
L6-15	Site Lighting & Electrical Plan	◆			
L6-16	Site Lighting & Electrical Plan	◆			
L6-17	Site Lighting Schedule & Details	◆			
SITE DETAILS					
L7-01	Site Details	◆			
L7-02	Site Details	◆			
L7-03	Site Details	◆			
L7-04	Site Details	◆			
L7-05	Site Details	◆			
L7-06	Site Details	◆			
L7-07	Site Details	◆			
L7-08	Site Details	◆			
L7-09	Site Details	◆			
L7-11	Site Details	◆			
L7-12	Site Details	◆			
TREE PLANTING SERIES *(Combined with Shrub & Groundcover Series to create Planting Series)*					
L8-00	Planting Key Plan and General Information Sheet	◆			
L8-01	Planting Plan	◆			
L8-02	Planting Plan	◆			
L8-03	Planting Plan	◆			
L8-04	Planting Plan	◆			
L8-05	Planting Plan	◆			
L8-06	Planting Plan	◆			
L8-07	Planting Plan	◆			
L8-08	Planting Plan	◆			
L8-09	Planting Plan	◆			
L8-10	Planting Plan	◆			
L8-11	Planting Plan	◆			
L8-12	Planting Plan	◆			
L8-13	Planting Plan	◆			
L8-14	Planting Plan	◆			
L8-15	Planting Plan	◆			
L8-16	Planting Plan	◆			
L8-17	Planting Plan Enlargement	◆			
L8-18	Planting Plan Enlargement	◆			
L8-19	Planting Plan Enlargement	◆			
L8-20	Planting Plan Enlargement	◆			
SHRUB AND GROUNDCOVER PLANTING SERIES					
L9-00	General Information Sheet				
L9-01	Shrub and GC Planting Plan				
L9-02	Shrub and GC Planting Plan				
L9-03	Shrub and GC Planting Plan				
L9-04	Shrub and GC Planting Plan				
L9-05	Shrub and GC Planting Plan				
L9-06	Shrub and GC Planting Plan				
L9-07	Shrub and GC Planting Plan				
L9-08	Shrub and GC Planting Plan				
L9-09	Shrub and GC Planting Plan				
L9-10	Shrub and GC Planting Plan				
L9-10	Shrub and GC Planting Plan				
L9-AA	Add/ Alternate Shrub Planting Plan				

Sheet No.	Sheet Title	Issue Date	Rev. # - Date, Description	Rev. # - Date, Description	Rev. # - Date, Description
SHRUB AND GROUNDCOVER PLANTING SERIES					
L9-00	Not Used at this Time - Combined with Tree Planting Series to create Planting Plans				
PLANTING DETAILS					
L10-01	Planting Details	◆			
SITE FURNISHINGS SERIES					
L11-00	Not Used at this Time				
LAKE EDGE SERIES					
L12-01	Lake Edge Typology Plan	◆			
L12-02	Lake Edge Construction Details	◆			
L12-03	Lake Edge Construction Details	◆			
L12-04	Lake Edge Construction Details	◆			
L12-05	Lake Edge Construction Details	◆			
Irrigation System Drawings:					
IR-1	Irrigation Plan	◆			
IR-2	Irrigation Plan	◆			
IR-3	Irrigation Plan	◆			
IR-4	Irrigation Plan	◆			
IR-5	Irrigation Plan	◆			
IR-6	Irrigation Plan	◆			
IR-7	Irrigation Plan	◆			
IR-8	Irrigation Plan	◆			
IR-9	Irrigation Plan	◆			
IR-10	Irrigation Plan	◆			
IR-11	Irrigation Plan	◆			
IR-12	Irrigation Plan	◆			
IR-13	Irrigation Plan	◆			
IR-14	Irrigation Plan	◆			
IR-15	Irrigation Plan	◆			
IR-16	Irrigation Plan	◆			
IR-17	Irrigation Details	◆			
Electrical Engineering Drawings:					
L9-1	Site Lighting & Power Plan	◆			
L9-2	Site Lighting & Power Plan	◆			
L9-3	Site Lighting & Power Plan	◆			
L9-4	Site Lighting & Power Plan	◆			
L9-5	Site Lighting & Power Plan	◆			
L9-6	Site Lighting & Power Plan	◆			
L9-7	Site Lighting & Power Plan	◆			
L9-8	Site Lighting & Power Plan	◆			
L9-9	Site Lighting & Power Plan	◆			
L9-10	Site Lighting & Power Plan	◆			
L9-11	Site Lighting & Power Plan	◆			
L9-12	Site Lighting & Power Plan	◆			
L9-13	Site Lighting & Power Plan	◆			
L9-14	Site Lighting & Power Plan	◆			
L9-15	Site Lighting & Power Plan	◆			
L9-16	Site Lighting & Power Plan	◆			
L10-1	Light Schedule & Details	◆			
Constructed Wetland Drawings:					
CW0-1	Phase I CW Plan	◆			
CW0-2	Hillside Location	◆			
CW0-3	Hillside Site and Details	◆			
CW0-4	Hillside Stie and Details	◆			
CW2-1	Stormwater Wetlands Site	◆			
CW2-2	Infiltration System	◆			
CW2-3	Wetlands Details	◆			
CW2-4	Wetland Control Details	◆			
CW2-5	SW-6A Details	◆			
CW2-6	SW-6B Details	◆			
CW2-7	SW-6C Details	◆			
CW2-8	SW-7A Details	◆			
CW2-9	SW-7B Details	◆			
CW2-10	SW-8A & SW-8B Details	◆			
CW2-11	SW-8C Details	◆			
CW3-1	Planting Plans	◆			
CW3-2	Planting Plans	◆			
CW3-3	Planting Plans	◆			
CW3-4	Planting Plans				
CW3-5	Not Used				
CW3-6	Planting Plans				
CW3-7	Planting Plans				
CW3-8	Planting Plans	◆			
CW3-9	Planting Plans	◆			
CW3-10	Not Used	◆			
CW3-11	Not Used	◆			
CW3-12	Planting Plans	◆			
CW3-13	Planting Plans	◆			
CW3-14	Planting Plans	◆			
CW3-15	Planting Plans	◆			
CW3-16	Planting Plans	◆			
CW4-1	Waterfall Plunge Pool	◆			
CW4-2	Pump and Control Station	◆			
CW4-3	Operable Weir	◆			
CW4-4	Miscellaneous Details	◆			
CW4-5	Miscellaneous Details	◆			
CW5-1	Lake Aeration Phase I				
CW5-2	Aeration Details				
CW6-1	Stop Log Gate and Details				
Site Structure Drawings:					
CD0-1	Overall Site Plan				
CD2-1	Site Plan				
SD4-1	Dam Structure Plan and Profile				
SD5-1	Typical Cross Sections of Dam Structure				
SD5-2	Drain Line Plan and Profile				
SD5-3	Drain Line Details				
SD6-1	Regulating Pond Outlet Profile and Details				
SD6-2	Geology Map of Dam Site and Reservoir				
SD6-3	Geologic Bore Hole Plan and Profile				
SD6-4	Boring Logs				
SP4-1	West Pedestrian Bridge				
SP4-2	East Pedestrian Bridge				
CV4-1	West Vehicular Bridge				
CV4-2	East Vehicular Bridge				

Licensure Stamp

16

If Required

NOTE: As part of this project , the Contractor shall maintain a complete, up-to-date set of all Drawings and Technical Specifications available for review at the construction site by the Owner's Representatives. In addition, the Contractor shall ensure all installations and coordination by all trades occurs in accordance with the above revisions.

3

OWNER:
KENNECOTT LAND
5295 South 300 West
Suite 475
Murray, Utah 84107
Tel: (801) 743-4624
Facsimile: (801) 743-4659

LANDSCAPE ARCHITECT:
DESIGNWORKSHOP
224 South 200 West
Suite 110
Salt Lake City, Utah
84101-1801
Tel: (801) 359-4771
Facsimile: (801) 359-4411

CIVIL ENGINEER:
NOLTE Associates, Inc.
6671 South Redwood Road,
Suite 101
West Jordan, Utah 84084
Tel: (801) 743-1326
Facsimile: (801) 743-0300

IRRIGATION DESIGN:
Dale Winchester & Associates
2215 East Pinecrest Lane
Sandy, Utah 84092
Tel: (801) 571-6060
Facsimile: (801) 572-4726

ELECTRICAL ENGINEER:
Spectrum Engineers
175 South Main Street
Suite 300
Salt Lake City, Utah 84111
Tel: (801) 328-5151
Facsimile: (801) 328-5155

LAKE AND WETLAND BIOLOGIST/ENGINEER:
Natural Systems International
3600 Cerrillos Rd.
Suite 1102
Sante Fe, NM 87507
Tel: (505) 988-7453
Facsimile: (505) 988-3720

STRUCTURAL ENGINEER:
NOLTE Associates, Inc.
6671 South Redwood Road,
Suite 101
West Jordan, Utah 84084
Tel: (801) 743-1326
Facsimile: (801) 743-0300

13 **Client Project Number: xxxx**
14 **DW Project Number: 3337**

LEGEND

1 Project Vicinity Map
2 Construction-Oriented Project Description
3 Project Team
4 Project Owner or Developer's Name
5 Project Title
6 Title of Included Work
7 Site Address
8 Document Set Description
9 Official Date of Issuance
10 Set Number
11 Project Location Map
12 Sheet Index
13 Owner's Project Reference Number
14 Landscape Architect's Project Number
15 Approvals/Authorization
16 Licensure Stamp

Another item that may be provided, but not currently depicted, if the project requires it, is:

–Community, District, or Other Area Reference.

Note: ***Bold face*** *items represent key distinctions between Construction Documents and Design Development documents.*

GENERAL SHEETS: DESIGN DEVELOPMENT SITE REFERENCE PLANS*

Objective

The Design Development Site Reference Plans introduce the project to a design audience by illustrating a holistic view of existing and proposed conditions.

General Requirements

The Site Reference Plan establishes the position of the project site within its immediate context, illustrating and labeling adjoining streets, properties, land uses, and other relevant contextual factors that may affect the design proposal or its implementation.

The Site Reference Plan is developed as the primary "reference" for the project, depicting the full scope of site development work. The plan is important because it may be the only plan within the landscape architect's document set to show the entire project on a single sheet. With that opportunity in mind, the Site Reference Plan should be composed to illustrate the entire site design program and label the key design spaces and elements for design-reviewing audiences.

The DD plan provides a composite depiction of interfacing multidisciplinary design elements, for design review by the consultant team, including hardscape, softscape, grading, planting, irrigation, infrastructure, buildings, and structural conditions.

Due to the complexity of the landscape architecture program, it may be difficult to clearly illustrate that program in its entirety on a single plan. Consequently, the program may be communicated on two separate plans, one illustrating hardscape conditions and the other softscape conditions. Requirements for each plan are presented.

Site Reference Plan—Hardscape

The hardscape program includes all proposed site improvements, including proposed grading and utilities, pavements, curbs, stairs, walls, fences, furniture, lighting, grading, signs, and key infrastructure, for example, irrigation water mainline, backflow preventer, and controller; civil (major utility installations or structures); and electrical (major vaults, transformers, and the like). Other structures, including but not limited to those associated with mechanical, pool or pond features, and so forth, should be included.

*Includes both the Hardscape Site Reference Plan and the Softscape Site Reference Plan.

Proposed plants and other softscape elements should not be included. All proposed improvements should be depicted as an overlay to all existing and contextual conditions to remain. Generic labels should be used to identify major components and hardscape improvements.

Site Reference Plan—Softscape

The softscape program includes all proposed plants and other softscape elements, for example, trees, shrubs, groundcovers, perennial/annuals and grass areas. These should be shown with screened back reference to proposed hardscape, grading and utilities improvements, and existing and contextual improvements to remain. Generic labels should be used to identify major components and proposed softscape improvements.

Key Distinctions between DD and CD Site Reference Plans

The landscape architect should be strategic in making content decisions for the Design Development documents. These guidelines suggest individual strategies for each of the DD sheets, subject to the unique role of that sheet in the design and documentation process.

Primary relationships between the DD and CD Site Reference Plans are summarized:

- The DD Site Reference Plan approximates the CD Site Reference Plan in terms of content. Each of the Specific Requirements defined below should be completed at a CD quality level.

Specific Requirements

Site Reference Plans—Hardscape and Softscape

- **Survey base sheet** to show all existing conditions to remain, including above-and below-grade structures, pavements, plants, topography, utilities, monuments, benchmarks, or other reference datum, and all legal conditions and restrictions such as property line bearings and distances, recorded easements, zoning setbacks, deed restrictions, adjacent property owners, and zoning districts if relevant to the project layout. Do not modify base sheet to change or obscure content, except to graphically remove those items that will be removed as part of the construction contract.
- **Perimeter existing conditions** immediately adjoining the project site, allowing the reader to understand the relationship between on- and off-site conditions. For example, it would be appropriate to graphically identify and label elements such as adjoining land uses, major architectural features, buildings or structures, and utility infrastructure such as influential drainage and utility courses and streets.

- **Preliminary limits of Project Scope of Work Line**, as agreed by landscape architect, civil engineer, contractor(s), and owner. Note that limits of work may not coincide with property lines, for example, when areas within the property area have been designated as non-work areas or if other areas or property outside project property limits must be utilized by the contractor. Accurate determination of limits of work requires the investigation of a number of issues that the landscape architect may not have immediate access to, including contractor staging, mobilization, construction access, traffic control, and other construction-related issues. Consequently, the DD limits of work may be revised as they are better informed at the CD phase.
- **Site areas not to be disturbed,** if necessary, including tree protection areas, natural areas, or existing construction to be protected during construction. However, tree protection graphics are not to be included on this plan.
- **All proposed buildings or structures,** labeled to reference their generic or official name, if designated at time of documentation. Generic names include references such as "Office Building" or "Residence." Official names include references such as "Sky Tower One" or "Madison Residence."
- **Interdisciplinary design program,** including civil infrastructure; architectural program including columns, overhangs, and subgrade elements; and electrical and irrigation infrastructure.
- **Labels** to identify major program elements and design features. Major features include primary spaces, parking areas and roads, water features, buildings, and site architecture. For example, it would be appropriate to label elements such as a clubhouse, pool area, children's play area, service area, and employee parking.
- Current project **phasing,** if applicable.

Graphic Requirements

Hardscape and Softscape Site Reference Plans

- **Existing conditions to remain,** screened a maximum of 50 percent as original unaltered survey, in order to better highlight proposed improvements. The landscape architect may also elect to incorporate existing conditions at full value, if that better serves graphic objectives.
- Single, **undivided Site Plan**, scaled as large as possible to fit on sheet.
- Plan orientation to match the orientation of plans within the document set.
- **Limit of Project Scope of Work Line** represented by equally spaced dashed bold line, with a "Limit of Project Scope of Work" note. Use a line width per landscape architect's CAD standards.
- **Labels** for major components, as described in the following list, as part of a graphic hierarchy in descending order of importance:
  1. Major landscape spaces and elements, for example, "Activity Terrace," or "Water Wall"
  2. Major buildings
  3. Proposed roads, parking, and service areas
  4. Existing roads and other conditions to remain
- **Line-weight hierarchy**, rigorously applied to distinguish proposed from existing conditions.

  Line-weight hierarchy, lightest to heaviest:
  1. Screened survey base showing existing conditions, including subgrade conditions
  2. Lines to distinguish on-grade materials and elements, for example, edges of pavements
  3. Lines to distinguish above-grade materials and elements, for example, walls, stairs and furniture
  4. Notes and labels

Hardscape Site Reference Plan

- **Hardscape program**, with screened hatches and patterns that are normally included on the Site Materials Plan if graphically coherent; otherwise omit. Include consultant improvements such as civil, with graphics screened to match landscape hardscape program.
- **Proposed grading contour lines**, bold line weight, without spot elevations, per *Grading Plan Graphic Requirements*.

Softscape Site Reference Plans

- **Proposed planting,** illustrated with simple circles for trees and shrubs, and massing symbol for perennials/annuals, grasses, and groundcovers.
- **Hardscape program**, greatly simplified, with outlines only depicting the limits of each material. Refer to line weight hierarchy above.
- **Grading program**, with screened plan hatches and patterns that are normally included on the Site Grading Plan, if graphically coherent; otherwise omit.

- **Consultant improvements**, as described earlier, with screened plan hatches and patterns, if graphically coherent; otherwise adjust graphically as necessary.

Best Practices

Design

Maximize the opportunity this plan provides to comprehensively examine interdisciplinary design relationships.

Coordination

Use the Site Reference Plan to coordinate work limits with others, for example, civil engineer and prime design consultant, if applicable.

Annotate the plan to refer to work by others that requires interface with work by the landscape architect, for example, grading work completed by civil engineer, and roadway or parking lot layout by civil engineer.

When reviewing agencies require that submittal documents clearly illustrate how and where key code requirements have been met, utilize the Site Reference Plan to highlight these elements. Graphically highlight and label applicable conditions, for example, parking calculations, ADA accessible routes, or protected wetlands.

Construction access locations, and construction staging area(s), if required by owner, are typically not required at Design Development. However, they may be necessary to document and should be completed on the CD Site Reference Plans. Refer to Best Practices in CD section.

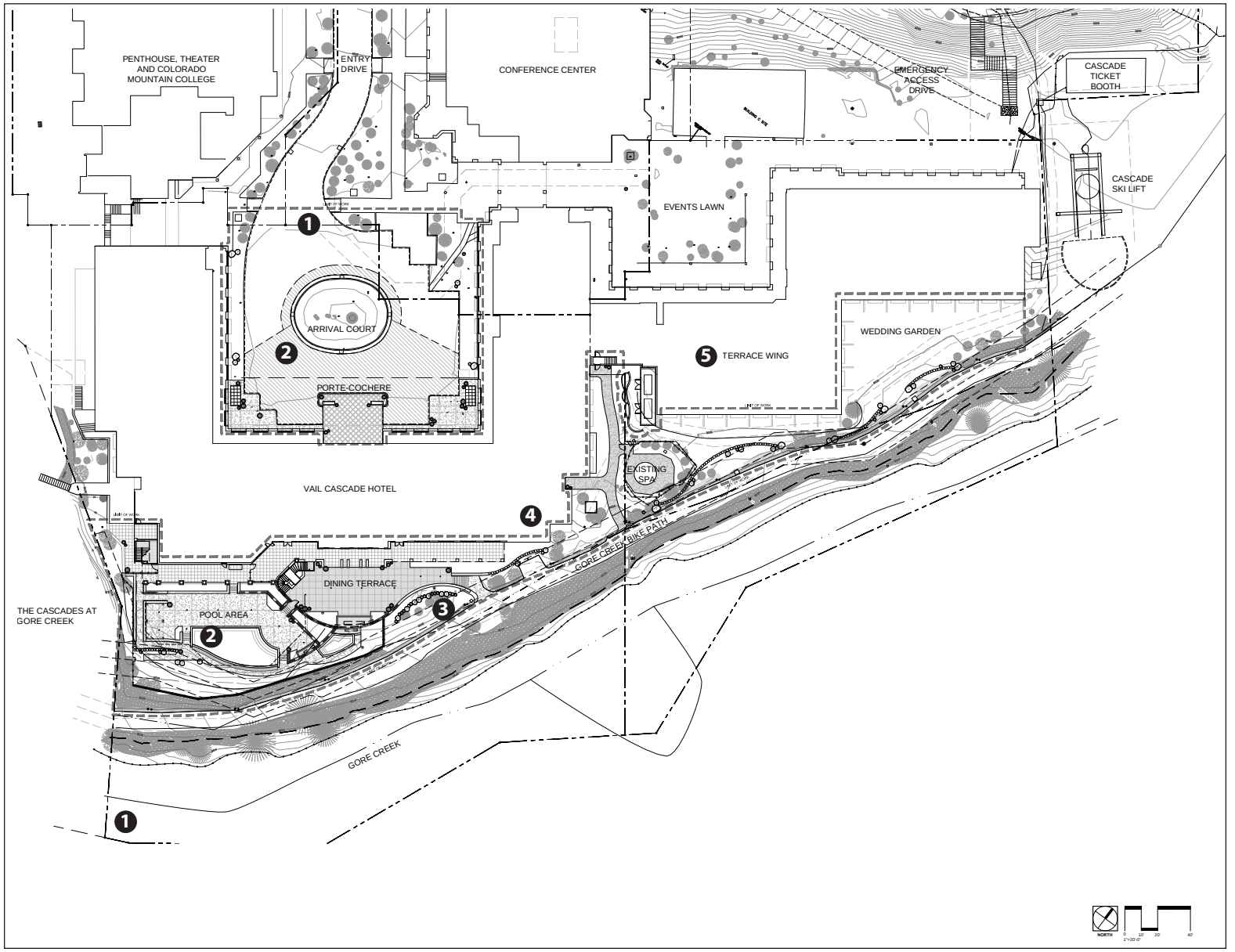
Technical

The Site Reference Plan should largely be constructed as part of automated CAD processes through the use of the landscape architect's standard external referencing protocols. For example, the site reference drawing(s) should be composed of a series of X-Refs to make said drawing, including the Site Materials X-Ref, Site Grading X-Ref, Site Lighting X-Ref, Planting X-Ref, Consult X-refs, and the Existing Conditions/Site Survey X-Ref, as required.

Strategies

In the field, contractors benefit from access to a single complete plan, in order to examine sitewide issues such as access, mobilization, and storage and relationships between proposed improvements to determine installation means and methods. The Site Reference Plan can best illustrate these issues and be the most useful if it clearly identifies sensitive site areas that are not to be used during the construction process.

Example DD Site Reference Plan—Hardscape



LEGEND

1. Survey Base Sheet
2. Proposed Site Improvements
3. Proposed Grading
4. Preliminary Limits of Work (if able to define) or Limit of Project Scope of Work Line
5. Labels

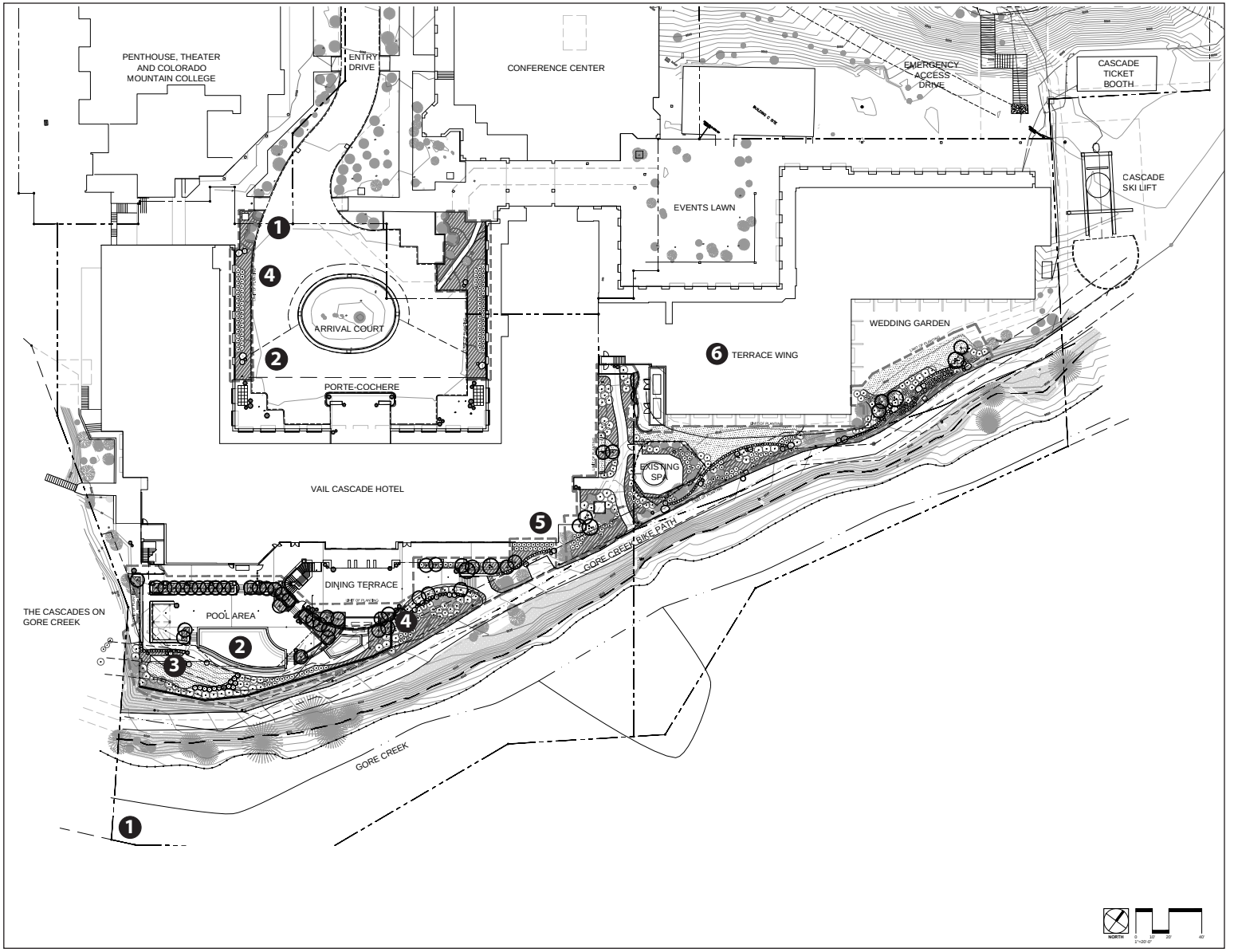
*Note: This sample depicts only the drawing area for this sheet. For title block requirements refer to beginning of this section.

Example DD Site Reference Plan—Softscape

LEGEND

1. Survey Base Sheet
2. Proposed Site Improvements
3. Proposed Grading
4. Proposed Planting
5. Preliminary Limits of Work (if able to define) or Limit of Project Scope of Work Line
6. Labels

*Note: This sample depicts only the drawing area for this sheet. For title block requirements refer to previous section.



GENERAL SHEETS: CONSTRUCTION DOCUMENTATION SITE REFERENCE PLANS*

Objective

The CD Site Reference Plan provides the contractor with an overall depiction of existing and proposed conditions.

General Requirements

The plan comprehensively communicates relationships between existing site and contextual conditions and the design proposal so that the contractor can determine strategies for access, mobilization, staging, and implementing construction.

The Reference Plans should provide the general contractor and subcontractors with a comprehensive depiction of the complete landscape architecture design proposal, including buildings, and other subconsultant and project team consultant improvements required to complete the work, so that the contracting team may begin to coordinate work interfaces.

*Includes both the Hardscape Site Reference Plan and the Softscape Site Reference Plan.

Specific Requirements

Hardscape and Softscape Site Reference Plans

- **Final limits of Project Scope of Work Line or Limit of Work Line (if determined),** as agreed by landscape architect, civil engineer, contractor(s), and owner
- **Contractual project phasing,** if applicable.
- **Construction staging area,** if location required by owner or governing body and direction provided by Owner and Contractor on size, location, access, security measures, etc. Otherwise, this is a means and methods item and the general contractor shall determine location.
- **Construction access location(s),** if locations required by owner or governing body and direction provided by Owner and Contractor on size, location, access, security measures, etc. Otherwise, general contractor shall determine and submit locations for review.

Graphic Requirements

(Same as *Design Development*)

Best Practices

(Same as *Design Development*)

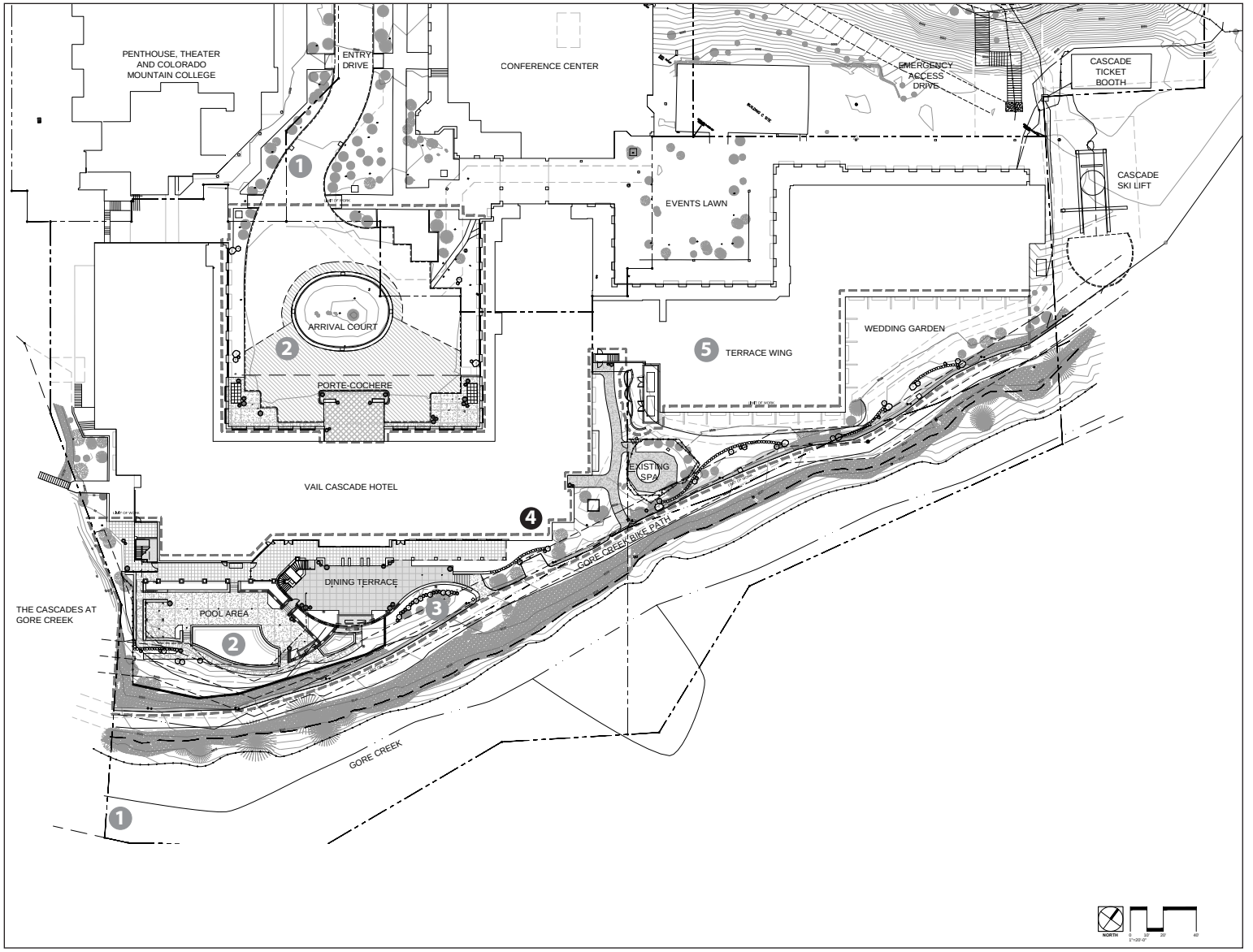
Example CD Site Reference Plan—Hardscape

LEGEND

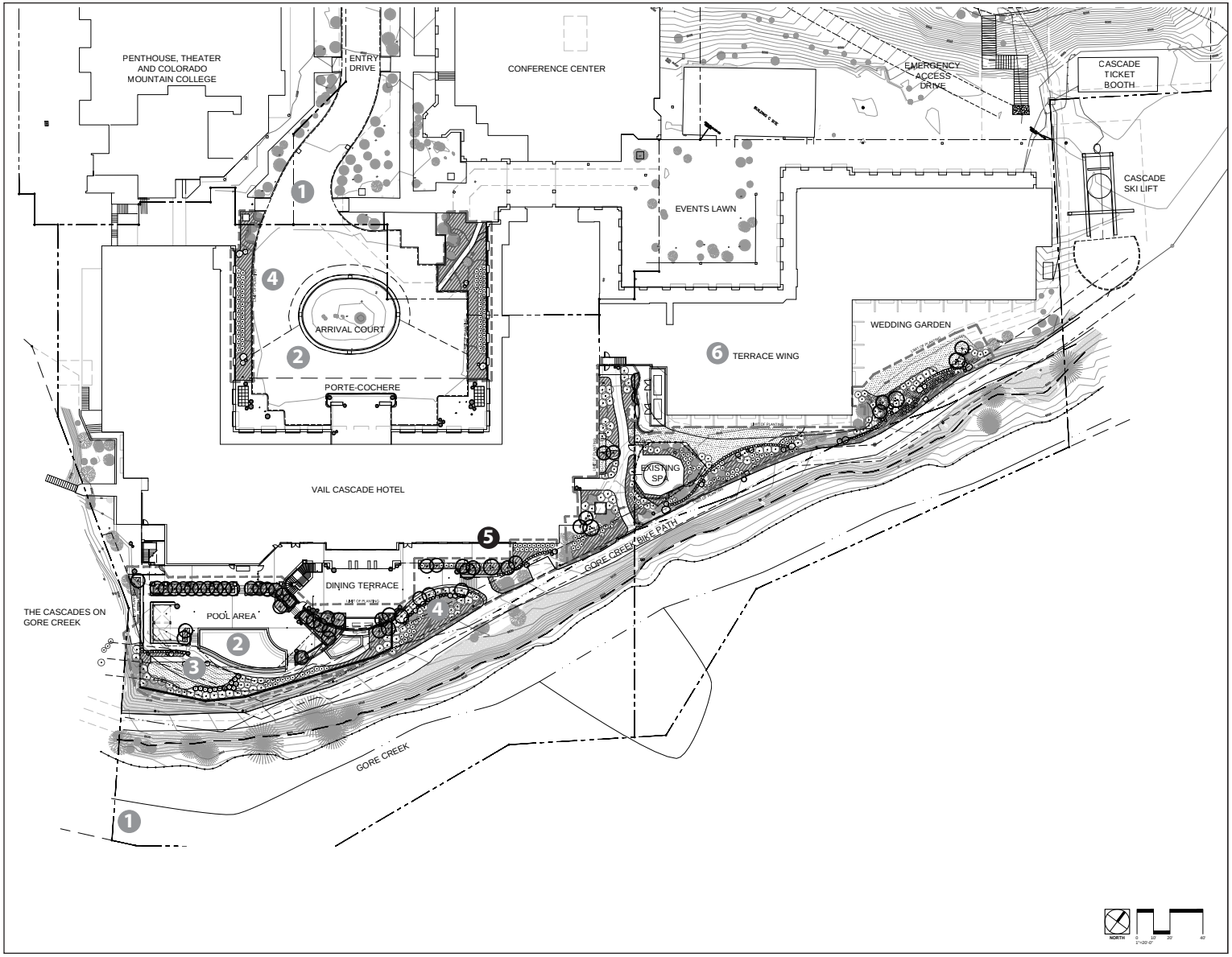
1. Survey Base Sheet
2. Proposed Site Improvements
3. Proposed Grading
4. **Final Limits of Work (if able to define) or Limit of Project Scope of Work Line**
5. **Labels**

*Note: **Boldface** items represent key distinctions between Construction Documentation documents and Design Development documents.

*Note: This sample depicts only the drawing area for this sheet. For title block requirements refer to preceding Title Block section.



Example CD Site Reference Plan—Softscape



LEGEND

1. Survey Base Sheet
2. Proposed Site Improvements
3. Proposed Grading
4. Proposed Planting
5. **Final Limits of Work (if able to define) or Limit of Project Scope of Work Line**
6. **Labels**

*Note: **Boldface items** represent key distinctions between Construction Documentation documents and Design Development documents.

*Note: This sample depicts only the drawing area for this sheet. For title block requirements refer to preceding Title Block section.

GENERAL SHEETS: DESIGN DEVELOPMENT KEY PLAN

Objective

The Design Development Key Plan presents the graphic organization of the landscape architectural plan sheets within the drawing set.

General Requirements

The Design Development Key Plan should reflect a fully resolved sheet layout organization that which will be used identically for both DD and CD plans.

Key Distinctions between DD and CD Key Plans

The landscape architect should be strategic in making content decisions for the Design Development documents. These guidelines suggest individual strategies for each of the DD sheets, subject to the unique role of that sheet in the design and documentation process.

Primary relationships between the DD and CD Key Plans are summarized:

1. The DD Key Plan approximates the CD Key Plan in terms of content. Each of the requirements defined below should be completed at a CD quality level.
2. The DD Key Plan defines the location and relationships between all plan sheets within the document set. Changes in sheet layout, regardless of however small, should be reflected in the CD Key Plan.

Specific Requirements

(Note: For purposes of these guidelines and as described in the beginning of this chapter, under Cover Sheet Design Development, landscape architecture projects are described in two categories: small projects and large projects.)

The requirements for both categories of Key Plans are described here:

- **Survey base sheet,** to show all existing conditions to remain, including above- and below-grade structures, pavements, plants, topography, utilities, monuments, benchmarks, or other reference datum, and all legal conditions and restrictions such as property line bearings and distances, recorded easements, zoning setbacks, deed restrictions, adjacent property owners, and zoning districts if relevant to the project layout. Do not modify the base sheet to change or obscure content, except to graphically remove those items that will be removed as part of the construction contract.
- **Perimeter existing conditions** immediately adjoining the project site, allowing the reader to understand the relationship between on- and off-site conditions. For example, it would be appropriate to graphically identify and label elements such as adjoining land uses, major architectural features, buildings or structures, and utility infrastructure such as influential drainage and utility courses and streets.
- **Preliminary limits of scope of work**, as agreed by landscape architect, civil engineer, contractor(s), and owner. Note that limits of work may not coincide with property lines, for example, when areas within the property area have been designated as non-work areas or if other areas or property outside project property limits must be utilized by the contractor. Accurate determination of limits of work requires the investigation of a number of issues that the landscape architect may not have immediate access to, including contractor staging, mobilization, construction access, traffic control, and other construction-related issues. Consequently, the DD limits of work may be revised as they are better informed at the CD phase.
- All major **on-site existing conditions to remain,** for example, streets and other pavements, landscape, water bodies, and existing buildings. Identify any unique features or elements that may affect design considerations or construction processes.
- **All proposed site improvements,** to coincide with those landscape architectural improvements shown on the Site Materials Plan. Site Lighting, Site Grading, and Drainage Planting and major consultant improvements can also be included to help depict extent of project work scope but is not a prerequisite. Note, however, that for series-specific key plans in the Large Project format, series plan information should be included. For example, Site Lighting Key Plan and General Information Sheet should include proposed site lighting improvements.
- **All proposed buildings** or structures, labeled to reference their generic or official name, if designated at time of documentation. Generic names include references such as "Office Building" or "Residence." Official names include references such as "Sky Tower One" or "Madison Residence."
- **Sheet boundary box,** identifying the boundary of the subject sheet (See *Graphic Requirements* below).
- **Sheet labels,** identifying the sheet number in the set, for example L*x*-01, L*x*-02, and so on, where *x* represents the series specific numbers.

Small Projects

The Key Plan Sheet should incorporate the survey base sheet, proposed improvement plans, sheet boundary box, and sheet labels as described earlier to create a comprehensive plan overview of the proposed project and the included sheet series. The Key Plan should be depicted at a legible scale, complete with north arrow and graphic scale bar. Plan limits of each sheet should be depicted. For small projects, this Key Plan layout governs the entire set.

Large Projects

The Key Plan, as described under small projects, should be combined with the General Information Sheet to become a Key Plan and General Information Sheet. This sheet is series-specific, so the drawing scales and sheet layout may be changed, if necessary, to better suit the associated scope of work.

The following items should be included on the Key Plan and General Information Sheet for large projects:

- Series-Specific Key Plan (not an all-inclusive set-governing Key Plan as for small projects)
- Series-Specific General Notes
- Series-Specific Legends
- Series-Specific Lists or Schedules

Graphic Requirements

Intent

The Key Plan graphic is intentionally spare in order to allow the sheet layout to read clearly. It utilizes area outlines, rather than symbols or hatches to define the landscape architecture program.

- **Survey base sheet/existing conditions to remain,** including **Perimeter existing conditions to remain,** screened back a maximum of 50 percent as original unaltered survey, in order to better highlight proposed improvements. The landscape architect may also elect to incorporate existing conditions at full value, if that better serves graphic objectives.
- Single, **undivided Site Plan**, scaled as large as possible to fit on sheet.
- **Plan orientation** to match orientation of plans within the document set.
- **Work limit of project scope of work line,** represented by equally spaced dashed bold line, with a "Limit of Work" note. Use a line width per landscape architect's CAD standards.
- All **proposed site improvements**, graphically depicted without patterns or hatches. Series-specific key plans should include series-specific plan information.
- A **line-weight hierarchy**, rigorously applied to distinguish proposed from existing conditions.

Line-weight hierarchy from lightest to heaviest:

1. Screened survey base showing existing conditions, including subgrade conditions
2. Lines to distinguish on-grade materials and elements, for example, edges of pavements
3. Lines to distinguish above-grade materials and elements, for example, walls, stairs, and furniture
4. Sheet boundary box and labels

Sheet Boundary Box

Graphically illustrate plan sheet layout and associated sheet references for plans included with the document set.

Use a heavy, bold, contiguous or dashed box to define the boundaries of each sheet. Boundaries are defined by the viewport window or workspace at the designated scale for each sheet. Sheet boundary boxes should overlap to provide sufficient context to reference adjoining sheets.

Use the following terminology to reference sheets within the Sheet Boundary Boxes: L*x*-01, L*x*-02, L*x*-03, and so on, where *x* indicates the series-specific sheets included within the document set.

Organize sequence of sheets in a series from top of Key Plan to bottom and from left to right, to the greatest extent possible. For example, Sheet L*x*-01 should be positioned in the upper-left corner of the site, with Sheet L*x*-02 occurring to the right and/or below Sheet L*x*-01.

Plan sheets should be ideally organized to address the following issues: However, Project criteria may dictate alternative layouts

- All sheets should be oriented identically, with north at the top of the sheet. However, project criteria may allow for different orientations.
- Sheets should be ordered from left to right, with a clockwise orientation around the site.
- Matched sheets should be organized as a rectangular grid. However, project criteria may suggest a set of inconsistently sized and shaped matchlines in order to minimize and efficiently match sheets.

- Include a 1-inch overlap on individual layout sheets to highlight relationship to adjoining sheets for orientation.
- Determine the sheet organization by determining critical "seams" between layout areas, and areas requiring self-contained layout information. For example, a plaza component of a project should not be subdivided into several pieces.
- The entire property ideally should be covered with sheet layout, even if sheets occur outside work limits, i.e. even if the project work scope area does not encompass the entire property. However, project parameters may suggest otherwise.

Best Practices

Design

Sheet Matchlines

During the development of the drawing set and sheet layout, matchlines play an integral role in communicating plans properly. Care must be taken in organizing the matched layout of sheets to avoid awkward cut lines, multiple sheets depicting the same elements, and general redundancy.

The landscape architect should study the project and proposed improvements and determine the best location to "break" the design with matchlines. Matchline determinations will inform sheet layout and sheet boundary boxes.

Graphically illustrate the "matchline" between adjoining sheets and area within the overlapping portions of the sheet boundary boxes.
The matchlines should be referenced on the individual series-specific sheets per the landscape architect's CAD standards. Matchlines define the limits of work defined on that sheet within the document set.

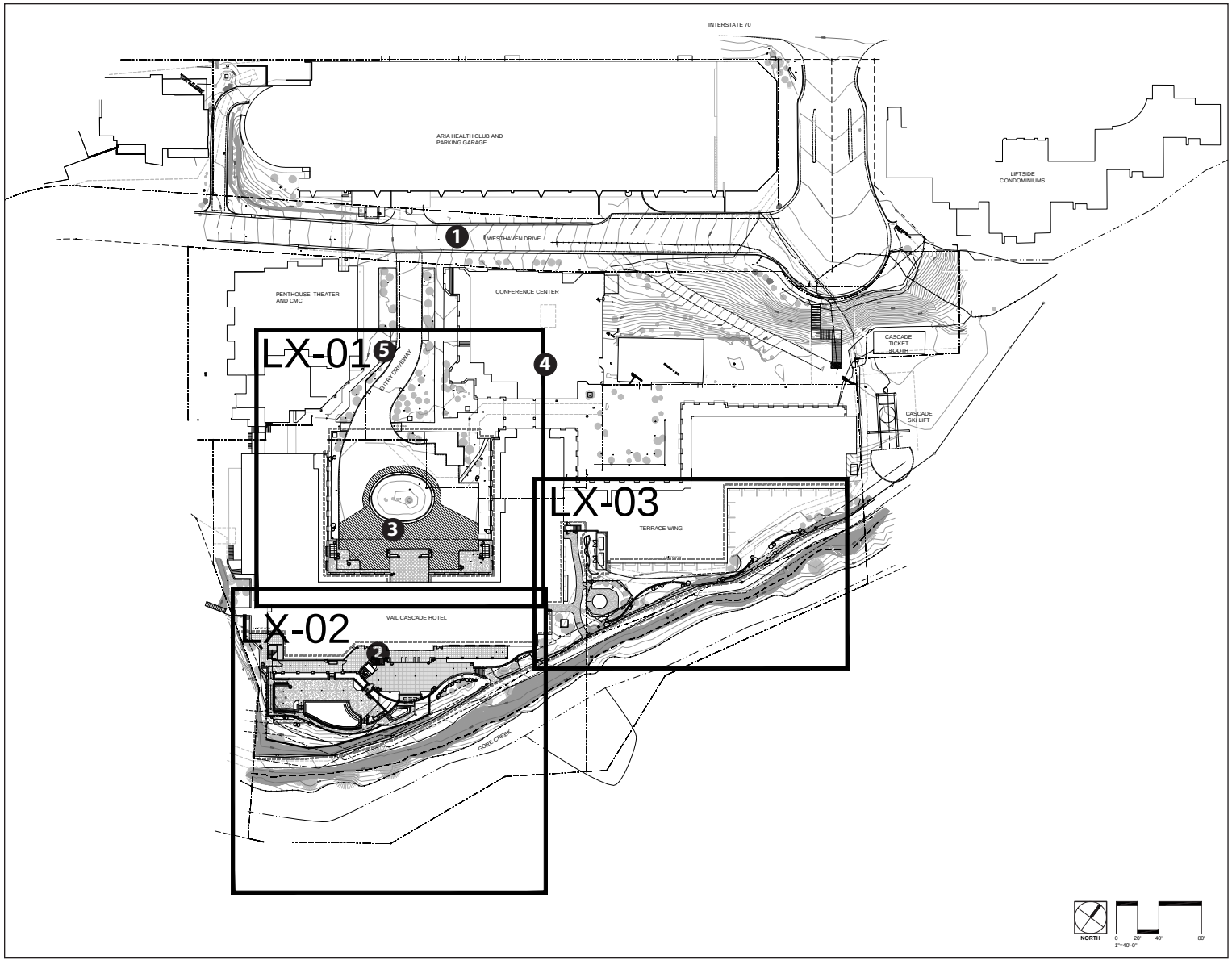
Coordination

Use the Key Plan to coordinate sheet organization with landscape architect's subconsultants, for example, irrigation and site electrical. While these subconsultants may desire to use an alternative sheet layout, there are benefits to aligning sheet organization among disciplines.

Technical

The Key Plan should largely be constructed as part of automated CAD processes through the use of the landscape architect's standard external referencing protocols. For example, the Key Plan drawing(s) should be composed of a series of X-Refs to make said drawing, including the Site Materials X-Ref, Site Grading X-Ref, Site Lighting X-Ref, Planting X-Ref, Consult X-Refs, and the Existing Conditions/Site Survey X-Ref, as required.

Example DD Key Plan—Small Project



LEGEND

1. Survey Base Sheet
2. Preliminary Limits of Work (if able to define) or Limit of Project Scope of Work Line
3. Proposed Site Improvements
4. Sheet Boundary Box
5. Sheet Labels

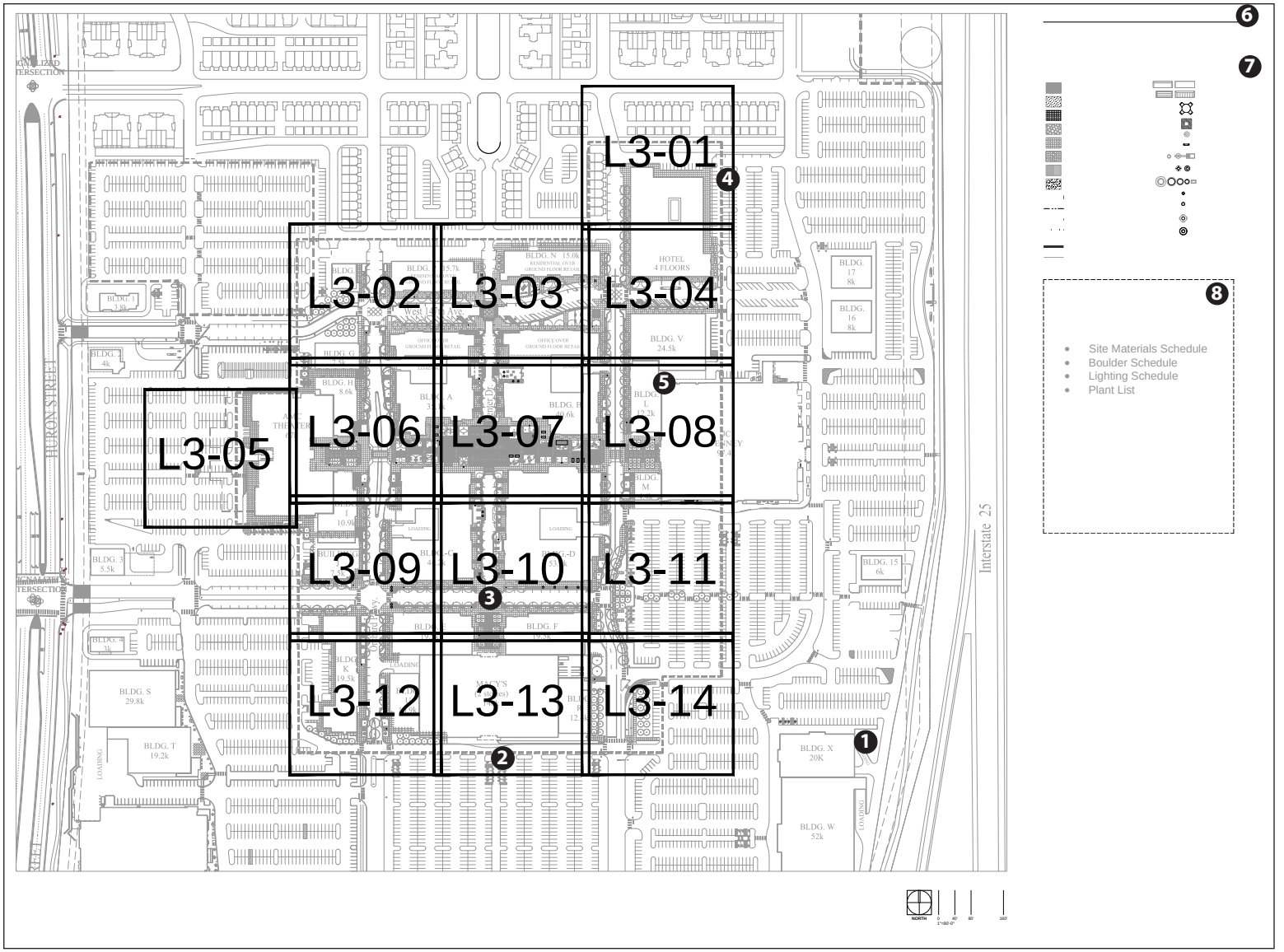
*Note: This sample depicts only the drawing area for this sheet. For title block requirements refer to preceding Title Block section.

Example DD Key Plan and General Information Sheet—Large Project
(Sample provided is for Site Materials Series)

LEGEND

1. Survey Base Sheet
2. Preliminary Limits of Work (if able to define) or Limit of Project Scope of Work Line
3. Proposed Site Improvments
4. Sheet Boundry Box
5. Sheet Labels
6. Series-Specific General Notes
7. Series-Specific Legends
8. Series-Specific Lists or Schedules

*Note: This sample depicts only the drawing area for this sheet. For title block requirements refer to preceding Title Block section



GENERAL SHEETS: CONSTRUCTION DOCUMENTATION KEY PLAN

Objective

The CD Key Plan depicts the plan organization of the drawing set for the general contractor.

General Requirements

The CD Key Plan should reflect a fully resolved sheet layout organization, precisely reflecting plan sheet positions.

Specific Requirements

There are no differences between the DD and CD Key Plans. However, the Key Plan sheet layout may evolve to better depict design revisions, convey changes in scope of work, depict changes in drawing scale, or show the addition of sheets or enlargement plans.

For Large Projects, the series-specific information provided as part of the General Information sheets should progress and be more comprehensive. Revisions to notes and/or legends and the incorporation of or updates to DD-level lists and schedules may be completed.

Graphic Requirements

There are no differences between the DD and CD Key Plans.

Best Practices

Best practices are described at the DD Key Plan. These practices should be exercised at both DD and CD phases.

Example CD Key Plan—Small Project

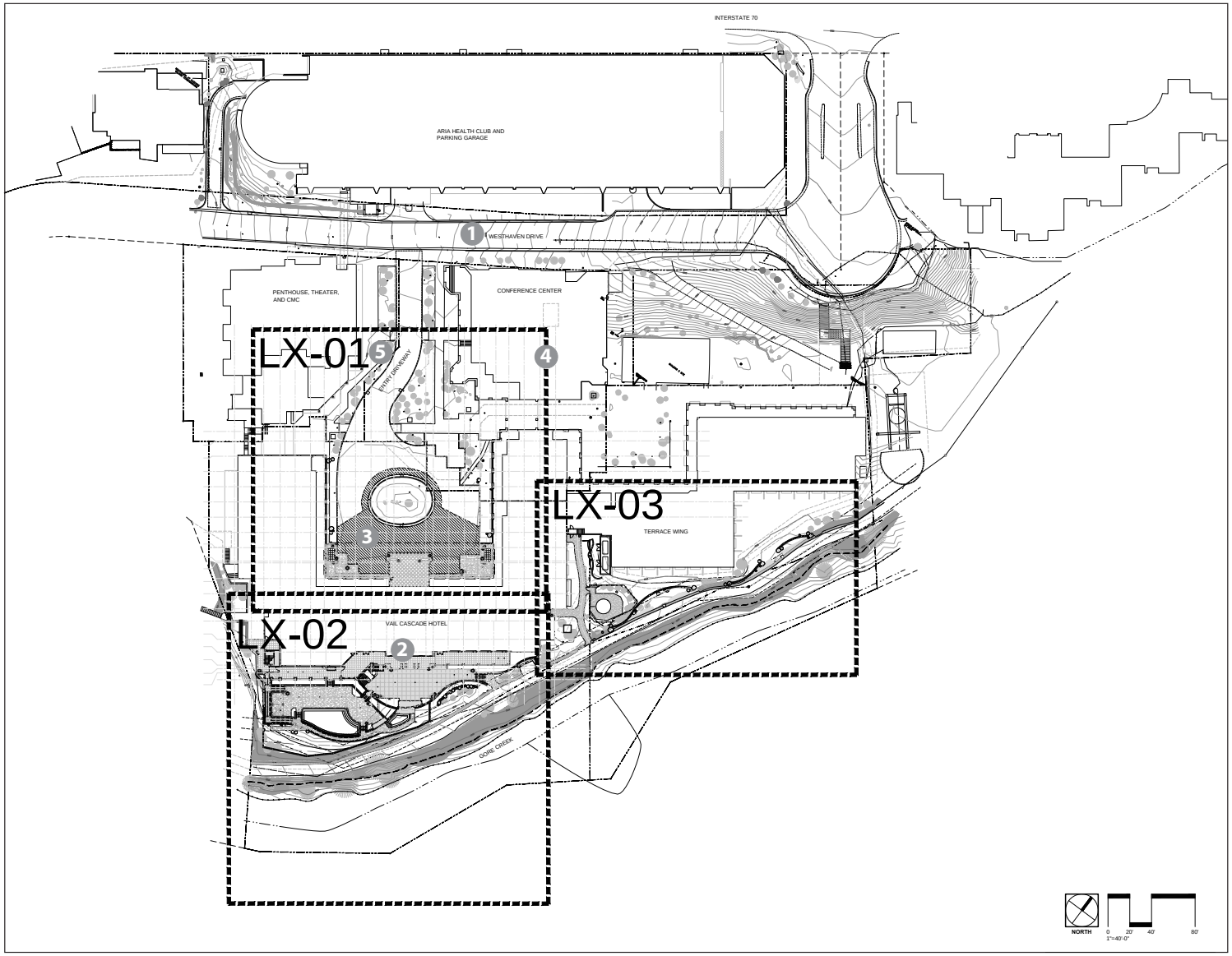
LEGEND

1. Survey Base Sheet
2. Final Limits of Work (if able to define) or Limit of Project Scope of Work Line
3. Proposed Site Improvements
4. Sheet Boundary Box
5. Sheet Labels

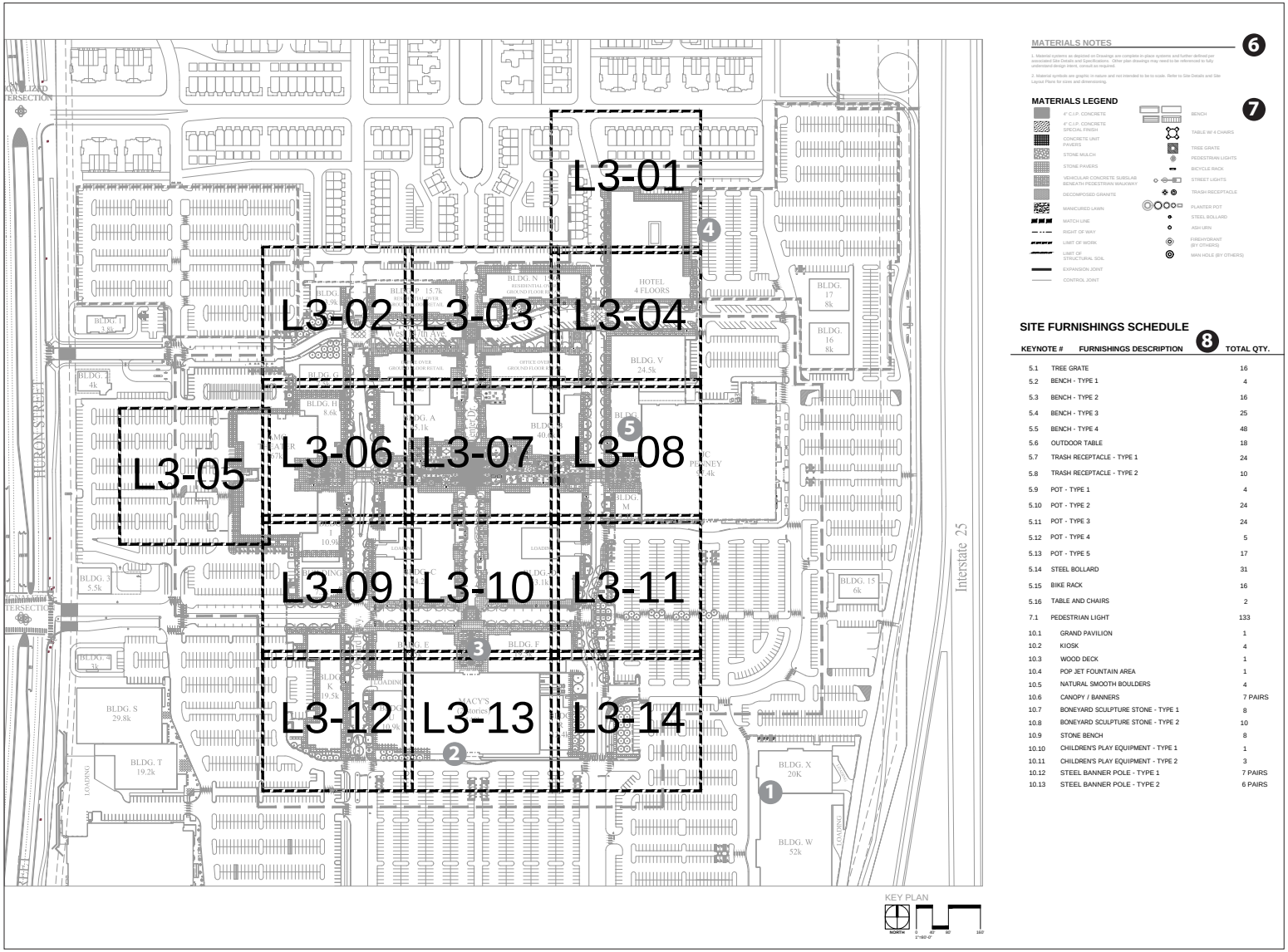
Note: **Boldface** items represent key distinctions between Construction Documentation documents and Design Development documents.

There are NO significant distinctions between DD and CD Drawings.

*Note: This sample depicts only the drawing area for this sheet. For title block requirements refer to preceding Title Block section.



Example CD Key Plan and General Information Sheet—Large Project
(Sample provided is for Site Materials Series)



MATERIALS NOTES 6

1. Material systems as depicted on Drawings are complete in-place systems and further defined per Specifications. Site Details and Site Layout Plans for other plan drawings may need to be referenced to fully understand design intent, consult as required.

2. Material symbols are graphic in nature and not intended to be to scale. Refer to Site Details and Site Layout Plans for sizes and dimensioning.

MATERIALS LEGEND 7

- 4" C.I.P. CONCRETE
- 4" C.I.P. CONCRETE SPECIAL FINISH
- CONCRETE UNIT PAVERS
- STONE MULCH
- STONE PAVERS
- VEHICULAR CONCRETE SUBSLAB BENEATH PEDESTRIAN WALKWAY
- DECOMPOSED GRANITE
- MANICURED LAWN
- MATCH LINE
- RIGHT OF WAY
- LIMIT OF WORK
- LIMIT OF STRUCTURAL SOIL
- EXPANSION JOINT
- CONTROL JOINT
- BENCH
- TABLE W/ 4 CHAIRS
- TREE GRATE
- PEDESTRIAN LIGHTS
- BICYCLE RACK
- STREET LIGHTS
- TRASH RECEPTACLE
- PLANTER POT
- STEEL BOLLARD
- ASH URN
- FIREHYDRANT (BY OTHERS)
- MAN HOLE (BY OTHERS)

SITE FURNISHINGS SCHEDULE 8

KEYNOTE #	FURNISHINGS DESCRIPTION	TOTAL QTY.
5.1	TREE GRATE	16
5.2	BENCH - TYPE 1	4
5.3	BENCH - TYPE 2	16
5.4	BENCH - TYPE 3	25
5.5	BENCH - TYPE 4	48
5.6	OUTDOOR TABLE	18
5.7	TRASH RECEPTACLE - TYPE 1	24
5.8	TRASH RECEPTACLE - TYPE 2	10
5.9	POT - TYPE 1	4
5.10	POT - TYPE 2	24
5.11	POT - TYPE 3	24
5.12	POT - TYPE 4	5
5.13	POT - TYPE 5	17
5.14	STEEL BOLLARD	31
5.15	BIKE RACK	16
5.16	TABLE AND CHAIRS	2
7.1	PEDESTRIAN LIGHT	133
10.1	GRAND PAVILION	1
10.2	KIOSK	4
10.3	WOOD DECK	1
10.4	POP JET FOUNTAIN AREA	1
10.5	NATURAL SMOOTH BOULDERS	4
10.6	CANOPY / BANNERS	7 PAIRS
10.7	BONEYARD SCULPTURE STONE - TYPE 1	8
10.8	BONEYARD SCULPTURE STONE - TYPE 2	10
10.9	STONE BENCH	8
10.10	CHILDREN'S PLAY EQUIPMENT - TYPE 1	1
10.11	CHILDREN'S PLAY EQUIPMENT - TYPE 2	3
10.12	STEEL BANNER POLE - TYPE 1	7 PAIRS
10.13	STEEL BANNER POLE - TYPE 2	6 PAIRS

LEGEND

1. Survey Base Sheet
2. Final Limits of Work (if able to define) or Limit of Project Scope of Work Line
3. Proposed Site Improvements
4. Sheet Boundry Box
5. Sheet Labels
6. Series-Specific General Notes
7. Series-Specific Legends
8. Series-Specific Lists or Schedules

Note: **Boldface** items represent key distinctions between Construction Documentation documents and Design Development documents.

*Note: This sample depicts only the drawing area for this sheet. For title block requirements refer to preceding Title Block section.

GENERAL SHEETS: DESIGN DEVELOPMENT GENERAL INFORMATION SHEET

Objective

The Design Development General Information Sheet previews general parameters associated with intended site construction and displays the compositional structure of the documentation systems included within the drawings. Compositional structure includes graphic and narrative systems.

General Requirements

The Design Development General Information Sheet should be well developed in order to overview the basic project construction requirements to be used for cost estimating, construction, and general contractor orientation. The Design Development General Information Sheet should approximate the Construction Document General Information Sheet in level of detail.

Historically, a single Master General Information Sheet has been used by landscape architects to serve the entire document set. This practice is recommended for all "small" projects at the Design Development phase in order to consolidate all general information for ease of coordination and review. For large projects, however, the landscape architect should utilize a "Series Key Plan and General Information Sheet." This Sheet is organized to coincide with sheet series such as Site Materials Plans, Site Layout Plans, Planting Plans, and so on, and is used to provide a more direct and specialized relationship between General Information Sheet content and the sheets that it serves. Series General Information Sheets are described in more detail within the "General Information Sheet" requirements of the *Construction Documents* section.

DD–CD Relationships

Key relationships between the Design Development General Information Sheet and Construction Document General Information Sheet are as follows:

1. Design Development General Notes may be derived from the landscape architect's standard notes. These notes do not yet need to be exhaustively edited to meet specific project conditions within the Design Development documents. These notes will be further developed upon confirmation of the Design Development proposal as part of the Construction Documentation process.

2. The DD Abbreviations List may be used as the landscape architect's standard list and does not yet need to be edited to reflect specific project conditions.

3. Design Development legends should be fully developed to accurately match current plans in order to properly guide the reader through the plans. Further evolution of the legend will take place during the Construction Documentation process.

4. A Preliminary Site Construction Mock-Up Plan may be included at the DD phase, with a complete illustration of programmatic and plan intentions. Complete delineation of the proposed mock-up, including dimensions and instructional Keynotes should be developed during Construction Documentation.

Prime Consultant Issues

The requirements defined below are utilized when Construction Documents are produced by the landscape architect as the lead or prime consultant. Such work includes parks and public spaces, residential gardens, and other landscapes not associated with a larger contract such as a building project. For projects where the landscape architect is developing documents as a subconsultant to a prime consultant, some of these components may not be included on the landscape architect's General Information Sheet. The landscape architect should work with the prime consultant to minimize redundancy and ensure the information is recorded in the right location within the documents.

Firm Standards

Utilize the landscape architect's firm standards for General Notes, Table of Abbreviations and symbols legends. Modify these documents as necessary to fit project requirements.

General Notes—Guidelines and Principles

General Notes are not intended to replace, reinforce or repeat specification information. Instead, General Notes are intended to provide broadly applicable, drawing-related information.

"General Notes are text information that applies to an entire collection of drawing sheets in a drawing [series] and are usually found near the Cover Sheet. These notes should be used sparingly and only when the information cannot be covered effectively in the specifications. General discipline notes are specific to each sheet [series] in a discipline." [1]

In the design industries, General Notes are often misused, improperly developed and not well coordinated between disciplines or between

[1] "Drawings." In *The Project Resource Manual — CSI Manual of Practice*, 5th ed. New York, New York: McGraw-Hill Companies, 2005.

drawings and other components of the Contract Documents. That can be problematic because these notes define both broad and specific requirements. As such, they require rigorous development and quality control review and coordination. They should not be merely copied from one project to another without consideration of their relevance to the current project.

The following guidelines should be used in the development of General Notes for use by landscape architects:

- General Notes are general.

  General Notes provide information which is so general that it cannot be specifically placed in the specifications, nor precisely located on plans or details. General Notes are general, not specific. Specific notes are referred to as "Reference Notes" and are discussed separately.

  An example highlights this point:

Appropriate General Note: All site construction must be performed in accordance with current City of Denver standards, specifications and details.

Inappropriate General Note: Align pavement joint with face of column.

Logic: This note should be used as a Site Layout Reference Note.

- General Notes are not specifications.

  Specifications communicate written requirements for materials, equipment, systems, standards, and workmanship for the work, and performance of related services.[2] Drawings communicate the size, forms, locations, and relationships of components and systems. General Notes provide general information to clarify drawing requirements, not specification requirements.

  An example highlights this point:

Appropriate General Note: All curbed radii shall be 10"- 0" at face of curb unless otherwise noted.

Inappropriate General Note: Provide 95 percent minimum compaction beneath all pavements.

Logic: This subject should be addressed in specifications.

[2] American Institute of Architects. AIA Form 201.

- General Notes represent general standards.

  Landscape architecture firms should develop standard General Notes that can be somewhat universally applied to projects. General Notes should not be developed anew for each project but rather adjusted to reference specific municipalities or unique project conditions.

  An example highlights this point:

Appropriate General Note: Refer to Civil Plans for additional information concerning drainage infrastructure.

Inappropriate General Note: Refer to Civil Sheet C2.1 for additional information concerning drainage infrastructure at the Events Plaza.

Logic: A separate graphic system exists for specific drawing cross-referencing within the Construction Documents.

- General Notes are explicit and/or measurable.

  Landscape architecture construction drawings are Contract Documents, and as such, must be clear, explicit, and legally defendable. Vague language subject to multiple interpretations does not satisfy that requirement. General Notes, although general (broadly applicable), can and must be phrased to be explicit and measurable. That test may be applied to each general note to verify its legitimacy.

  An example highlights this point:

Appropriate General Note: The general contractor shall verify all dimensions and existing conditions prior to commencing work and promptly notify the landscape architect of any discrepancies between actual site conditions and the Contract Documents.

Inappropriate General Note: The general contractor shall make every effort to schedule a meeting with the landscape architect if he encounters conditions that might affect the project schedule.

Logic: This note is too vague.

- General discipline notes are specific to and categorized by discipline.

  Appropriate Site Grading and Drainage General Note: No grading work shall result in alteration of predevelopment runoff patterns, as this impacts adjoining sites.

Inappropriate Site Grading and Drainage General Note: No grading work shall result in alteration of predevelopment runoff patterns, as this impacts adjoining sites, nor should any construction work interfere with vehicular traffic movements outside the project limits.

Logic: This note addresses multiple, unrelated disciplinary responsibilities and could result in unintended relationships or be overlooked if the note is located improperly.

The following sample General Notes may be included on a typical landscape architecture project. They should be revised to meet the requirements of the project.

1. Company X prepared the survey for this project. It has been reformatted for use in and for preparation of these documents. Contractor shall obtain official signed copy from Company X (address, phone number) and become familiar with it, existing conditions, and site context prior to construction. All discrepancies should be brought to the attention of the landscape architect for resolution immediately. The landscape architect is not responsible for errors or omissions associated with preparation or documentation of the survey.
2. Company Y prepared the geotechnical investigation and report for this project. It has been referenced during preparation of these documents. Contractor shall obtain official signed copy from Company Y (address, phone number) and become familiar with it prior to construction. All discrepancies should be brought to the attention of the landscape architect for resolution immediately. The landscape architect is not responsible for errors or omissions associated with preparation or documentation of the report.
3. The contractor is responsible for determining Means and Methods for construction. These drawings may indicate a Limit of Proposed Improvements, Limits of Site Demolitions, etc., for delineation of expected extents of disturbance. However, final impact shall be determined in the field. Should limits of disturbance exceed boundaries defined in drawings, the contractor shall contact the landscape architect immediately for resolution.
4. The contractor is responsible for repairing all work disturbed by construction outside of limit lines defined on drawings or through his/her Means and Methods to a condition better than or equal to the existing conditions prior to commencement of construction at no additional cost to the owner.

Specific Requirements

Specific requirements for Index of Drawings, General Notes, legends, Abbreviations List, and the Construction Mock-Up Plan are described next.

General Notes

The requirements for topical General Notes are listed in an ideal order of presentation. The order is based upon a logical relationship between the information presented, and a sequence that relates to actual construction.

- **Site Work General Notes:** These notes apply generally to all forms of site work and should be developed to encompass broad conditions associated with landscape architectural site work. These notes should not include specialized work such as site demolition, tree protection, and planting.
- ****Plant Protection and Removal Notes:** These notes apply only to work associated with the protection, removal, transplanting, and care of existing trees and other plants during construction. These notes should be coordinated with Site Demolition Notes and the civil engineer when appropriate. Municipal requirements for plant protection, such as those developed by the city forester, may influence landscape architectural practices.
- ***Site Demolition Notes:** These notes apply only to work associated with protecting, demolishing, removing, recycling, hauling, or salvaging existing site conditions. For especially complex sites, for example, those with extensive utilities to be demolished, civil engineers may prepare the Site Demolition Plan and associated Site Demolition Notes. If buildings or other significant structures are to be demolished, the landscape architect should not develop General Notes to address building demolition, as this work is not included in the landscape architect's work scope, nor is it his expertise.
- ***Erosion and Sedimentation Control Notes:** These notes apply only to work associated with controlling sedimentation and erosion, both during and after completed construction.

  Often, the Erosion and Sedimentation Control Plan and associated General Notes are prepared by the civil engineer. In some situations, the landscape architect leads the preparation of these plans. Local municipal requirements for erosion and sedimentation control are often well developed and will likely influence General Notes and preferred practices.

*Indicates General Notes that may be omitted from the landscape architect's General Information Sheet, and included elsewhere in the multi-disciplinary document set, when that work is completed by others.

**Indicates General Notes that must be coordinated with related disciplines such as civil engineers, to assure consistency and eliminate conflicts.

- **Site Layout Notes:** These notes apply to all activities associated with horizontal positioning of landscape architectural improvements on the site, including existing conditions review, layout and dimensioning, and interdisciplinary relationships between components and systems.
- ****Site Grading and Drainage Notes:** These notes apply to all vertical positioning of site work, including earthwork grading, hardscape elevations, stair elevations, wall elevations, and drainage infrastructure. Sustainable stormwater management is an important component of the plan and associated General Notes. Civil engineers will likely have a role in site grading and drainage. Coordination between the landscape architects and the civil engineer is important to avoid conflicts and redundancy.
- ****Planting Notes:** These notes apply to the procurement, shipping, storage, installation, and maintenance of trees and all other plants, including turf. These notes may need to be coordinated with Irrigation System General Notes and possibly Erosion and Sedimentation Control General Notes.
- ***Irrigation Notes:** These notes apply to all activities associated with landscape irrigation installation, including coordination with mechanical, civil, and planting work. These notes may need to be coordinated with work of the civil engineer and mechanical engineer and are typically prepared by an irrigation systems consultant. These notes should be included within the irrigation drawings when prepared by the irrigation consultant.
- **Site Soils Notes:** These notes apply to all activities associated with procurement, shipping, storage, preparation, mixing, installation, and testing of planting soils. These notes may need to be coordinated with Planting Notes and Erosion and Sedimentation Control Notes.

Legends

Site Work Abbreviations List

Landscape architecture firms should develop standard site work abbreviations that can be somewhat universally applied to projects. The list should include all terms commonly used on the landscape architectural drawings.

Abbreviations are used on drawings in a consistent fashion to save space. For example, if the abbreviation "typ" is used to reflect the word "typical," then the abbreviation should be used consistently, rather than interchangeably with the word "typical."

The list should not include terms used by allied or collaborating disciplines used elsewhere in the documents, unless these consultants are subconsultants to the landscape architect and whose work is closely associated with the landscape architecture work. In that case, abbreviations used by the landscape architect should be checked with those used by other disciplines to ensure consistency. That process should be initiated at the outset of the DD process by distributing and coordinating a master Site Work Abbreviations List with closely associated subconsultants.

TABLE OF ABBREVIATIONS

APPROX	APPROXIMATE	MH	MANHOLE
ARCH	ARCHITECT	MIN	MINIMUM
AVG	AVERAGE	MISC	MISCELLANEOUS
B&B	BALLED AND BURLAPPED	N	NORTH
BC	BOTTOM OF CURB	NIC	NOT IN CONTRACT
BLDG	BUILDING	NO	NUMBER
BM	BENCHMARK	NOM	NOMINAL
BOC	BACK OF CURB	NTS	NOT TO SCALE
BR	BOTTOM OF RAMP	OC	ON CENTER
BS	BOTTOM OF STEP	OD	OUTSIDE DIAMETER
BW	BOTTOM OF WALL	PC	POINT OF CURVATURE
CAL	CALIPER	PE	POLYURETHANE
CB	CATCH BASIN	PI	POINT OF INTERSECTION
CF	CUBIC FEET	PL	PROPERTY LINE
CIP	CAST IN PLACE	PT	POINT, POINT OF TANGENCY
CL	CENTER LINE	PVC	POLYVINYL CHLORIDE
CLR	CLEARANCE	QTY	QUANTITY
CM	CENTIMETER	R	RADIUS
CO	CLEAN OUT	REF	REFERENCE
CONT	CONTINUOUS	REINF	REINFORCE(D)
CY	CUBIC YARD	REQ'D	REQUIRED
DEG	DEGREE	REV	REVISION, REVISED
DEMO	DEMOLISH, DEMOLITION	ROW	RIGHT OF WAY
DIA	DIAMETER	S	SOUTH
DIM	DIMENSION	SAN	SANITARY
DTL	DETAIL	SD	STORM DRAIN
DWG	DRAWING	SF	SQUARE FOOT (FEET)
E	EAST	SHT	SHEET
EA	EACH	SIM	SIMILAR
EL	ELEVATION	SPECS	SPECIFICATIONS
ENG	ENGINEER	ST	STORM SEWER
EQ	EQUAL	SY	SQUARE YARD
EST	ESTIMATE	STA	STATION
E.W.	EACH WAY	STD	STANDARD
EXIST	EXISTING	SYM	SYMMETRICAL
EXP	EXPANSION, EXPOSED	T&B	TOP AND BOTTOM
FFE	FINISHED FLOOR ELEVATION	TBC	TOP OF BACK CURB
FG	FINISHED GRADE	TC	TOP OF CURB
FL	FLOW LINE	TF	TOP OF FOOTING
FOC	FACE OF CURB	TH	THICK
FT	FOOT (FEET)	TOPO	TOPOGRAPHY
FTG	FOOTING	TR	TOP OF RAMP
GA	GAUGE	TS	TOP OF STEP
GEN	GENERAL	TW	TOP OF WALL
GR	GRADE ELEVATION	TYP	TYPICAL
HORIZ	HORIZONTAL	VAR	VARIES
HP	HIGH POINT	VOL	VOLUME
HT	HEIGHT	W/	WITH
ID	INSIDE DIAMETER	W/O	WITHOUT
INV	INVERT ELEVATION	WT	WEIGHT
IN	INCH(ES)	WL	WATER LEVEL
INCL	INCLUDE(D)	WWF	WELDED WIRE FABRIC
JT	JOINT	YD	YARD
LF	LINEAR FEET	@	AT
LP	LOW POINT		
MAX	MAXIMUM		

Example Table of Abbreviations Legend

The Abbreviations List may be edited to reflect the actual language and program of the project, rather than have with an excessive number of unused references. The list should be alphabetized by abbreviation reference.

Line Type Legend:

Requirements for the Site Work Linetype Legend are described below under *Graphic Requirements, Site Work Symbols, Line Type Legend*.

Site Work Symbols Legend

Requirements for the Site Work Symbols Legend are described below under *Graphic Requirements, Site Work, Symbols Legend.*

Plant Legend

The Plant Legend illustrates the graphic symbols and nomenclature used to identify plants found on Planting Plans. The Plant Legend does not provide an itemization of plant quantities—that information is provided on Plant Lists, which is included on either the General Information Sheet or Planting Key Plan and General Information Sheet for a large project. Requirements for the Plant Legend are described below under both *Tree Planting Plan* and *Shrub and Ground Cover Planting Plan Requirements—Design Development and Construction Documentation*.

Charts and Lists

A variety of charts may be included on the General Information Sheet, including Plant Removal List, Tree Transplant Chart, Salvaged Items List or Chart, Plant List, Materials Chart, Lighting Schedule, Signage Schedule, etc.

Keynotes

Keynotes are used in the design industries to replace the former use of text annotations on plans and other drawings. Keynotes represent a consolidated set of standard master annotations, used throughout the project as indicated by numerical references.

Keynote systems vary from firm to firm, from very simple numerical identification of materials and systems to keyed relationships between plan elements and associated detail drawings to highly detailed references between drawing elements and specification sections. Architects generally use the more sophisticated keynote systems, whereas landscape architects tend to use simpler versions.

Two distinct sets of Keynotes are recommended for use by landscape architects. Each keynote system accomplishes a very different set of objectives within the design and Construction Documents. A more detailed description of the role and organization of the keynoting system has been included in Chapter 9, Key Documentation Practices.

Site Detail Keynotes

List and categorize all site construction systems, in order to establish relationships between plan identifications, detail designations, and specification sections. This list represents an itemization of the entire landscape architecture improvement program. Site Detail Keynotes are applied to plans as numeric references within a hexagonal symbol.

Site Reference Notes

Series-specific notes that apply only to a particular sheet or drawing are generally used where, for clarity and drafting efficiency, the note or text is replaced with an identifying symbol. The identifying symbol then refers back to the full [list of notes], which is reproduced elsewhere on the drawing sheet.[3]

Site Reference Notes define all the varied instructions that are applied to site plans to guide the contractor through construction requirements. These notes are distinguished from the Site Detail Keynotes in that they define procedures, not systems or components. These notes may be derived from a standard or master list of such notes developed by the landscape architect. The list should be customized to fit unique project needs. Site Reference Notes are applied to plans as numeric references within an elliptical symbol.

Site Construction Mock-Up Plan—Role

Construction mock-ups are an invaluable, if not critical component of the construction process. In architectural design, building mock-ups are more commonly standard requirements, and are viewed by owners and contractors as both a wise investment and risk-mitigation strategy. Architectural craftsman have been using mock-up processes for centuries. Mock-ups help to avoid the completion of unsatisfactory work during actual construction.

Mock-ups are built by the general contractor in order to accomplish the following objectives:

- Determine the viability and constructability of proposed systems.
- Determine an acceptable level of craftsmanship and execution.
- Make decisions about colors, finishes, and details, to confirm selections or consider alternatives to be selected.
- Serve as an ongoing reference for quality expectations as the project is built. In this case, the team can compare the quality of ongoing work with that of the accepted mock-up.
- In unique cases, play a role in the evaluation of the short- to midterm performance of proposed systems.

[3] "Drawings." In *The Project Resource Manual — CSI Manual of Practice*, 5th ed. New York, New York: McGraw-Hill Companies, 2005.

Mock-ups are underutilized by landscape architects, partly because of the upfront costs associated with construction that may be destroyed after the mock-up serves its purpose. Mock-ups are also neglected because they arenot given enough attention in the Construction Documents, resulting in projects where little or no money has been allocated for their construction.

Typically, requirements for construction mock-ups are defined within the specifications, under Division 01, Section 01400–Quality Requirements and within individual sections such as Section 321316–Concrete Paving, Section 044313 Anchored Stone Masonry Veneer, and Section 096340 Stone Flooring and others. In addition, some designers include an individual section titled "Mock-ups" under Division One for additional emphasis. The specification language is typically simple, and leaves room for interpretation by the contractor. The landscape architecture mock-up specification does not usually require that multiple systems be built side-by-side, as they would in the actual construction. Architectural mock-ups typically do include multiple systems, built integrally as they would in the actual construction, for example, a wall system, with veneers, windows, and base details. These may be referred to as composite assemblies.

Example specification language highlights these points:

1. At location on Project selected by landscape architect, prepare mock-up 4 feet by 4 feet for review and approval.
2. Construct mock-up using processes and techniques intended for use on permanent work.
3. Mock-up shall be completed by the individual workers who will actually be performing the work for the Project.
4. Obtain written approval of the mock-up from the landscape architect before start of actual work.
5. Retain approved mock-up through completion of the Work for use as a quality standard for finished work.
6. Approved mock-up may become part of the completed Work if undisturbed at time of Substantial Completion.
7. Remove and legally dispose of mock-up when directed.

In order to upgrade the role of the landscape architectural construction mock-up, a mock-up plan shall be included within the Construction Documents. It is recommended that the mock-up plan be initiated during Design Development in order to begin the coordination and review process. In addition, the mock-up plan will need to be reflected in DD level cost estimation for the project. If it is not reflected in the DD estimates, it may be difficult to add it during the Construction Documentation phase. The mock-up plan shall be positioned on the General Information Sheet, together with General Notes, lists, legends, and abbreviations in order to highlight its importance.

Mock-up Plan may consist of plans and/or elevations. Information provided on General Information Sheet should be sufficient enough to convey intent and reinforce requirements provided in drawings and specifications.

Site Construction Composite Mock-up Plan–Requirements and Principles

The Site Construction Mock-up Plan shall explicitly define the mock-up construction requirements, illustrating, keynoting, and dimensioning intentions for the contractor to bid and construct key components of the project in a composite assembly.

The following organizational principles are recommended for the Site Construction Composite Mock-up Plan:

- Determine key construction systems that will require initial mock-up review prior to actual construction. Ideally, all pavements, joints, steps, and walls will be included in the composite mock-up.
- Arrange contiguous systems that coincide with permanent designed relationships, in order to evaluate these relationships in the mock-up. Include intended relationships between horizontal and vertical systems.
- Organize contiguous systems with relationships that establish actual project jointing conditions, for example, between pavements and between pavements and vertical systems. Include up these joints in the mock-up.
- Consider incorporating a range of potential finishes from which to select For example, for various concrete finishes, show a range of options from light to heavy.
- Avoid excessively large mock-up panels, in order to reduce cost and spatial requirements. Seek to consolidate systems within 10'- 0" square maximum panels.

Graphic Requirements for General Notes

Graphic Requirements—General Notes

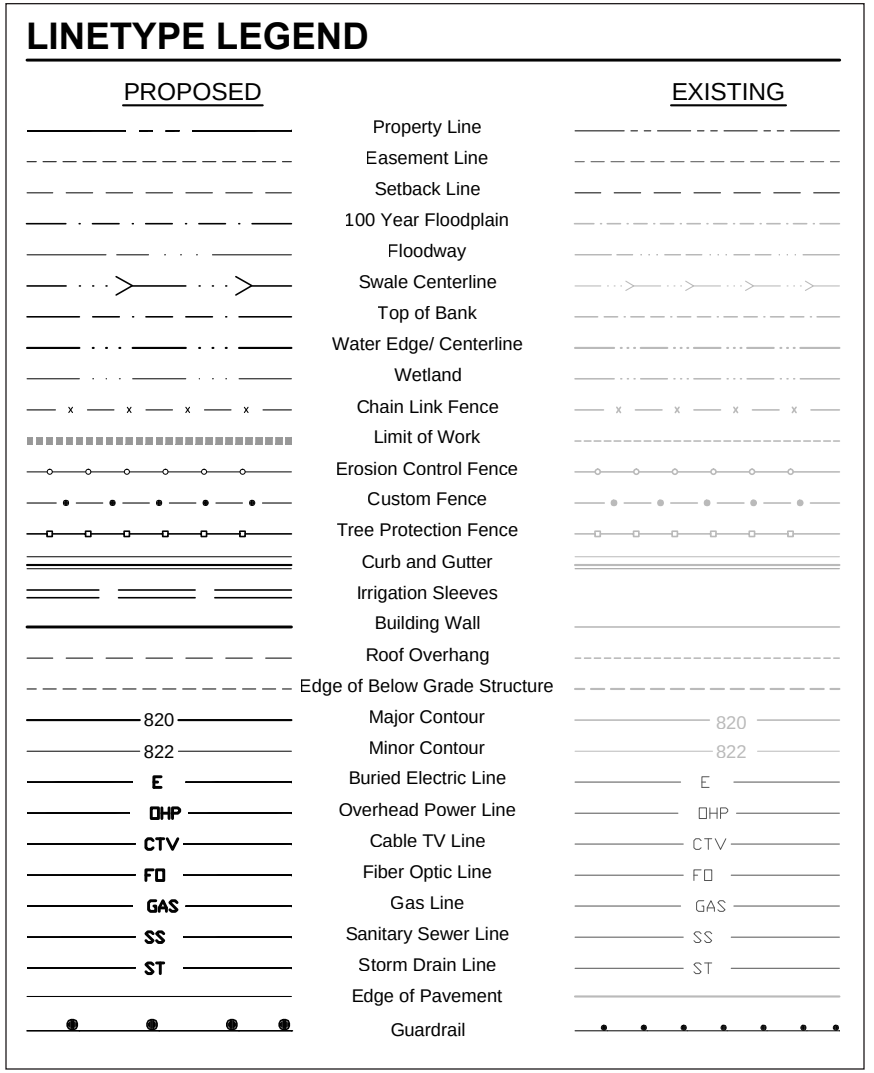
- Include a space between each note.
- Text should be left justified below first text line, rather than wrapping and falling below number.

Graphic Requirements—Abbreviations List

Organize the abbreviations alphabetically and vertically, for ease of reading.

Graphic Requirements—Linetype Legend

The linetype legend should define the style of lines incorporated in the plans and accurately convey these graphically for consistency. The lines defined should include both existing and proposed and represent those incorporated in both the existing conditions survey and proposed improvement plans.



Example Linetype Legend

Graphic Requirements—Site Work Symbols Legend

The primary symbols in the legends should encompass all the symbols and hatch patterns used on landscape architectural site plans including plant protection and removal, site demolition, site materials, site furnishings, site lighting, grading and drainage, landscape boulders, planting and site soils.

If civil or other disciplinary components are included on the landscape architect's plans, copy these symbols directly from consultants' legend(s) and include them at bottom of the primary legend.

Organize the legends to comply with construction sequence and organization of the document set. Some legends may be combined if necessary, but only for Small Project document organization. See example General Information Sheet for typical organization of legends.

Symbols should be sized as closely as possible to the actual plan size, for clarity and consistency with plans on the pages that follow.

Refer to the landscape architect's standard CAD symbols for additional graphic references.

Enclose hatch symbols within a consistently sized bounding rectangle to reflect patterns on drawings.

Center and align component symbols along a vertical axis.

Precisely match the symbol descriptive text to the associated keynote text, for example, "Crushed Stone Paving" or "Concrete Wall Type 1."

Graphic Requirements—Keynotes

Include Site Detail Keynotes and Site Reference Notes legends to depict annotation systems for the drawing set and familiarize the reviewer with the proposed system and associated protocols. Project-specific Site Detail Keynotes legend and Site Reference Notes legend shall be placed on specific drawing sheets. Refer to Chapter 9, Key Documentation Practices, for additional information concerning the organization of these systems.

Graphic Requirements—Site Construction Composite Mock-Up Plan

The Site Construction Composite Mock-Up Plan should be developed as a mini or partial Site Materials Plan or Site Detail and should utilize the graphic conventions defined within this document for the Site Materials Plan and Site Details construction document.

Some site layout information should be included on the Construction Mock-Up Plan to convey basic dimensional intent.

Best Practices

Design

Construction Mock-Up

The construction mock-up process is a key initial step in graphically conveying expectations for quality and workmanship. A project is unlikely to achieve intended design and implementation quality without a sound mock-up process.

Regional variations in construction practices require some customization of General Notes, Reference Notes, and implementation practices. Therefore, project offices and project teams will need to systematically adapt firmwide standards.

Coordination

Client

Coordinate client or agency requirements for the General Information Sheet. Encourage use of the landscape architect's standards for this sheet, from which content and layout changes may be made to suit the client or agency.

Interdisciplinary

Rigorously coordinate and cross-check all General Notes identified above with related disciplines. Require that General Notes be reviewed by collaborating disciplines, for example, architect, civil, irrigation consultant, and others if applicable.

Cross-check abbreviations list with abbreviations lists by provided by others for consistency.

Review the civil engineer's symbols legend by to verify there are no conflicts with symbols used by the landscape architect.

Internal

Establish precise consistency between Keynote descriptions and associated symbols descriptions on legends. For example, if a Keynote describes a pavement system as "Concrete Unit Paving, Type 1," then the associated note on the symbols legend should match that title, rather than use a similar title such as "Unit Paving."

Coordinate construction mock-up plans with those described in specifications. Explicitly list all mock-up requirements illustrated on plans in this section. Note that additional mock-up requirements may be necessary that are not illustrated on the General Information Sheet, for example, custom items such as metal work, lighting, site furniture, signage, and water features.

Technical

On the General Notes, note the source of base information, that is, who prepared the survey or base, and, if applicable, the project's benchmark.

Index of Drawings (Not Normally Included)

Note that in some cases the landscape architect may choose to include an Index of Drawings on the General Information Sheet at the DD phase, rather than on the Cover Sheet. He may choose to do that when it is desirable to keep the Cover Sheet clean and free of technical information. Refer to the Design Development Cover Sheet section for detailed requirements of the Index of Drawings.

Strategies

Refer to landscape architect's General Notes standards for specific note requirements. Review, edit and expand these notes to fit project circumstances.

Example DD General Information Sheet—Small Project

LEGEND

1. General Notes
2. Series-Specific General Notes
3. List of Abbreviations
4. Linetype Legend
5. Pattern/Symbols Legends
6. Site Detail Keynote Legend
7. Site Reference Note Legend
8. Plant Identification Key
9. Plant List

*Note: This sample depicts only the drawing area for this sheet. For title block requirements refer to preceding Title Block section.

1 GENERAL NOTES

1. EAGLE VALLEY SURVEYING, INC. PREPARED THE SURVEY FOR THIS PROJECT. IT HAS BEEN DOCUMENTED FOR USE IN AND FOR PREPARATION OF THESE DOCUMENTS. CONTRACTOR SHALL OBTAIN OFFICIALLY SIGNED COPY FROM EAGLE VALLEY SURVEYING, INC. (PO BOX 1230, EDWARDS, CO 81632, PHONE - 970-949-1400) AND BECOME FAMILIAR WITH IT. THE EXISTING CONDITIONS AND SITE CONTEXT PRIOR TO CONSTRUCTION. ALL DISCREPANCIES SHOULD BE BROUGHT TO THE ATTENTION OF THE LANDSCAPE ARCHITECT FOR RESOLUTION IMMEDIATELY. LANDSCAPE ARCHITECT IS NOT RESPONSIBLE FOR ERRORS OR OMISSIONS ASSOCIATED WITH PREPARATION OR DOCUMENTATION OF SURVEY.

2. GROUND ENGINEERING CONSULTANTS, INC. PREPARED THE GEOTECHNICAL INVESTIGATION AND REPORT FOR THIS PROJECT. IT HAS BEEN REFERENCED DURING PREPARATION OF THESE DOCUMENTS. CONTRACTOR SHALL OBTAIN OFFICIALLY SIGNED COPY FROM GROUND ENGINEERING CONSULTANTS, INC. (PO BOX 484, 101A AIRPARK DRIVE, UNIT 1, GYPSUM, COLORADO 81637, PHONE - 970-524-0720) AND BECOME FAMILIAR WITH IT PRIOR TO CONSTRUCTION. ALL DISCREPANCIES SHOULD BE BROUGHT TO THE ATTENTION OF THE LANDSCAPE ARCHITECT FOR RESOLUTION IMMEDIATELY. LANDSCAPE ARCHITECT IS NOT RESPONSIBLE FOR ERRORS OR OMISSIONS ASSOCIATED WITH PREPARATION OR DOCUMENTATION OF REPORT.

3. CONTRACTOR IS RESPONSIBLE FOR DETERMINING MEANS AND METHODS FOR CONSTRUCTION. THESE DRAWINGS MAY INDICATE A LIMIT OF PROPOSED IMPROVEMENTS, LIMITS OF SITE DEMOLITION, ETC. FOR DELINEATION OF EXPECTED EXTENTS OF DISTURBANCE. HOWEVER, FINAL IMPACT SHALL BE DETERMINED IN THE FIELD. SHOULD LIMITS OF DISTURBANCE EXCEED BOUNDARIES DEFINED IN DRAWINGS, CONTRACTOR SHALL CONTACT LANDSCAPE ARCHITECT FOR RESOLUTION.

4. CONTRACTOR IS RESPONSIBLE FOR REPAIRING ALL WORK DISTURBED BY CONSTRUCTION OUTSIDE OF LIMIT LINES DEFINED ON DRAWINGS OR THROUGH HIS/HER MEANS AND METHODS TO A CONDITION BETTER THAN OR EQUAL TO THE EXISTING CONDITIONS PRIOR TO COMMENCEMENT OF CONSTRUCTION AT NO ADDITIONAL COST TO THE OWNER.

5. CONTRACTOR IS RESPONSIBLE FOR MAINTAINING A COMPLETE UP-TO-DATE SET OF DRAWINGS AND SPECIFICATIONS AT THE CONSTRUCTION SITE AND ENSURING THE DOCUMENTS ARE READILY AVAILABLE FOR REVIEW BY THE LANDSCAPE ARCHITECT AND GOVERNING AGENCY.

6. THE DRAWINGS AND SPECIFICATIONS ARE COMPLEMENTARY TO ONE ANOTHER AND IMPLIED TO CORRESPOND WITH ONE ANOTHER. ANY DISCREPANCIES SHOULD BE BROUGHT TO THE ATTENTION OF THE LANDSCAPE ARCHITECT FOR RESOLUTION IMMEDIATELY.

2 PLANT PROTECTION AND REMOVAL NOTES

1. Plant symbols as indicated on Drawings do not represent actual driplines. Contractor shall verify in field prior to construction. Proposed plant protection fencing shall be placed outside of edge of actual dripline or as directed by Landscape Architect in the field.

2. Protection fencing shall be maintained throughout construction unless otherwise directed by Landscape Architect. Contractor shall obtain permission to enter from Landscape Architect prior to conducting work within plant protection zones.

3. Coordinate with City Forester prior to conducting any tree removal or pruning.

4. Trees indicated to be removed shall also include complete removal of stump and roots and filling in depression with suitable soil fill.

SITE DEMOLITION NOTES

(Use when majority of site items are to be removed)

1. Remove items (site structures) shown on the plan to the full depth of their construction unless designated to remain.

(Use when majority of site items are to remain).

1. Items (site structures) shall remain unless designated for removal. Remove designated items shown on the plan to the full depth of their construction unless otherwise noted.

2. Verify the location of items (site structures) to remain (to be removed) prior to commencement of the work.

3. Items (site structures) encountered below grade and not shown on the drawings shall be brought to the attention of the Landscape Architect.

4. Remove demolished materials from site. Disposal by burning and/or burying is prohibited.

5. Contact the local underground service update for utility location and identification prior to demolition.

6. The location of existing utilities as shown on the plans may vary in relation to actual existing conditions; additional utilities not shown on the drawings may exist. Verify in the field the data shown, and call any discrepancies to the attention of the Landscape Architect or Site Representative before starting work.

7. Perform excavation in the vicinity of existing utilities by hand where applicable. The Contractor is responsible for damage to existing utilities caused by any person, vehicle, equipment or tool related to the execution of the Contract.

SITE LAYOUT NOTES

1. Layout and verify dimensions prior to construction. Bring discrepancies to the attention of the Landscape Architect.

2. For dimensions of buildings, refer to the Architectural Drawings. Copies of these Drawings are available from the Owner.

3. Written dimensions take precedence over scale. Do not scale drawings.

4. This drawing includes the dimensional controls for all proposed site improvement hardscape elements. Refer to Planting Plans and Site Lighting Plans for specific dimensioning of these elements.

5. Where dimensions are called as "equal," space referenced items equally, measured to their center lines.

6. Measurements are to face of building, wall or the fixed site improvement. Dimensions to center lines is indicated.

7. Install intersecting elements at 90 degree angles to each other unless otherwise noted.

8. Provide expansion joints where concrete flatwork meets vertical structures such as walls, curbs, steps and building elements.

9. Parking areas are dimensioned from face of curb.

10. All lighting standards shall be set back 2'-0" clear from face of curb, and from each other where and as shown.

11. Expansion joints in walkways shall be located twenty feet (20'-0") O.C. maximum.

SITE GRADING AND DRAINAGE NOTES

1. Existing underground utilities are shown per available records. Verify the actual location and elevation in the field prior to beginning construction of the new facilities. Protect existing utilities and be responsible for damage to utilities encountered during construction.

2. Request inspection as required 48 hours in advance of performing any work unless otherwise noted on this sheet.

3. Debris created by removal operations become the property of the Contractor and is to be legally disposed of away from the job site.

4. Notify local underground service companies for utility finds 48 hours prior to any excavation.

5. Refer to structural drawings for connections to drains over structure.

6. Refer to architectural drawings for waterproofing of slab penetrations.

7. Refer to Civil Engineer's drawings for connections to drains.

SITE LIGHTING NOTES

1. Lighting symbols on plans are diagrammatic. Refer to details and specifications for actual dimensions and product information.

2. Lighting design is intended to produce an overall 0.5 footcandle illumination level on the trail with 1.0 footcandle illumination minimum at trail intersections. Final installation shall confirm these illumination standards.

3. Contractor shall ensure luminaires are installed in accordance with Manufacturer's specifications to ensure there is no light illumination greater than 0.10 footcandles at the property line upon installation. Contractor shall notify Landscape Architect if discrepancy.

4. Layout dimensions are for general reference only. Final location to be determined in the field by the Landscape Architect.

5. Lighting pull-boxes, vaults and other in-grade appurtenances shall be flush with adjacent finish grades or surfaces. Notify Landscape Architect if located on a slope greater than 5% for direction.

6. Coordinate with existing and proposed underground utilities. Notify Landscape Architect of any conflicts for direction on fixture placement.

SITE SOILS NOTES

1. Planting soil shall be provided moved and ready for installation. On-site mixing of Planting Soil Types 1 and 2 is acceptable.

2. Contractor shall coordinate with Owner's Representative for location of stockpile areas for stripped topsoil and planting soil products. Contractor shall ensure area is protected and contamination or disturbance of stored products is not allowed.

3. Contractor shall ensure subgrade is scarified prior to installing planting soil and blend with initial lift or placement of proposed planting soil.

4. All rock, cobble or debris larger than 2-inch diameter shall be removed and legally disposed of offsite prior to placing proposed planting soil.

5. Coordinate placement of planting soil with other work, especially utilities. Placement should occur after installation of all hardscape improvements, irrigation system, utilities, etc. and before installation of plants.

PLANTING NOTES

1. Source of base sheets is (EdB as required)

2. Refer to Civil Engineer's utility and precise grading plans for utility location and final grading. If actual site conditions vary from what is shown on the plans, contact the Landscape Architect for direction as to how to proceed.

3. Verify locations of pertinent site improvements installed under other sections. If any part of this plan cannot be followed due to site conditions, contact Landscape Architect for instructions prior to commencing work.

4. Exact locations of plant materials to be approved by the Landscape Architect in the field prior to installation. Landscape Architect reserves the right to adjust plants to exact location in field.

5. Verify plant counts and square footages: Quantities are provided as Owner information only. If quantities on plant list differ from graphic indications, then graphics shall prevail.

6. Contact the local underground utility services for utility location and identification.

7. Perform excavation in the vicinity of underground utilities with care and if necessary, by hand. The Contractor bears full responsibility for this work and disruption or damage to utilities shall be repaired immediately at no expense to the Owner.

8. Trees shall bear same relation to finished grade as it bore to existing.

9. Trees to be planted a minimum of 4 feet from face of building, or pavement, except as approved by Landscape Architect.

10. Provide matching forms and sizes for plant materials within each specie and size designated on the drawings.

11. Prune newly planted trees only as directed by Landscape Architect.

12. Align and equally space in all directions shrubs so designated per these notes and drawings.

13. Finish grades of shrub areas and lawns shall be 1 1/2 inches below adjacent paving or header. (Check mulch depth and if needed or sodded lawns).

14. Provide specified edging as divider between planting beds and lawn areas.

15. Provide burlap wrapping to second branch with 50% overlap.

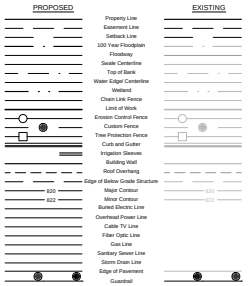
16. Cut and remove burlap from top 1/3 of ball.

17. Landscape Architect to review plant materials at source or by photographs prior to digging or shipping of plant materials.

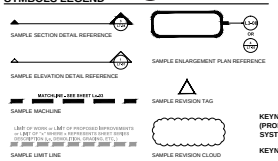
3 LIST OF ABBREVIATIONS

APPROX	APPROXIMATE	MH	MANHOLE
ARCH	ARCHITECT	MIN	MINIMUM
AVG	AVERAGE	MISC	MISCELLANEOUS
B&B	BALLED AND BURLAPPED	MTD	MOUNTED
BC	BOTTOM OF CURB	MTL	METAL
BF	BOTTOM OF FOOTING	N	NORTH
BLDG	BUILDING	NIC	NOT IN CONTRACT
BM	BENCHMARK	NO	NUMBER
BOC	BACK OF CURB	NOM	NOMINAL
BR	BOTTOM OF RAMP	NTS	NOT TO SCALE
BRG	BEARING	OC	ON CENTER
BS	BOTTOM OF STEP	OD	OUTSIDE DIAMETER
BW	BOTTOM OF WALL	OPP	OPPOSITE
CAL	CALIPER	PAR	PARALLEL
CAP	CAPACITY	PC	POINT OF CURVATURE
CF	CUBIC FEET	PE	POLYURETHANE
CHAM	CHAMFER	PERF	PERFORATED
CIP	CAST IN PLACE	PED	PEDESTRIAN
CJ	CONTROL JOINT	PI	POINT OF INTERSECTION
CL	CENTER LINE	PL	PROPERTY LINE
CLR	CLEARANCE	PT	POINT, POINT OF TANGENCY
CM	CENTIMETER	PVC	POLYVINYL CHLORIDE
CO	CLEAN OUT	PVMT	PAVEMENT
COMP	COMPACTED	PVR	PAVER
CONC	CONCRETE	PVT	PRIVATE
CONST	CONSTRUCTION	R	RADIUS
CONT	CONTINUOUS	RECEP	RECEPTACLE
CONTR	CONTRACTOR	REF	REFERENCE
CU	CUBIC	REINF	REINFORCE(D)
CY	CUBIC YARD	REM	REMOVE
DBL	DOUBLE	REQ'D	REQUIRED
DF	DIRECTION OF FLOW	REV	REVISION, REVISED
DEG	DEGREE	ROW	RIGHT OF WAY
DEMO	DEMOLISH, DEMOLITION	RT	RIGHT
DIA	DIAMETER	S	SOUTH
DIM	DIMENSION	SAN	SANITARY
DTL	DETAIL	SCH	SCHEDULE
DWG	DRAWING	STM	STORM DRAIN
E	EAST	SEC	SECTION
EA	EACH	SF	SQUARE FOOT (FEET)
EJ	EXPANSION JOINT	SHT	SHEET
EL	ELEVATION	SI	STORM INLET
ELEC	ELECTRICAL	SIM	SIMILAR
ENG	ENGINEER	SNT	SEALANT
EQ	EQUAL	SPECS	SPECIFICATIONS
EQUIP	EQUIPMENT	SQ	SQUARE
EST	ESTIMATE	ST	STORM SEWER
E-W	EACH WAY	SY	SQUARE YARD
EXIST	EXISTING	STA	STATION
EXP	EXPANSION, EXPOSED	STD	STANDARD
FE	FINISHED FLOOR ELEVATION	STEEL	STEEL
FG	FINISHED GRADE	STRL	STRUCTURAL
FIN	FINISH	SYM	SYMMETRICAL
FL	FLOW LINE	T&B	TOP AND BOTTOM
FOC	FACE OF CURB	TBC	TOP OF BACK CURB
FT	FOOT (FEET)	TC	TOP OF CURB
FTG	FOOTING	TF	TOP OF FOOTING
GA	GAUGE	THK	THICK
GAL	GALVANIZED	TOC	TOP OF CONCRETE
GC	GENERAL CONTRACT(OR)	TOPO	TOPOGRAPHY
GEN	GENERAL	TSL	TOP OF SLAB
HORIZ	HORIZONTAL	TRAS	TRANSFORMER
HP	HIGH POINT	TR	TOP OF RAMP
HT	HEIGHT	TS	TOP OF STEP
ID	INSIDE DIAMETER	TW	TOP OF WALL
INV	INVERT ELEVATION	TYP	TYPICAL
IN	INCHES	VAR	VARIED
INCL	INCLUD(ED)	VERT	VERTICAL
INL	INLET	VEH	VEHICLE
IRR	IRRIGATION	VOL	VOLUME
JT	JOINT	W/	WITH
LIN	LINEAR	W/O	WITHOUT
LF	LINEAR FEET	WT	WEIGHT
LP	LOW POINT	WL	WEIR LEVEL
LT	LIGHT	WWF	WELDED WIRE FABRIC
MATL	MATERIAL	YD	YARD
MAX	MAXIMUM	@	AT
MEMB	MEMBRANE		

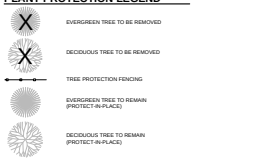
4 LINETYPE LEGEND



5 SYMBOLS LEGEND

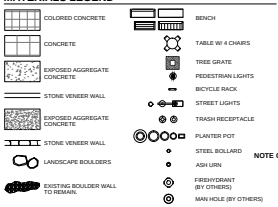


PLANT PROTECTION LEGEND

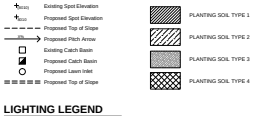


SITE DEMOLITION LEGEND

MATERIALS LEGEND



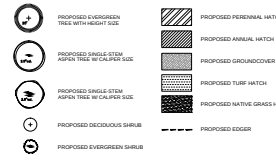
GRADING LEGEND



SOILS LEGEND

LIGHTING LEGEND

PLANTING LEGEND



6 KEYNOTE LEGEND:

SITE DETAIL KEYNOTES:

	DETAIL/ SHEET	RELATED DETAIL(S)	SPEC. SECTION(S)
1.0 PAVEMENTS, RAMPS, CURBS			
1.1 STONE PAVING TYPE 1 - Sand Set w/ Planting Joints	x/ Ls-01	x/ Ls-0x, x/ Ls-0x, x/ Ls-0x	321400

KEYNOTE HEADING (PROPOSED IMPROVEMENT SYSTEM)

KEYNOTE CALL-OUT

KEYNOTE (SYSTEM) ITEM AND BRIEF DESCRIPTION

PRIMARY KEYNOTE DETAIL REFERENCE (NUMBER AND SHEET)

ADDITIONAL DETAIL REFERENCES (COMPOSITE SECTIONS/ELEVATIONS, OTHER SECTIONS, ELEVATIONS OR 3D DRAWINGS, AND/OR TRANSITION OR CONNECTION DETAILS)
NOTE: MULTIPLE DETAILS MAY BE REFERENCED

SPECIFICATION REFERENCE (CSI SECTION NUMBER MASTER FORMAT 2004 OR OTHER JURISDICTIONAL REQUIREMENT)
NOTE: MULTIPLE SPECIFICATIONS MAY BE REFERENCED

THE FOLLOWING LIST OF KEYNOTE HEADINGS (PROPOSED IMPROVEMENT SYSTEMS) HAVE BEEN INCORPORATED WITHIN THIS DRAWING SET:

1.0 PAVEMENT, RAMPS, AND CURBS
2.0 JOINTING
3.0 STEPS
4.0 SITE WALLS/EMBANKMENTS
5.0 SITE FURNITURE
6.0 RAILINGS, BARRIERS, AND FENCING
7.0 SITE LIGHTING
8.0 DRAINAGE
9.0 PLANTING AND LANDSCAPE
10.0 MISCELLANEOUS ELEMENTS
11.0 PLANT PROTECTION

NOTE: IF A KEYNOTE HEADING IS NOT INCORPORATED IN PROJECT, A "NOT USED AT THIS TIME" REFERENCE HAS BEEN PROVIDED.

7 REFERENCE NOTE LEGEND:

"x" REFERENCE NOTES

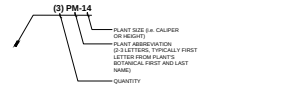
1. **Final Location of Path to be Determined in Field Under Direction of Landscape Architect**

NOTE CALL-OUT

SERIES SPECIFIC REFERENCE NOTE (SUPPLEMENTAL TO KEYNOTES. TYPICALLY DESCRIBES ITEMS TO BE CONSIDERED DURING CONSTRUCTION. MAY REFERENCE A DETAIL OR SPECIFICATION OR BOTH.)

NOTE: "x" Refers to Drawing Series (i.e. SITE DEMOLITION REFERENCE NOTES). THERE SHOULD BE SPECIFIC REFERENCE NOTES FOR EACH DRAWING SERIES. HOWEVER, SOME NOTES MAY APPEAR ON MULTIPLE SERIES.

8 PLANT IDENTIFICATION KEY



NOTE: PLANT ABBREVIATION ON PLANT IDENTIFICATION KEY SHOULD CORRESPOND WITH ABBREVIATION ON PLANT LIST
(i.e. PM-14 SHOULD REFER TO A PSEUDOTSUGA MENSIESII, 14-FOOT HEIGHT)

9 PLANT LIST

ABBR.	QTY.	BOTANICAL NAME	COMMON NAME	SPACING	SIZE	NOTES
DECIDUOUS TREES						
PT-10	15	*Populus tremuloides*	Quaking Aspen	As Shown	10 gal.	Full Specimens, Multi-Stemmed
PT-1.5	25	*Populus tremuloides*	Quaking Aspen	As Shown	1.5" cal.	Full Specimens, Multi-Stemmed
PT-2.5	45	*Populus tremuloides*	Quaking Aspen	As Shown	2.0' cal.	Full Specimens, Multi-Stemmed
EVERGREEN TREES						
PP-12	12	*Picea pungens*	Colorado Spruce	As Shown	10' ht.	Full, Dense Specimens, No Shearing
PP-12	5	*Picea pungens*	Colorado Spruce	As Shown	12' ht.	Full, Dense Specimens, No Shearing
PP-14	3	*Picea pungens*	Colorado Spruce	As Shown	14' ht.	Full, Dense Specimens, No Shearing
PP-16	2	*Picea pungens*	Colorado Spruce	As Shown	16' ht.	Full, Dense Specimens, No Shearing
PP-18	5	*Picea pungens*	Colorado Spruce	As Shown	18' ht.	Full, Dense Specimens, No Shearing
PP-20	3	*Picea pungens*	Colorado Spruce	As Shown	20' ht.	Full, Dense Specimens, No Shearing
PM-8	15	*Pseudotsuga menziesii*	Douglas Fir	As Shown	8' ht.	Full, Dense Specimens, No Shearing
PM-10	8	*Pseudotsuga menziesii*	Douglas Fir	As Shown	10' ht.	Full, Dense Specimens, No Shearing
PM-12	12	*Pseudotsuga menziesii*	Douglas Fir	As Shown	12' ht.	Full, Dense Specimens, No Shearing
PM-14	9	*Pseudotsuga menziesii*	Douglas Fir	As Shown	14' ht.	Full, Dense Specimens, No Shearing
SHRUBS						
BN-5	35	*Betula nana*	Bog Birch	As Shown	5 gal.	Full Plants
CSA-1	CSA	*Cornus sericea 'Arctic Fire'*	Dwarf Red Twig Dogwood	As Shown	1 gal.	Full Plants
CS-5	50	*Cornus sericea 'Bailey'*	Red Twig Dogwood	As Shown	5 gal.	Full Plants
JC-5	33	*Juniperus communis 'Silver Miles'*	Spreading Juniper	30" O.C.	5 gal.	Full Plants
MR-5	75	*Mahonia repens*	Creeping Oregon Grape	As Shown	5 gal.	Full Plants
PM-1	125	*Paxistima myrsinites*	Mountain Lover	24" O.C.	1 gal.	Full Plants
RAR-5	90	*Rhus aromatica*	Low Grow Sumac	As Shown	5 gal.	Full Plants
RIW-1	12	*Ribes wolfii*	Wolf Currant	As Shown	1 gal.	Full Plants
RP-5	15	*Rubus parviflorus*	Thimbleberry	As Shown	5 gal.	Full Plants
SW-5	23	*Salix wolfii*	Wolf's Willow	As Shown	5 gal.	Full Plants
SE-5	42	*Salix exigua*	Sandbar Willow	As Shown	5 gal.	Full Plants
GROUNDCOVERS / PERENNIALS						
AM-1	115	*Achillea 'Moonshine'*	Yarrow 'Moonshine'	12" O.C.	1 gal	Full Plants
ATC-1	65	*Achillea 'Terra Cotta'*	Yarrow 'Terra Cotta'	12" O.C.	1 gal	Full Plants
CR-1	43	*Campanula rotundifolia*	Mtn. Bluebell	As Shown	1 gal	Full Plants
EP-1	156	*Echinacea purpurea*	Coneflower	As Shown	1 gal	Full Plants
GO-8	200	*Galium odorata*	Sweet Woodruff	8" O.C.	Flats of 18	Full Plants
BG-8	15	*Gentian andrewsii*	Bottle Gentian	12" O.C.	Flats of 18	Full Plants
GJB-8	183	*Geranium 'Johnson's Blue'*	Johnson's Blue Geranium	12" O.C.	Flats of 18	Full Plants
LMC-1	23	*Lupinus 'My Castle'*	Lupine 'My Castle'	As Shown	1 gal	Full Plants
LS-1	87	*Leucanthemum x superbum*	Shasta Daisy	14" O.C.	1 gal.	Full Plants
MA-1	23	*Mentha arvensis*	Field Mint	12" O.C.	1 gal	Full Plants
PG-1	41	*Pedicularis groenlandica*	Elephant's-head Lousewort	12" O.C.	1 gal	Full Plants
PE-1	143	*Penstemon watsonii*	Firecracker Penstemon	12" O.C.	1 gal	Full Plants
PJ-1	21	*Penstemon jamesii*	James Penstemon	12" O.C.	1 gal	Full Plants
PR-1	76	*Penstemon rydbergii*	Rydbergs Penstemon	12" O.C.	1 gal	Full Plants
PC-1	109	*Polemonium caeruleum*	Jacobs Ladder	12" O.C.	1 gal	Full Plants
RF-1	315	*Rudbeckia fulgida 'Goldsturm'*	Black Eyed Susan	12" O.C.	1 gal	Full Plants
SH-8	201	*Salvia nemorosa 'Blue Queen'*	'Blue Queen' Sage	8" O.C.	Flats of 18	Full Plants
MISCELLANEOUS						
			Turf			
			Steel Edging			

IF DESIGN DEVELOPMENT DRAWINGS ARE BEING UTILIZED TO OBTAIN PRELIMINARY CONTRACTOR BID/PRICING OR FOR GUARANTEED MAXIMUM PRICING (GMP) PURPOSES, INCLUDE SITE CONSTRUCTION MOCK-UP PLANS. OTHERWISE PROVIDE IN CONSTRUCTION DOCUMENTS.

Example DD General Information Sheet—Large Project

1 GENERAL NOTES

1. EAGLE VALLEY SURVEYING, INC. PREPARED THE SURVEY FOR THIS PROJECT. IT HAS BEEN REFORMATTED FOR USE IN AND FOR PREPARATION OF THESE DOCUMENTS. CONTRACTOR SHALL OBTAIN OFFICIALLY SIGNED COPY FROM EAGLE VALLEY SURVEYING, INC. (PO BOX 1230, EDWARDS, CO 81632, PHONE - 970-949-1406) AND BECOME FAMILIAR WITH IT, THE EXISTING CONDITIONS AND SITE CONTEXT PRIOR TO CONSTRUCTION. ALL DISCREPANCIES SHOULD BE BROUGHT TO THE ATTENTION OF THE LANDSCAPE ARCHITECT FOR RESOLUTION IMMEDIATELY. LANDSCAPE ARCHITECT IS NOT RESPONSIBLE FOR ERRORS OR OMISSIONS ASSOCIATED WITH PREPARATION OR DOCUMENTATION OF SURVEY.

2. GROUND ENGINEERING CONSULTANTS, INC. PREPARED THE GEOTECHNICAL INVESTIGATION AND REPORT FOR THIS PROJECT. IT HAS BEEN REFERENCED DURING PREPARATION OF THESE DOCUMENTS. CONTRACTOR SHALL OBTAIN OFFICIALLY SIGNED COPY FROM GROUND ENGINEERING CONSULTANTS, INC. (PO BOX 464, 101A AIRPARK DRIVE, UNIT 9, GYPSUM, CO 81637, PHONE - 970-524-0720) AND BECOME FAMILIAR WITH IT PRIOR TO CONSTRUCTION. ALL DISCREPANCIES SHOULD BE BROUGHT TO THE ATTENTION OF THE LANDSCAPE ARCHITECT FOR RESOLUTION IMMEDIATELY. LANDSCAPE ARCHITECT IS NOT RESPONSIBLE FOR ERRORS OR OMISSIONS ASSOCIATED WITH PREPARATION OR DOCUMENTATION OF REPORT.

3. CONTRACTOR IS RESPONSIBLE FOR DETERMINING MEANS AND METHODS FOR CONSTRUCTION. THESE DRAWINGS MAY INDICATE A LIMIT OF PROPOSED IMPROVEMENTS, LIMITS OF SITE DEMOLITION, ETC. FOR DELINEATION OF EXPECTED EXTENTS OF DISTURBANCE. HOWEVER, FINAL IMPACT SHALL BE DETERMINED IN THE FIELD. SHOULD LIMITS OF DISTURBANCE EXCEED BOUNDARIES DEFINED IN DRAWINGS, CONTRACTOR SHALL CONTACT LANDSCAPE ARCHITECT FOR RESOLUTION.

4. CONTRACTOR IS RESPONSIBLE FOR REPAIRING ALL WORK DISTURBED BY CONSTRUCTION OUTSIDE OF LIMIT LINES DEFINED ON DRAWINGS OR THROUGH HIS/HER MEANS AND METHODS TO A CONDITION BETTER THAN OR EQUAL TO THE EXISTING CONDITIONS PRIOR TO COMMENCEMENT OF CONSTRUCTION AT NO ADDITIONAL COST TO THE OWNER.

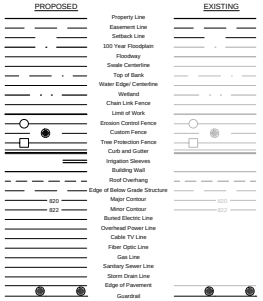
5. CONTRACTOR IS RESPONSIBLE FOR MAINTAINING A COMPLETE UP-TO-DATE SET OF DRAWINGS AND SPECIFICATIONS AT THE CONSTRUCTION SITE AND ENSURING THE DOCUMENTS ARE READILY AVAILABLE FOR REVIEW BY THE LANDSCAPE ARCHITECT AND GOVERNING AGENCY.

6. THE DRAWINGS AND SPECIFICATIONS ARE COMPLEMENTARY TO ONE ANOTHER AND IMPLIED TO CORRESPOND WITH ONE ANOTHER. ANY DISCREPANCIES SHOULD BE BROUGHT TO THE ATTENTION OF THE LANDSCAPE ARCHITECT FOR RESOLUTION IMMEDIATELY.

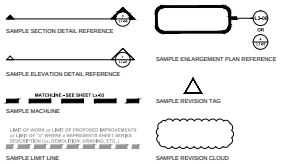
2 LIST OF ABBREVIATIONS

APPROX	APPROXIMATE	MH	MANHOLE
ARCH	ARCHITECT	MIN	MINIMUM
AVG	AVERAGE	MISC	MISCELLANEOUS
B&B	BALLED AND BURLAPPED	MTD	MOUNTED
BC	BOTTOM OF CURB	MTL	METAL
BF	BOTTOM OF FOOTING	N	NORTH
BLDG	BUILDING	NIC	NOT IN CONTRACT
BM	BENCHMARK	NO	NUMBER
BOC	BACK OF CURB	NOM	NOMINAL
BR	BOTTOM OF RAMP	NTS	NOT TO SCALE
BRG	BEARING	OC	ON CENTER
BS	BOTTOM OF STEP	OD	OUTSIDE DIAMETER
BW	BOTTOM OF WALL	OPP	OPPOSITE
CAL	CALIPER	PAR	PARALLEL
CAP	CAPACITY	PC	POINT OF CURVATURE
CF	CUBIC FEET	PE	POLYURETHANE
CHAM	CHAMFER	PERF	PERFORATED
CIP	CAST IN PLACE	PED	PEDESTRIAN
CJ	CONTROL JOINT	PI	POINT OF INTERSECTION
CL	CENTER LINE	PL	PROPERTY LINE
CLR	CLEARANCE	PT	POINT, POINT OF TANGENCY
CM	CENTIMETER	PVC	POLYVINYL CHLORIDE
CO	CLEAN OUT	PVMT	PAVEMENT
COMP	COMPACTED	PVR	PAVER
CONC	CONCRETE	QTY	QUANTITY
CONST	CONSTRUCTION	R	RADIUS
CONT	CONTINUOUS	RECEP	RECEPTACLE
CONTR	CONTRACTOR	REF	REFERENCE
CU	CUBIC	REINF	REINFORCE(D)
CY	CUBIC YARD	REM	REMOVE
DBL	DOUBLE	REQ'D	REQUIRED
DF	DIRECTION OF FLOW	REV	REVISION, REVISED
DEG	DEGREE	ROW	RIGHT OF WAY
DEMO	DEMOLISH, DEMOLITION	RT	RIGHT
DIA	DIAMETER	S	SOUTH
DIM	DIMENSION	SAN	SANITARY
DTL	DETAIL	SCH	SCHEDULE
DWG	DRAWING	SD	STORM DRAIN
E	EAST	SEC	SECTION
EA	EACH	SF	SQUARE FOOT (FEET)
EJ	EXPANSION JOINT	SHT	SHEET
EL	ELEVATION	SI	STORM INLET
ELEC	ELECTRICAL	SIM	SIMILAR
ENG	ENGINEER	SNT	SEALANT
EQ	EQUAL	SPECS	SPECIFICATIONS
EQMP	EQUIPMENT	SQ	SQUARE
EST	ESTIMATE	ST	STORM SEWER
E.W.	EACH WAY	SY	SQUARE YARD
EXIST	EXISTING	STA	STATION
EXP	EXPANSION, EXPOSED	STD	STANDARD
FF	FINISHED FLOOR ELEVATION	STL	STEEL
FG	FINISHED GRADE	STRL	STRUCTURAL
FIN	FINISH	SYM	SYMMETRICAL
FL	FLOW LINE	T&B	TOP AND BOTTOM
FOC	FACE OF CURB	TBC	TOP OF BACK CURB
FT	FOOT (FEET)	TC	TOP OF CURB
FTG	FOOTING	TF	TOP OF FOOTING
GA	GAUGE	THK	THICK
GAL	GALVANIZED	TOC	TOP OF CONCRETE
GC	GENERAL CONTRACT(OR)	TOPO	TOPOGRAPHY
GEN	GENERAL	TSL	TOP OF SLAB
HORIZ	HORIZONTAL	TRAS	TRANSFORMER
HP	HIGH POINT	TR	TOP OF RAMP
HT	HEIGHT	TS	TOP OF STEP
ID	INSIDE DIAMETER	TW	TOP OF WALL
INV	INVERT ELEVATION	TYP	TYPICAL
IN	INCHES	VAR	VARIES
INCL	INCLUDE(D)	VERT	VERTICAL
INL	INLET	VEH	VEHICLE
IRR	IRRIGATION	VOL	VOLUME
JT	JOINT	W/	WITH
LIN	LINEAR	W/O	WITHOUT
LF	LINEAR FEET	WT	WEIGHT
LP	LOW POINT	WL	WEIR LEVEL
LT	LIGHT	WWF	WELDED WIRE FABRIC
MATL	MATERIAL	YD	YARD
MAX	MAXIMUM	@	AT
MEMB	MEMBRANE		

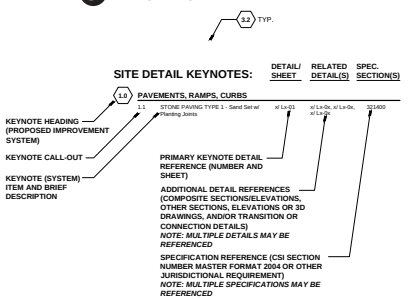
3 LINETYPE LEGEND



4 SYMBOLS LEGEND



5 KEYNOTE LEGEND:

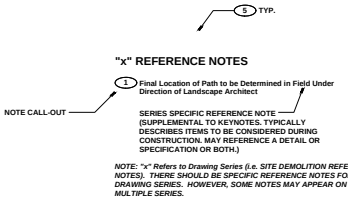


THE FOLLOWING LIST OF KEYNOTE HEADINGS (PROPOSED IMPROVEMENT SYSTEMS) HAVE BEEN INCORPORATED WITHIN THIS DRAWING SET:

1.0 PAVEMENT, RAMPS, AND CURBS
2.0 JOINTING
3.0 STEPS
4.0 SITE WALLS/EMBANKMENTS
5.0 SITE FURNITURE
6.0 RAILINGS, BARRIERS, AND FENCING
7.0 SITE LIGHTING
8.0 DRAINAGE
9.0 PLANTING AND LANDSCAPE
10.0 MISCELLANEOUS ELEMENTS
11.0 PLANT PROTECTION

NOTE: IF A KEYNOTE HEADING IS NOT INCORPORATED IN PROJECT, A "NOT USED AT THIS TIME" REFERENCE HAS BEEN PROVIDED.

6 REFERENCE NOTE LEGEND:



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LEGEND

1. General Notes
2. List of Abbreviations
3. Linetype Legend
4. Symbols Legend
5. Site Detail Keynote Legend
6. Site Reference Note Legend

**Note: Series-specific notes, series-specific Pattern/Symbols legends, the Planting Key legend, the Plant List, and any other series- specific legends, lists, or schedules should be located on the series-specific Key Plan and General Information Sheet.*

*Note: This sample depicts only the drawing area for this sheet. For title block requirements refer to preceding Title Block section.

GENERAL SHEETS: CONSTRUCTION DOCUMENTS GENERAL INFORMATION SHEET

Objective

The CD General Information Sheet finalizes general parameters associated with the intended site construction and displays the compositional structure* of all landscape architectural Construction Documentation systems. It is intended to be used as an ongoing reference during construction, used jointly with individual sheets.

*The compositional structure includes graphic and narrative systems.

General Requirements

The quality of the built work may be determined, in part, by the quality of general instructions and requirements. Much of this information represents an establishment of intent. In addition, this sheet presents a content directory for material on the pages that follow. A well-developed, well-coordinated General Information Sheet establishes a solid foundation for the construction document set.

Specific Requirements

There are no differences between DD and CD General Information Sheets. However, General Information Sheet content should be advanced to better reflect the information conveyed in the drawings and should include the Mock-up Plan if not provided on the DD General Information Sheet.

Graphic Requirements

There are no differences between the DD and CD General Information Sheets.

Best Practices

(Same as Design Development)

Example CD General Information Sheet—Small Project

1

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6. THE DRAWINGS AND SPECIFICATIONS ARE COMPLEMENTARY TO ONE ANOTHER AND IMPLIED TO CORRESPOND WITH ONE ANOTHER. ANY DISCREPANCIES SHOULD BE BROUGHT TO THE ATTENTION OF THE LANDSCAPE ARCHITECT FOR RESOLUTION IMMEDIATELY.

2

PLANT PROTECTION AND REMOVAL NOTES

1. Plant symbols as indicated on Drawings do not represent actual driplines. Contractor shall verify in field prior to construction. Proposed plant protection fencing shall be placed outside of edge of actual dripline or as directed by Landscape Architect in the field.

2. Protection fencing shall be maintained throughout construction unless otherwise directed by Landscape Architect. Contractor shall obtain permission to enter from Landscape Architect prior to conducting work within plant protection zones.

3. Coordinate with City Forester prior to conducting any tree removal or pruning.

4. Trees indicated to be removed shall also include complete removal of stump and roots and filling in depression with suitable soil fill.

SITE DEMOLITION NOTES

1. Remove items shown on the Drawings to be removed to the full depth of their construction unless designated to remain.

2. Verify the extent and location of items to remain (to be removed) prior to commencement of the work.

3. Items (site structures) encountered below grade and not shown on the drawings shall be brought to the attention of the Landscape Architect for clarification.

4. Contact the local underground service update for utility location and identification prior to demolition.

5. The location of existing utilities as shown on the Drawings may vary in relation to actual existing conditions; additional utilities not shown on the Drawings may exist. Verify in the field the data shown, and call any discrepancies to the attention of the Landscape Architect before starting work.

SITE LAYOUT NOTES

1. Layout and verify dimensions prior to construction. Bring discrepancies to the attention of the Landscape Architect for clarification.

2. For dimensions of porte cochere and staircases, refer to the architectural drawings. Copies of these Drawings are available from the Owner.

3. Written dimensions take precedence over scale. Do not scale drawings.

4. Where dimensions are called as "equal," space referenced items equally, measured to their center lines.

5. Measurements are to face of building, wall or the fixed site improvement. Dimensions to center lines is indicated.

6. Install intersecting elements at 90 degree angles to each other unless otherwise noted.

7. Provide expansion joints where concrete flatwork meets vertical structures such as walls, curbs, steps and building elements and as indicated on Drawings and specs.

5

SITE GRADING AND DRAINAGE NOTES

1. Existing underground utilities are shown per available records. Verify the actual location and elevation in the field prior to beginning construction of the new facilities. Protect existing utilities and be responsible for damage to utilities encountered during construction.

2. Request inspection as required 48 hours in advance of performing any work unless otherwise noted on the drawings or specifications.

SITE LIGHTING NOTES

1. Lighting symbols on plans are diagrammatic. Refer to details and specifications for actual dimensions and product information.

2. Lighting design is intended to produce an overall 0.5 footcandle illumination level on the trail with 1.0 footcandle illumination minimum at trail intersections. Final installation shall confirm these illumination standards.

3. Contractor shall ensure luminaires are installed in accordance with Manufacturer's specifications to ensure there is no light illumination greater than 0.10 footcandles at the property line upon installation. Contractor shall notify Landscape Architect if discrepancy.

4. Layout dimensions are for general reference only. Final location to be determined in the field by the Landscape Architect.

5. Lighting pull-boxes, vaults and other in-grade appurtenances shall be flush with adjacent finish grades or surfaces. Notify Landscape Architect if located on a slope greater than 5% for direction.

6. Coordinate with existing and proposed underground utilities. Notify Landscape Architect of any conflicts for direction on fixture placement.

SITE SOILS NOTES

1. Planting soil shall be provided mixed and ready for installation. On-site mixing of Planting Soil Types 1 and 2 is acceptable.

2. Contractor shall coordinate with Owner's Representative for location of stockpile areas for stripped topsoil and planting soil products. Contractor shall ensure area is protected and contamination or disturbance of stored products is not allowed.

3. Contractor shall ensure subgrade is scarified prior to installing planting soil and blend with initial lift or placement of proposed planting soil.

4. All rock, cobble or debris larger than 2-inch diameter shall be removed and legally disposed of offsite prior to placing proposed planting soil.

5. Coordinate placement of planting soil with other work, especially utilities. Placement should occur after installation of all hardscape improvements, irrigation system, utilities, etc. and before installation of plants.

5

PLANTING NOTES

1. Contractor shall be reponsible for becoming aware of all related existing conditions, pipes and structures, etc. prior to bidding and construction.

2. See specifications and details for planting methods, requirements, soil testing, materials, execution and plan protection.

3. Plant names may be abbreviated on drawings. Refer to plant list and legends for symbols, abbrevistions, botanical and common names, sizes, estimated quantities and other remarks.

4. Where provided, area takeoffs and plant quantity estimates in plant list are for information only. Contractor is responsible to do their own quantity takeoffs for all plant material and sizes shown on the drawings. In case f descrepancies to the attention of the landscape architect for clarification.

5. Contractor is responsible to 'restore' all areas of the site, or adjacent areas, where disturbed to a condition that meets or exceeds the conditions prior to the disturbance.

3

LIST OF ABBREVIATIONS

APPROX	APPROXIMATE	MH	MANHOLE
ARCH	ARCHITECT	MIN	MINIMUM
AVG	AVERAGE	MISC	MISCELLANEOUS
B&B	BALLED AND BURLAPPED	N	NORTH
BC	BOTTOM OF CURB	NIC	NOT IN CONTRACT
BLDG	BUILDING	NO	NUMBER
BM	BENCHMARK	NOM	NOMINAL
BOC	BACK OF CURB	NTS	NOT TO SCALE
BR	BOTTOM OF RAMP	OC	ON CENTER
BS	BOTTOM OF STEP	OD	OUTSIDE DIAMETER
BW	BOTTOM OF WALL	PC	POINT OF CURVATURE
CAL	CALIPER	PE	POLYURETHANE
CB	CATCH BASIN	PI	POINT OF INTERSECTION
CF	CUBIC FEET	PL	PROPERTY LINE
CIP	CAST IN PLACE	PT	POINT, POINT OF TANGENCY
CL	CENTER LINE	PVC	POLYVINYL CHLORIDE
CLR	CLEARANCE	QTY	QUANTITY
CM	CENTIMETER	R	RADIUS
CO	CLEAN OUT	REF	REFERENCE
CONT	CONTINUOUS	REINF	REINFORCE(D)
CY	CUBIC YARD	REQ'D	REQUIRED
DEG	DEGREE	REV	REVISION, REVISED
DEMO	DEMOLISH, DEMOLITION	ROW	RIGHT OF WAY
DIA	DIAMETER	S	SOUTH
DIM	DIMENSION	SAN	SANITARY
DTL	DETAIL	SD	STORM DRAIN
DWG	DRAWING	SF	SQUARE FOOT (FEET)
E	EAST	SHT	SHEET
EA	EACH	SIM	SIMILAR
EL	ELEVATION	SPECS	SPECIFICATIONS
ENG	ENGINEER	ST	STORM SEWER
EQ	EQUAL	SY	SQUARE YARD
EST	ESTIMATE	STA	STATION
E.W.	EACH WAY	STD	STANDARD
EXIST	EXISTING	SYM	SYMMETRICAL
EXP	EXPANSION, EXPOSED	T&B	TOP AND BOTTOM
FFE	FINISHED FLOOR ELEVATION	TBC	TOP OF BACK CURB
FG	FINISHED GRADE	TC	TOP OF CURB
FL	FLOW LINE	TF	TOP OF FOOTING
FOC	FACE OF CURB	TH	THICK
FT	FOOT (FEET)	TOPO	TOPOGRAPHY
FTG	FOOTING	TR	TOP OF RAMP
GA	GAUGE	TS	TOP OF STEP
GEN	GENERAL	TW	TOP OF WALL
GR	GRADE ELEVATION	TYP	TYPICAL
HORIZ	HORIZONTAL	VAR	VARIES
HP	HIGH POINT	VOL	VOLUME
HT	HEIGHT	W/	WITH
ID	INSIDE DIAMETER	W/O	WITHOUT
INV	INVERT ELEVATION	WT	WEIGHT
IN	INCH(ES)	WL	WATER LEVEL
INCL	INCLUDE(D)	WWF	WELDED WIRE FABRIC
JT	JOINT	YD	YARD
LF	LINEAR FEET	@	AT
LP	LOW POINT		
MAX	MAXIMUM		

5

4

LINETYPE LEGEND

PROPOSED		EXISTING
	Property Line	
	Easement Line	
	Setback Line	
	100 Year Floodplain	
	Limit of Work	
	Matchline	
	Building Wall	
	Roof Overhang	
	Edge of Below Grade Structure	
820	Major Contour	820
822	Minor Contour	822
E	Buried Electric Line	
OP	Overhead Power Line	
FO	Fiber Optic Line	
G	Gas Line	
SS	Sanitary Sewer Line	
ST	Storm Drain Line	
W	Water Line	
	Gore Creek Flow Line	
	Gore Creek Water Edge	W W W
	Fence to Remain	
	Wall Center Line	
	Edge of Pavement	

5

SYMBOLS LEGEND

3 / L7-04 — SAMPLE SECTION DETAIL REFERENCE

L3-08 OR 4 / L7-05 — SAMPLE ENLARGEMENT PLAN REFERENCE

1 / L7-01 — SAMPLE ELEVATION DETAIL REFERENCE

MATCHLINE - SEE SHEET Lx-03 — SAMPLE MACHLINE

SAMPLE REVISION TAG

LIMIT OF WORK or LIMIT OF PROPOSED IMPROVEMENTS or LIMIT OF "x" WHERE x REPRESENTS SHEET SERIES DESCRIPTION (i.e. DEMOLITION, GRADING, ETC.) — SAMPLE LIMIT LINE

SAMPLE REVISION CLOUD

PLANT PROTECTION LEGEND

- EVERGREEN TREE TO BE REMOVED
- DECIDUOUS TREE TO BE REMOVED
- TREE PROTECTION FENCING
- EVERGREEN TREE TO REMAIN (PROTECT-IN-PLACE)
- DECIDUOUS TREE TO REMAIN (PROTECT-IN-PLACE)

5

SITE DEMOLITION LEGEND

- EXISTING PAVERS TO BE REMOVED
- EXISTING PLANTING AREA TO BE REMOVED
- EXISTING POOL/SPA TO BE REMOVED
- EXISTING DECKING TO BE REMOVED
- EXISTING CONCRETE PAVING TO BE REMOVED
- EXISTING PAVERS TO BE REMOVED AND SALVAGED
- EXISTING PAVERS TO BE REMOVED AND REUSED
- AREA TO BE REMOVED PER ARCHITECT'S DRAWINGS - N.I.C.

MATERIALS LEGEND

- Concrete Paving Type 1
- Concrete Paving Type 2
- Concrete Paving Type 3
- Concrete Paving Type 4
- Concrete Paving Type 5
- Concrete Paving Type 6
- Handrail
- Score Joint
- Control Joint
- Expansion Joint
- Stone Veneer Wall
- Dry-Stack Wall
- Landscape Boulders (See also boulder Legend)
- Existing Boulder Wall to Remain.
- Ash Urn
- Trash Receptacle
- Planter Type 1
- Planter Type 2
- Planter Type 3
- Proposed 5' ht. Pool Enclosure Fence Type 1
- Proposed Pool Enclosure Glass Fence Type 1
- Proposed 5' ht. Pool Enclosure Fence Type 2
- Limit of Work
- Matchline

BOULDER LEGEND

- A — 2' - 3' and Approximate .75 - 1 Ton
- B — 3' - 4' and Approximate 2 - 4 Ton
- C — 4' - 5' and Approximate 5 - 8 Ton
- D — 5' + and Approximate 9 - 12 Ton

GRADING LEGEND

- (8010) Existing Spot Elevation
- 8010 Proposed Spot Elevation
- Proposed Top of Slope
- X% Proposed Pitch Arrow
- Existing Catch Basin
- Proposed Catch Basin
- Proposed Lawn Inlet
- Proposed Top of Slope

SOILS LEGEND

- PLANTING SOIL TYPE 1
- PLANTING SOIL TYPE 2
- PLANTING SOIL TYPE 3
- PLANTING SOIL TYPE 4

LIGHTING LEGEND

- Proposed Street Light
- Proposed Pedestrian Light
- Proposed Bollard Light
- Proposed Step Light
- Proposed Uplight

PLANTING LEGEND

- 20' PROPOSED EVERGREEN TREE WITH HEIGHT SIZE
- 2.5"cal. PROPOSED SINGLE-STEM ASPEN TREE W/ CALIPER SIZE
- 2.5"cal. PROPOSED SINGLE-STEM ASPEN TREE W/ CALIPER SIZE
- PROPOSED DECIDUOUS SHRUB
- PROPOSED EVERGREEN SHRUB
- PROPOSED PERENNIAL HATCH
- PROPOSED ANNUAL HATCH
- PROPOSED GROUNDCOVER HATCH
- PROPOSED TURF HATCH
- PROPOSED NATIVE GRASS HATCH
- PROPOSED EDGER

6

KEYNOTE LEGEND:

3.2 TYP.

SITE DETAIL KEYNOTES:	DETAIL/ SHEET	RELATED DETAIL(S)	SPEC. SECTION(S)
1.0 PAVEMENTS, RAMPS, CURBS			
1.1 STONE PAVING TYPE 1 - Sand Set w/ Planting Joints	x/ Lx-01	x/ Lx-0x, x/ Lx-0x, x/ Lx-0x	321400

KEYNOTE HEADING (PROPOSED IMPROVEMENT SYSTEM)

KEYNOTE CALL-OUT

KEYNOTE (SYSTEM) ITEM AND BRIEF DESCRIPTION

PRIMARY KEYNOTE DETAIL REFERENCE (NUMBER AND SHEET)

ADDITIONAL DETAIL REFERENCES (COMPOSITE SECTIONS/ELEVATIONS, OTHER SECTIONS, ELEVATIONS OR 3D DRAWINGS, AND/OR TRANSITION OR CONNECTION DETAILS)
NOTE: MULTIPLE DETAILS MAY BE REFERENCED

SPECIFICATION REFERENCE (CSI SECTION NUMBER MASTER FORMAT 2004 OR OTHER JURISDICTIONAL REQUIREMENT)
NOTE: MULTIPLE SPECIFICATIONS MAY BE REFERENCED

THE FOLLOWING LIST OF KEYNOTE HEADINGS (PROPOSED IMPROVEMENT SYSTEMS) HAVE BEEN INCORPORATED WITHIN THIS DRAWING SET:

1.0 PAVEMENT, RAMPS, AND CURBS
2.0 JOINTING
3.0 STEPS
4.0 SITE WALLS/EMBANKMENTS
5.0 SITE FURNITURE
6.0 RAILINGS, BARRIERS, AND FENCING
7.0 SITE LIGHTING
8.0 DRAINAGE
9.0 PLANTING AND LANDSCAPE
10.0 MISCELLANEOUS ELEMENTS
11.0 PLANT PROTECTION

NOTE: IF A KEYNOTE HEADING IS NOT INCORPORATED IN PROJECT, A "NOT USED AT THIS TIME" REFERENCE HAS BEEN PROVIDED.

REFERENCE NOTE LEGEND:

5 TYP.

7

"x" REFERENCE NOTES

1 Final Location of Path to be Determined in Field Under Direction of Landscape Architect

NOTE CALL-OUT

SERIES SPECIFIC REFERENCE NOTE (SUPPLEMENTAL TO KEYNOTES. TYPICALLY DESCRIBES ITEMS TO BE CONSIDERED DURING CONSTRUCTION. MAY REFERENCE A DETAIL OR SPECIFICATION OR BOTH.)

NOTE: "x" Refers to Drawing Series (i.e. SITE DEMOLITION REFERENCE NOTES). THERE SHOULD BE SPECIFIC REFERENCE NOTES FOR EACH DRAWING SERIES. HOWEVER, SOME NOTES MAY APPEAR ON MULTIPLE SERIES.

8

PLANT IDENTIFICATION KEY

(3) PM-14

- PLANT SIZE (i.e. CALIPER OR HEIGHT)
- PLANT ABBREVIATION (2-3 LETTERS, TYPICALLY FIRST LETTER FROM PLANT'S BOTANICAL FIRST AND LAST NAME)
- QUANTITY

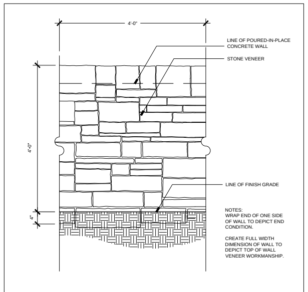
NOTE: PLANT ABBREVIATION ON PLANT IDENTIFICATION KEY SHOULD CORRESPOND WITH ABBREVIATION ON PLANT LIST *(i.e. PM-14 SHOULD REFER TO A PSEUDOTSUGA MENSIESII, 14-FOOT HEIGHT)*

9

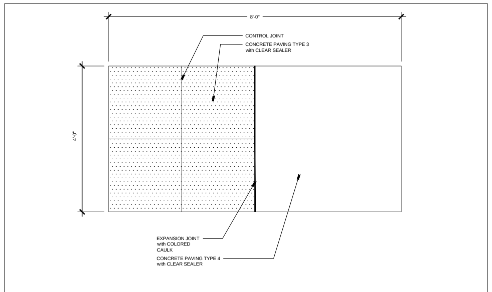
PLANT LIST

ABBR.	QTY.	BOTANICAL NAME	COMMON NAME	SPACING	SIZE	NOTES
DECIDUOUS TREES						
PT-2.5	49	*Populus tremuloides*	Quaking Aspen	As Shown	2.5" cal.	Full Specimens
PT-2.5	5	*Populus tremuloides*	Quaking Aspen	As Shown	2.5' cal.	Full Specimens, Multi-Stemmed
EVERGREEN TREES						
PP-10	2	*Picea pungens*	Colorado Spruce	As Shown	10' ht.	Full, Dense Specimens, No Shearing
PP-12	1	*Picea pungens*	Colorado Spruce	As Shown	12' ht.	Full, Dense Specimens, No Shearing
SHRUBS						
CD-5	19	*Cotoneaster divaricatus*	Spreading Cotoneaster	As Shown	5 gal.	Full Plants
CS-5	101	*Cornus sericea 'Baileyi'*	Red Twig Dogwood	As Shown	5 gal.	Full Plants
JC-5	28	*Juniperus communis*	Common Juniper	As Shown	5 gal.	Full Plants
PF-5	40	*Potentilla fruticosa 'Kathryn Dykes'*	'Kathryn Dykes' Potentilla	As Shown	5 gal.	Full Plants
PM-1	5	*Paxistima myrsinites*	Mountain Lover	24" O.C.	1 gal.	Full Plants
PXS-5	72	*Philadelphus x 'Snowbelle'*	Snowbelle Mockorange	As Shown	5 gal.	Full Plants
PYM-5	56	*Physocarpus monogynus*	Mountain Ninebark	As Shown	5 gal.	Full Plants
RA-5	74	*Ribes aureum*	Golden Currant	As Shown	5 gal.	Full Plants
RAR-5	11	*Rhus aromatica*	Low Grow Sumac	As Shown	5 gal.	Full Plants
RP-5	114	*Rubus parviflorus*	Thimbleberry	As Shown	5 gal.	Full Plants
SO-5	65	*Symphoricarpos oreophilus*	Mountain Snowberry	As Shown	5 gal.	Full Plants
SS-5	3	*Sorbus scopulina*	Mountain Ash	As Shown	5 gal.	Full Plants
GROUNDCOVERS / PERENNIALS						
AM-1	139	*Achillea 'Moonshine'*	'Moonshine' Yarrow	18" O.C.	1 gal	Full Plants
AC-1	239	*Aquilegia canadensis 'Little Lantern'*	'Little Lantern' Columbine	15" O.C.	1 gal	Full Plants
ATC-1	145	*Achillea 'Terra Cotta'*	'Terra Cotta' Yarrow	18" O.C.	1 gal	Full Plants
CR-1	84	*Campanula rotundifolia*	Mountain Bluebell	15" O.C.	1 gal	Full Plants
DPG-1	75	*Delphinium x Pacific Giant 'Blue Bird'*	Medium Blue Larkspur	24" O.C.	1 gal.	Full Plants
EP-1	323	*Echinacea purpurea*	Purple Coneflower	18" O.C.	1 gal	Full Plants
GO-fl	27	*Gallium odorata*	Sweet Woodruff	8" O.C.	Flats of 15	Full Plants
GB-1	45	*Geranium 'Brookside'*	Brookside Geranium	As Shown	1 gal	Full Plants
GJB-fl	47	*Geranium 'Johnsons Blue'*	Johnson's Blue Geranium	12" O.C.	Flats of 15	Full Plants
IM-1	36	*Ipomoea 'Marguerite'*	Potato Vine	As Shown	1 gal.	Full Plants
LE-1	48	*Lobelia erinus 'Fountain Blue'*	Lobelia	As Shown	1 gal	Full Plants
LS-1	404	*Leucanthemum x superbum*	Shasta Daisy	18" O.C.	1 gal.	**Full Plants**
LP-1	48	*Lysimachia punctata 'Golden Alexander'*	Yellow Loosestrife	As Shown	1 gal.	Full Plants
MA-1	49	*Mentha arvensis*	Field Mint	12" O.C.	1 gal	Full Plants
PC-1	24	*Polemonium caeruleum*	Jacobs Ladder	15" O.C.	1 gal	Full Plants
PE-1	124	*Penstemon eatonii*	Firecracker Penstemon	12" O.C.	1 gal	Full Plants
PG-1	28	*Pedicularis groenlandica*	Elephant's-head Lousewort	12" O.C.	1 gal	Full Plants
PMP-1	24	*Penstemon x. mexicali 'Psymers'*	Shadow Mtn. Penstemon	12" O.C.	1 gal	Full Plants
PS-1	216	*Phlox subulata 'Candy Stripes'*	Pink Phlox w/ White Stripe	9" O.C.	1 gal	Full Plants
PDR-1	42	*Penstemon digitalis 'Husker Red'*	'Husker Red' Penstemon	18" O.C.	1 gal	Full Plants
RF-1	198	*Rudbeckia fulgida 'Goldsturm'*	Black Eyed Susan	18" O.C.	1 gal	Full Plants
SN-1	34	*Salvia nemorosa 'Blue Queen'*	'Blue Queen' Sage	12" O.C.	1 gal	Full Plants
RMP-1	143	*Penstemon strictus*	Rocky Mountain Penstemon	12" O.C.	1 gal.	Full Plants
UU-1	18	*Uncinia uncinata 'Red'*	Uncinia	As Shown	1 gal	Full Plants
ANNUALS	300		Season Annuals	6" O.C.	Flats	Full Plants
TURF	2,713 SF	*Poa pratensis*	Kentucky Bluegrass			

10 SITE CONSTRUCTION MOCKUPS



TYPICAL STONE VENEER WALL - ELEVATION VIEW



CONCRETE PAVING - PLAN VIEW

LEGEND

1. General Notes
2. Series-Specific General Notes
3. List of Abbreviations
4. Linetype Legend
5. Pattern/Symbols Legend
6. Site Detail Keynote Legend
7. Site Reference Note Legend
8. Plant Identification Key
9. Plant List
10. **Mock-Ups**

Note: **Boldface** items represent key distinctions between Construction Documentation documents and Design Development documents..

*Note: This sample depicts only the drawing area for this sheet. For title block requirements refer to preceding Title Block section.

Example CD General Information Sheet—Large Project

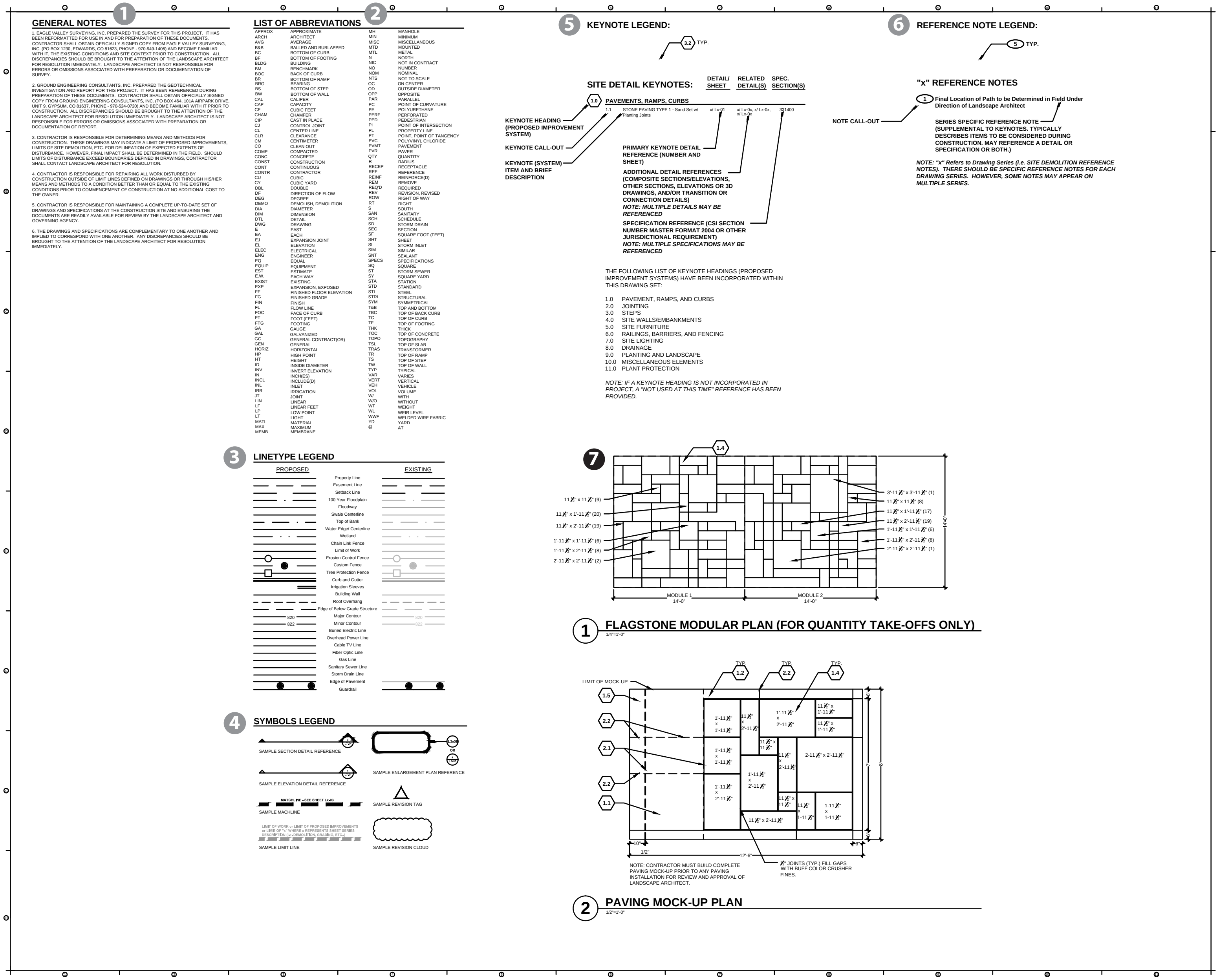
LEGEND

1. General Notes
2. List of Abbreviations
3. Linetype Legend
4. Symbols Legend
5. Site Detail Keynote Legend
6. Site Reference Note Legend
7. **Mock-Ups**

Note: **Boldface** items represent key distinctions between Construction Documentation documents and Design Development documents..

Note: Series-specific notes, series-specific Pattern/Symbols legends, the Planting Key legend, Plant List and any other series-specific legends, lists, or schedules should be located on the series-specific Key Plan and General Information Sheet.

*Note: This sample depicts only the drawing area for this sheet. For title block requirements refer to preceding Title Block section.



DESIGN DEVELOPMENT PLANT PROTECTION AND REMOVAL PLAN

Objective

The DD Plant Protection and Removal Plan explicitly defines the primary intentions for protection, removal, transplanting, and care of trees, shrubs, and other existing plants, because of their inherent value.

General Requirements

The DD Plant Protection and Removal Plan should identify all decisions regarding existing plants, for review and coordination with the client and collaborators prior to beginning Construction Documentation. The plan should provide a complete description of the tree and plant protection work scope in order to properly prepare a Design Development (DD) level cost estimate for the work.

Should landscape preservation be a key driver in the design process, the DD Plant Protection and Removal Plan should be used to evaluate the success of existing landscape preservation. A mature existing landscape may present more benefits than its replacement and the removal of any existing trees deserves careful analysis. Trees should be removed only as necessary to implement a well-considered design and accomplish environmental objectives.

A fundamental component of the tree protection decision-making process is the determination of the tree protection area itself. This process varies widely and is subject to varying and sometimes damaging determinations. Tree protection areas should include the collective "critical root zone" area of all trees. The "critical root zone" area is generally defined as that area directly beneath the crown of the tree, otherwise known as "within the drip line." As noted separately within these guidelines, the drip line of mature trees is subject to impact by site construction and should be defined on the site survey, for the landscape architect's use in determining the position of proposed improvements.

Local government agencies may have standards for determining the tree protection zone. In some jurisdictions, the critical root zone is defined by a circle with the tree trunk at its radius point, and a radius of a preset number of feet for each inch of tree trunk diameter at breast height (DBH). Breast height is usually measured at 4.5 feet above ground level. Note that all trunks are typically added together at multi-stem tree trunks. [4]

[4] City of Atlanta, Office of Buildings, Arborist Division. "Tree Protection Plan Checklist." Accessed July, 2014. www.atlantaga.gov/modules/showdocument.aspx?documentid=12407.

While establishing a tree protection zone within the critical root zone offers good protection for mature trees, better protection is offered with a larger protection area (beyond the critical root zone). Example guidelines are provided below for general reference. These guidelines should not be used universally. For most projects where existing trees may be impacted, a local arborist, horticulturist, or forester should be consulted. An excellent source of information and criteria for protecting existing trees is *Trees and Development: A Technical Guide to Preservation of Trees During Land Development* by Naida Matheny and James R. Clark. The publication includes discussion about potential disturbances such as topographic manipulation and associated soil impacts.

Mature Tree Protection Zone Guidelines [5]

Mature Tree Protection Zone Radius (from trunk)			
Trunk Diameter	**Good Protection**	**Better Protection**	**Best Protection**
8 inches	10 feet	12 feet	20 feet
12 inches	15 feet	18 feet	30 feet
16 inches	20 feet	24 feet	40 feet
20 inches	25 feet	30 feet	50 feet

Tree and plant protection is often more complex than encircling existing trees with a flimsy fence. A variety of methods and practices exist to safeguard the health of mature trees on a construction site. These methods include sturdy, well-placed protection fencing, transplanting, boxing, compaction mitigation, root zone aeration, tree wells, root pruning, branch pruning, and construction access control. Primary methods should be defined preliminarily and documented at the Design Development phase. Detailed definition should occur at the Construction Documentation phase.

The Design Development Plant Protection and Removal Plan should be used to evaluate the impacts of work by all disciplines to existing trees, including subgrade utility and civil work, foundations, footings, excavations, and earthwork.

Relationships to Associated Plans

In most cases, the Plant Protection and Removal Plan should be used as the primary reference for all requirements associated with plant protection, care, removal, and transplanting. In some unique cases, the landscape architect may determine reasons to use associated plans to communicate plant protection and removal requirements. A number of these scenarios are described here.

[5] www.dlr.enr.state.nc.us/TAC%20website/2008_06_Drafts_for_Public_Comment/Tree%20Protection/New%20Tree%20Protection.pdf.

The site conditions and level of contractor work scope complexity will influence documentation decisions concerning the plan location of tree protection and removal requirements. A number of documentation scenarios may be considered and include the following options:

- **Plant Protection and Removal Plan:** This is the preferred documentation scenario. This plan is used when mature trees and plants are of critical importance to the ecosystem, land value, and aesthetic of the site. Damage penalties are included for unauthorized impacts to trees during construction operations. The plan includes all requirements associated with tree protection, care, removal, and transplanting. This document must be well-coordinated with the Site Demolition Plan, Site Grading and Drainage Plan, Planting Plan, and Erosion and Sedimentation Control Plan. In some cases, the Erosion and Sedimentation Control Plan is prepared by the landscape architect; in other cases, it is prepared by the civil engineer.
- **Plant Protection Plan:** This plan shows only tree and plant protection, with tree removal requirements included on the Site Demolition Plan, as noted here. The Plant Protection Plan focuses on all measures necessary to protect and nurture the health of existing trees and plants during construction. Transplanting requirements should be included on this plan, as they require protection prior to transplant.
- **Plant Removal and Site Demolition Plan:** In this scenario, tree removal requirements are included on the Plant Removal and Site Demolition Plan in order to clearly separate protection from removal and associated demolition work. By showing tree and plant removal on the Site Demolition Plan, the demolition and removal requirements are consolidated for ease of reference and coordination benefit. This scenario would require that tree protection measures be shown on Plant Protection Plans as previously noted.

  Additionally, on some projects, there may be minimal tree and plant protection needs, that is, there may be few existing trees that need protection, and/or the protection requirements may be very simple. In this case, tree and plant protection requirements may be included on the Site Demolition Plan. This approach requires that graphic emphasis be placed on tree and plant protection measures, and to be clearly evident among demolition requirements.
- **Protection and Control Plan:** In some cases a more comprehensive Protection and Control Plan may be developed to include tree and plant protection requirements, soil erosion and sedimentation control, and project protection and control. These plans focus on protection of existing trees and plants, controlling sedimentation and erosion, and any other activities requiring contractor control, such as site access and circulation requirements. The idea here is to highlight and consolidate all protective systems up front in the documentation package.
- **Erosion and Sedimentation Control Plan:** This plan illustrates contractual measures to reduce soil detachment and transport, complying with all regulatory requirements. Relationships to Plant Protection Plans and Site Grading and Drainage Plans are important, as impacts to existing grades may impact existing plants, which in turn may result in sedimentation and/or erosion impacts. Note that the Erosion and Sedimentation Control Plan is typically used specially for plant protection and removal, but can be adapted to do so.

  Some combination of the plan options above may also be utilized by the landscape architect.

Key Distinctions between DD and CD Plant Protection and Removal Plans

The landscape architect should be strategic in making content decisions for the DD documents. These guidelines suggest individual strategies for each of the DD sheets, subject to the unique role of that sheet in the design and documentation process.

Primary relationships between the DD and CD Plant Protection and Removal Plans are summarized here:

1. The DD Plant Protection and Removal Plan approximates the content of the CD Plant Protection and Removal Plan. All decisions regarding the disposition of existing plants should be made. As such, fully developed CD-level graphic symbols should be utilized. Supporting decisions such as compaction reduction areas, aeration zones, root and branch pruning, allowable disturbance within plant protection zones, and damage penalties may be completed during Construction Documentation.
2. Primary plant protection methods should be defined preliminarily and documented at the DD phase and detailed definition should occur at the CD phase. These methods are described below under both DD and CD *Special Conditions Requirements* and include practices such as branch and root pruning, and root zone aeration.
3. Preliminary interdisciplinary coordination and quality-control review of the DD Tree and Plant Protection Plan should be completed, with final and more exhaustive review and editing completed at the CD phase.

Specific Requirements

Core Requirements

Core Requirements include those elements that are typically necessary on all Plant Protection and Removal Plans.

Survey base sheet to show all existing conditions to remain, including above-and below-grade structures, pavements, plants, topography, utilities, monuments, benchmarks or other reference datum, and all legal conditions and restrictions such as property line bearings and distances, recorded easements, zoning setbacks, deed restrictions, adjacent property owners, and zoning districts if relevant to the project layout. Do not modify base sheet to change or obscure content.

Trees and plants must be properly inventoried in order to create a successful Plant Protection and Removal Plan. The survey drawing serves as the base for the Plant Protection Plan. The survey base should include the following information in areas where proposed improvements may impact existing trees and plants.

- All existing tree *trunk locations*, with tree trunks scaled proportionately to actual size, for trees with caliper 1½" and greater. Note that caliper size requirements vary by locale.
- Identification of *ground elevation* on upper slope side of each tree trunk.
- All existing tree and plant *crowns* shown to reflect actual drip line, with circular shape, uniquely drawn to reflect actual crown shape, size, and position (Note that tree canopies, especially when in groups, are rarely round, but rather occur as eccentric and irregular shapes).
- For trees that require *special protection*, either because of their size, age, or other special characteristics, include delineation of both the "Critical Root Zone" and "Zone of Rapid Taper" for these trees. Refer to Critical Root Zone description under Best Practices that follow. The Zone of Rapid taper is generally known as the root area with closest proximity to the trunk, where roots taper most rapidly in diameter, often from about eight inches to two inches. This root zone is critical to the health of the tree, and is often most prone to construction impacts.
- All existing trees and plants identified by *caliper*, *height*, or *size* and *species*, indicated on plan adjacent to symbol. Identification of species for each plant to be reflected in English common name at a minimum, and with botanical terms if required in contractual Request for Survey, for example, "12' Caliper Lodge Pole Pine, Pinus contorta sp. Murrayana."
- Caliper and species descriptions may not be necessary for large forested areas generally removed from work areas.
- In some cases, the *health* of individual trees may be important to record on the site survey, especially in cases where potential damage penalties may be based, in part, upon the current condition of the tree. The survey should indicate the general state of health, for example, poor, fair, good, or excellent, and may require collaboration with a certified arborist, horticulturist, or forester who can assist in determining the state of health. Otherwise the landscape architect may need to refer to the *Reference Guide for Plant Appraisal*, 8th Edition, (copyright 1993 by the International Society for Arboriculture) for determining tree health. Stressed trees in poor health, with dead wood, major bark damage, or wilting leaves or lean crowns may need to be removed, even if they are not susceptible to construction impacts.

- *Existing topography* at a 1-foot contour interval or another interval that suits the project needs.
- Other survey requirements as described under *Site Survey/Existing Conditions Plan* within these guidelines.
- **Preliminary limits of scope of work**, as agreed by landscape architect, civil engineer, contractor(s), and owner. Note that limits of work may not coincide with property lines, for example, when areas within the property area have been designated as non-work areas or if other areas of property outside project property limits must be utilized by the contractor. Accurate determination of limits of work requires the investigation of a number of issues that the landscape architect may not have immediate access to, including contractor staging, mobilization, construction access, traffic control, and other construction-related issues. Consequently, the DD limits of work may be revised as they are better informed at the CD phase.
- Consider the impacts of site grading and drainage work, site demolition work, and the contractor's construction management plan, as this work has direct impact on trees.
- **Limits of clearing and/or selective clearing**, as coordinated with collaborating disciplines such as arborist, horticulturist, forester, ecologist, and civil engineer. Note that limits of clearing are defined as those areas outside of which no plant clearing or similar disturbance may take place.

- **Sheet matchlines,** identifying relationship of subject plan sheet to immediately adjoining plan sheets, with label (on the side of the line that you are matching the sheet to) that reads "Matchline—Refer to Sheet L1-*x*." Show consistent, but minimal dimension of work outside matchline, for example, 1" on a full-sized sheet.
- Comprehensive **Site Detail Keynote List**, with references to any typical plant protection or removal details, for example, tree protection fence detail. Note that detail keynote references on the DD Plant Protection and Removal Plan are not usually very extensive, as this plan does not generally include any new construction. There may be a need, however, for specialized plant protection details.
- **Preliminary Plant Protection and Removal Reference Notes** to supplement graphic instruction and General Notes. The DD Plant Protection and Removal Plan may utilize a set of initial Reference Notes that communicate primary, rather than exhaustively annotated intent. While the use of Reference Notes may not be fully developed, the DD Plant Protection and Removal Plan must graphically identify every element to be protected, removed, salvaged, or relocated.

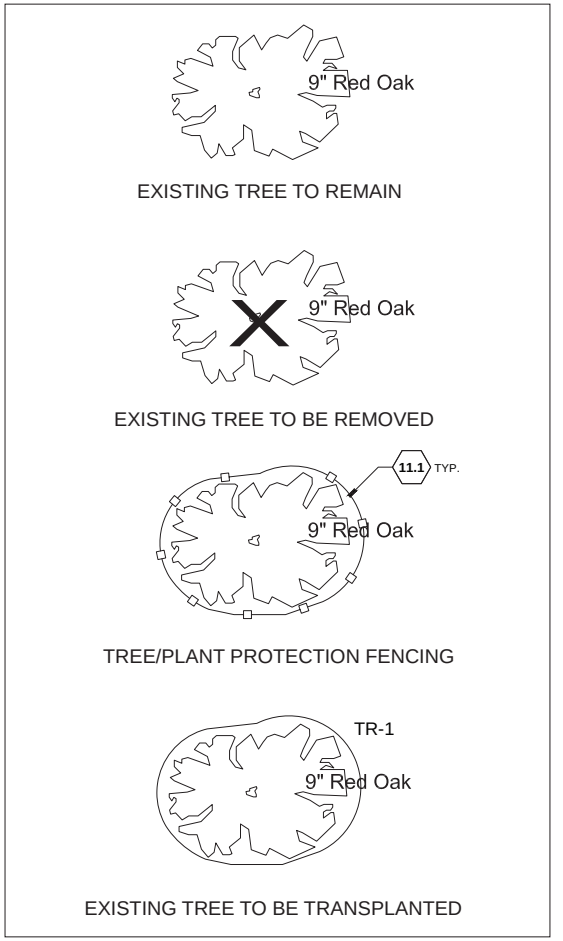
  Examples of plant protection and removal Reference Notes are provided below (see the generic description of Reference Notes in Chapter 9, Key Documentation Practices). Note that these are sample notes and do not represent a comprehensive list. They address likely topics. As such, they should not be used by landscape architects for project applications. The landscape architect should customize Reference Notes to suit individual project needs. The landscape architect should organize Reference Notes by approximating a logical order of tree protection and removal.

Examples of Plant Protection and Removal Reference Notes

1. Limit grading in this area to hand digging, taking care not to disturb roots.
2. Review health of existing tree with city forester prior to initiating removal of existing pavements within drip line.
3. Compaction mitigation may be required within drip line. Coordinate limits with landscape architect and city forester.

- **Graphic definition of individual trees and plants to be protected** and left undisturbed, including survey-recorded size and species, for example, 20"-diameter red oak. Note that size and species references are most important in likely work areas where potential damages can be assessed relative to the tree species, size, and health.
- **Tree and plant massing areas to be protected** and left undisturbed.

SAMPLE TREE AND PLANT PROTECTION AND REMOVAL GRAPHICS



**Note: Sample graphic depicts tree symbol and plant annotation as provided in licensed surveyor's CAD file.*

- **Individual trees and plants to be removed,** including survey recorded-size and species, for example, 20"-diameter red oak.
- **Individual trees and plants to be transplanted**, including survey-recorded size and species, for example, 20"-diameter red oak.
- **Locations of tree and plant protection fences**, and associated Detail Keynote reference.

Special Conditions Requirements

Special Conditions Requirements include detailed plant protection and care practices. These requirements must be derived from careful study by the landscape architect, often in collaboration with arborists, horticulturists or foresters. While the DD Plant Protection and Removal Plan should reflect a comprehensive set of decisions, Special Conditions Requirements may be determined during the CD phase, after final design adjustments are made at the conclusion of the DD phase. See *CD Plant Protection and Removal Plan* below for additional special conditions requirements.

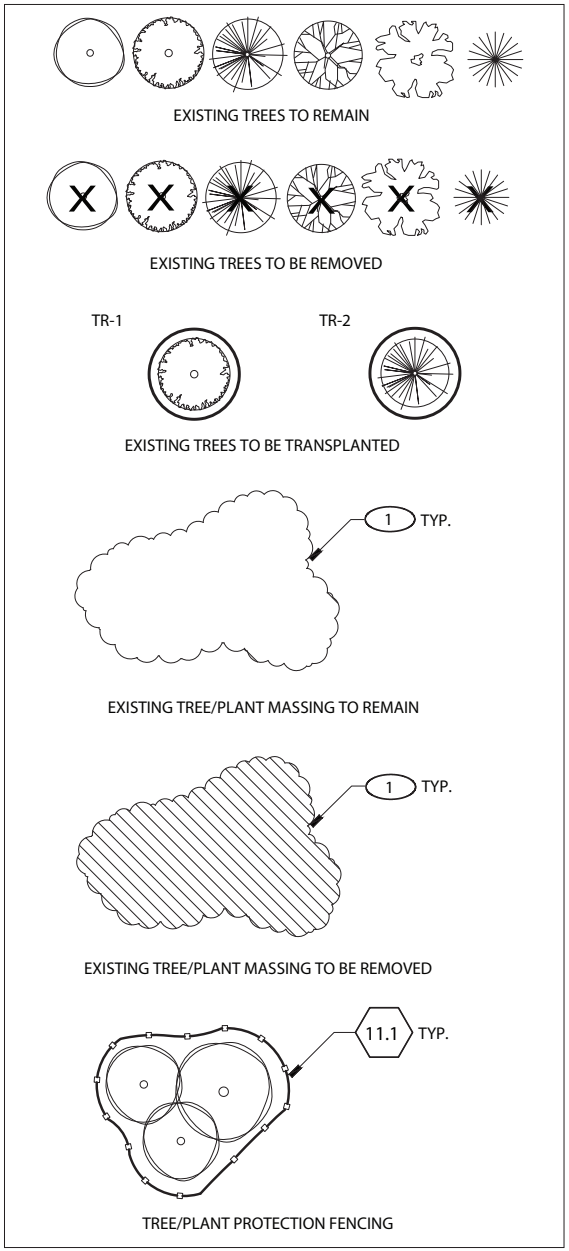
- **Potential Locations for Tree Wells or Tree Islands:** Tree wells should be used judiciously—they can be expensive and complicated, and do not always perform well. Realistic expectations for tree survival will need to be established based upon tree species, soil conditions, drainage, depth of fill, and ability to aerate. If tree wells or islands are used, explicit details should be provided.
- **Individual Trees to Be Boxed:** Boxing offers an alternative to fencing when trees to be saved occur within the construction area and the elevations around the tree may be impacted. A temporary box construction may be built around trees to maintain existing grades in the critical root zone, where grades must be adjusted temporarily and permanently restored as part of the new construction.
- Locations for **temporary irrigation**, if existing system service will be interrupted and is important to the health of existing trees.
- **Lowering or raising the grade** within tree protection areas.
- **Trenching for infrastructure** within tree protection areas.
- **Preliminary branch or root pruning** designations.

Graphic Requirements

- **Survey base sheet**, utilized to show all existing conditions, including above-and below-grade structures, pavements, plants, topography, utilities, restrictions, monuments, benchmarks, or other reference datum. Do not modify base sheet to change or obscure content.
- **Limit of Project Scope of Work Line** represented by equally spaced dashed bold line, with a "Limit of **Project Scope of Work**" note. Use a line width per landscape architect's CAD standards.
- **Plant protection and removal limit line** represented by equally spaced dashed bold line, with "Limit of Plant Protection" note. Limit of protection area may occur within the larger limit of project scope of work area. Consider screening this line to distinguish it from the matchlines that separate sheets.
- **Symbols** overlaid on the unaltered survey, used to represent existing trees and other plants to be protected, removed, or transplanted, shall be as specifically noted below.
- **Trees and plants to be saved and protected**, designated without any additional graphic overlay to surveyed tree trunk symbol. Maintain a graphically unaltered survey tree symbol to indicate that the tree is to remain.
- **Tree and plant protection areas**, indicated with a reference note as necessary. Sample note may read "Tree Protection Area—No Entry. Do not Disturb. Protect in Place." Note that in some circumstances contractor(s) entry may be necessary, for example, to complete fine grading, trenching or landscape cleanup.
- **Native landscape to remain**, including tree massings, large shrub, plants, turf, designated with a boundary line, and keynote symbols indicating intentions. Indicate natural or other existing landscape areas to be protected with a numerical reference note. A sample note might read "All trees and plants protected by a tree and plant fence shall be considered a landscape protection area and should not be disturbed unless otherwise indicated."

  "Native Landscape Areas" may be referred to as "Landscape Protection Areas" and are also protected with tree and plant fencing.
- **Tree and plant protection fence**, delineated with a specialty line as shown on example plan. Label the symbol with Detail Keynote referencing the construction detail and specification section for this fence.
- **Selective clearing landscape area**, designated with a tone or other hatch pattern over existing landscape areas (e.g. turf, native grasses, etc.) to be removed. Include numerical reference note indicating selective clearing intent. Designate areas of selective clearing with a boundary line symbol as shown. If a fence or protective edge of any sort is required, include a detail keynote indicating the detail reference.
- **Trees (and plants) to be transplanted**, designated with a bold line weight circle and "TR" annotation. Each tree to be transplanted should be identified with a number, for example, TR1, TR2. Tree size and species should be identified so that contractor may establish a fee, for example, 20"-diameter red oak. If these trees will be planted as part of the proposed design, they should be identified on the Planting Plan

MINIMUM GRAPHIC REQUIREMENTS FOR PLANT PROTECTION AND REMOVAL PLANS



**Note: Sample existing tree and/or plant massing symbol graphics as provided by licensed surveyor or CAD file.*

and associated Plant List, with the same references noted on the Tree Protection Plan, for example, TR1, TR2. A Tree Transplant Chart should be developed and shown on the General Information Sheet. The chart itemizes numerically referenced trees as noted earlier, together with the tree species and caliper. Note that Planting Plans will define the transplanted location of these trees, with the Plant List identifying these trees with numerical references as used on the Tree Transplant chart.

- **Individual trees (and plants) to be removed**, designated with a bold "X" at the surveyed tree trunk symbol, if the tree trunk is included in the survey. Include an "X" on the center of the tree symbol if the trunk is not provided on the survey.
- **Tree massing to be removed**, designated with crosshatching symbol. Include a numerical Reference Note indicating intent to remove and dispose.
- **Line-weight hierarchy**, rigorously applied to distinguish plant protection and removal requirements from existing conditions.

  Line-weight hierarchy, from lightest to heaviest:

  1. Screened survey base showing existing conditions, including subgrade conditions.
  2. Graphic patterns and symbols communicating plant protection and removal requirements, for example, protection areas, fencing, and the like.
  3. Keynotes and leader lines.

Best Practices

Design

Carbon Sequestration

As trees grow, they may help mitigate global warming by removing carbon dioxide from the air, storing carbon in the trees and the soil, and releasing oxygen into the atmosphere. Larger, more mature trees absorb more CO_2 than smaller plants because their woody biomass can store more CO_2. While the specific effectiveness of different types of trees in sequestering carbon is under study, the landscape architect's role in using trees for this purpose is critical. That role begins with protecting healthy mature trees on existing sites.

When working on sites with mature trees, the landscape architect could calculate the amount of tree woody biomass lost to development and seek to replace or exceed that biomass with new tree plantings. Note, however, that in a constructed environment, newly planted trees may fall short in fully replacing lost carbon, regardless of the number of new trees planted.

Biomass calculations can be complicated and depend upon detailed criteria such as tree species, softwood versus hardwood, size, form, and branch structure. Rather than attempting detailed calculations or relying upon tree species biomass data resources, the landscape architect should seek simpler means to determine the necessary metrics. For example, existing trees can be grouped and quantified by mature size—small, medium, and large. Small, medium, and large trees lost to development should be replaced by the same number of trees in each category. Ideally, the landscape architect and design team will determine a means of improving the site tree inventory as a "carbon sink," rather than merely maintaining its current condition.

Value and Impacts

Identify high-value trees requiring preservation at the outset of the design process. Incorporate these trees in base plan for studying alternative design proposals.

For commercial projects, trees less than 5" caliper, unless they occur as a grove, may not be worth saving as individual specimens. Extraordinary effort may not be justified to adjust proposed site improvements to preserve these size trees. All trees should be evaluated for their value to the project and the environment.

For other projects, such as residential or public projects on wooded sites, smaller-caliper trees may certainly be worth preserving. On all projects jurisdictional requirements should be addressed, as some jurisdictions may require full caliper tree replacement for trees above a defined caliper size.

Conduct focused quality-control review with an eye to how proposed improvements impact existing trees. For example, should proposed sidewalks or pavements be raised, lowered, narrowed, curved, or relocated to prevent damage to trees? Or, potentially less evident, will new site drainage patterns adversely affect existing trees and plants?

Planting Design

New (proposed) plantings in existing tree root zones can damage existing trees as much as newly constructed pavements. The landscape architect should minimize these plantings beneath mature tree drip zones, especially the planting of trees and shrubs. Planting Plans should be documented on survey base plan illustrating drip lines of existing trees, as noted previously.

Coordination

Field Verification

Verify base information prior to development of the Plant Protection and Removal Plan, with a detailed site visit. Confirm all surface features, including existing vegetation. Measure key relationships, for example, distances between buildings to remain. Place emphasis on conditions upon which the proposed design is based. Also, review surveyed depiction of existing trees, confirming approximate size, location, and health. Healthy trees and plants are most worthy of preservation, and vegetation in poor condition may need to be selectively removed.

Plant protection and removal is best prepared by a group of professionals with similar objectives but diverse backgrounds, and would benefit from the contributions of the following individuals: landscape architect, arborist, civil engineer, property manager, city officials, and contractors. Conflicts may arise between design, construction and tree preservation. These conflicts are best resolved by a group of professionals interested in the best project outcome.

Associated Documents

Coordinate the Plant Protection and Removal Plan with the Site Demolition Plan, if utilized. General Demolition Notes and/or General Plant Protection Notes may include specific interdrawing references. When a Site Demolition Plan and Plant Protection and Removal Plan are both utilized, the Site Demolition Plan should show only all existing trees to remain. It is not necessary to show trees to be removed on the Site Demolition Plan, as these trees would have been removed previously by others. Identify pavements to be removed that will require special care around tree roots on the Site Demolition Plan and on the Plant Protection and Removal Plan for reference.

Avoid combining the Plant Protection and Removal Plan and Site Demolition Plan, unless project requirements are very simple.

Coordinate plant protection intentions with grading design. Grading impacts to trees may be more significant than other construction proximities.

Organization of work sequencing will be critical to the health of existing trees. These work elements include project mobilization, plant protection, sedimentation and erosion control, demolition, grading, site construction, and planting.

Technical

Plant Protection

Grading impacts to trees and plants are often the key factor in their survival. Carefully consider elevation changes around trees and plants. Measure impacts by depth of cut and fill. Avoid any cutting of roots beneath the tree crown (drip line) or critical root zone. Some suggest that the critical root zone coincides with the drip line, while others suggest that it is a larger area, for example, an area "represented by a concentric circle centering on the tree's

trunk with a radius equal in feet to one and one-half times the number of inches of the trunk diameter."

While tree species vary in their tolerance of fill, a general rule suggests avoiding filling more than several inches in area beneath the tree drip line or within the critical root zone. In some cases, greater fill depth can be selectively completed, in areas up to 30 to 50 percent of the root zone, if completed properly.

Note that the loss of trees on a site may result in destabilized soils and erosion. Remedial actions may be necessary to address that impact. Trees and plants may also play a role in stormwater management by helping to intercept rainfall and facilitate groundwater infiltration.

Some horticulturists recommend locating tree protection fence at a distance of twice the drip line distance from the trunk. Other factors may influence the distance and location of the fence. At a minimum, locate the fencing at or beyond the drip line. The tree survey may not accurately depict the drip line (crown) location. A contractor site visit may be necessary to do so. Such intentions can be communicated in Plant Protection and Removal Plan General Notes.

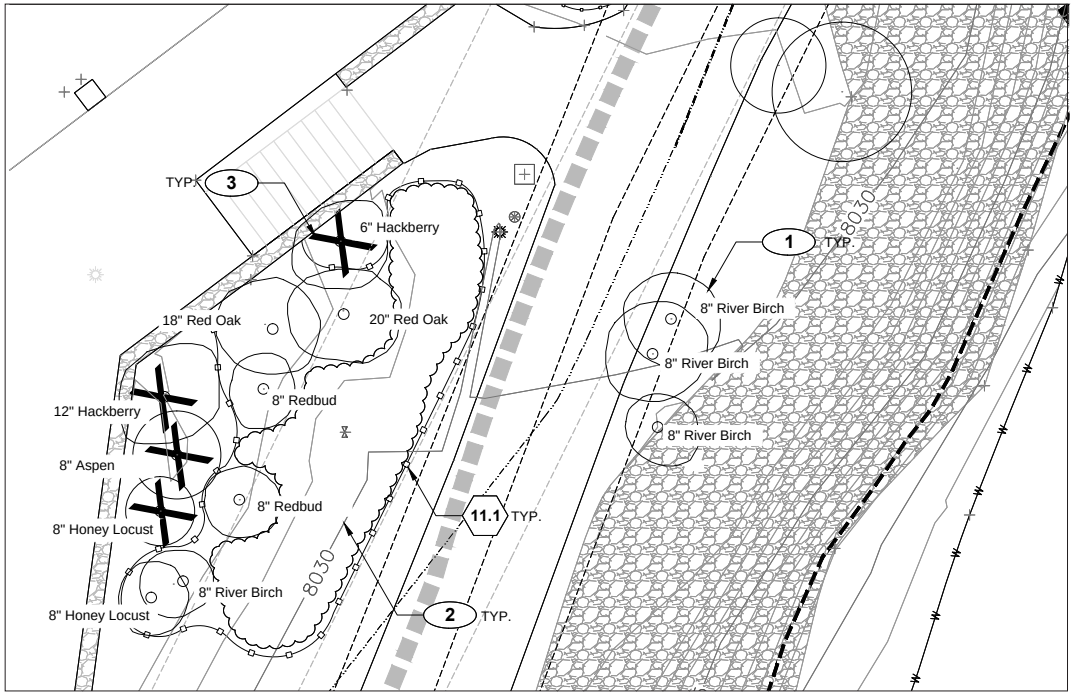
All trees and plants should be evaluated for their value to the project and the environment. In some cases the landscape architect may conclude that small caliper individual trees may need to be removed in order to allow the benefits of proposed improvements. Extraordinary effort may not be justified to adjust proposed site improvements to preserve small individual trees.

Strategies

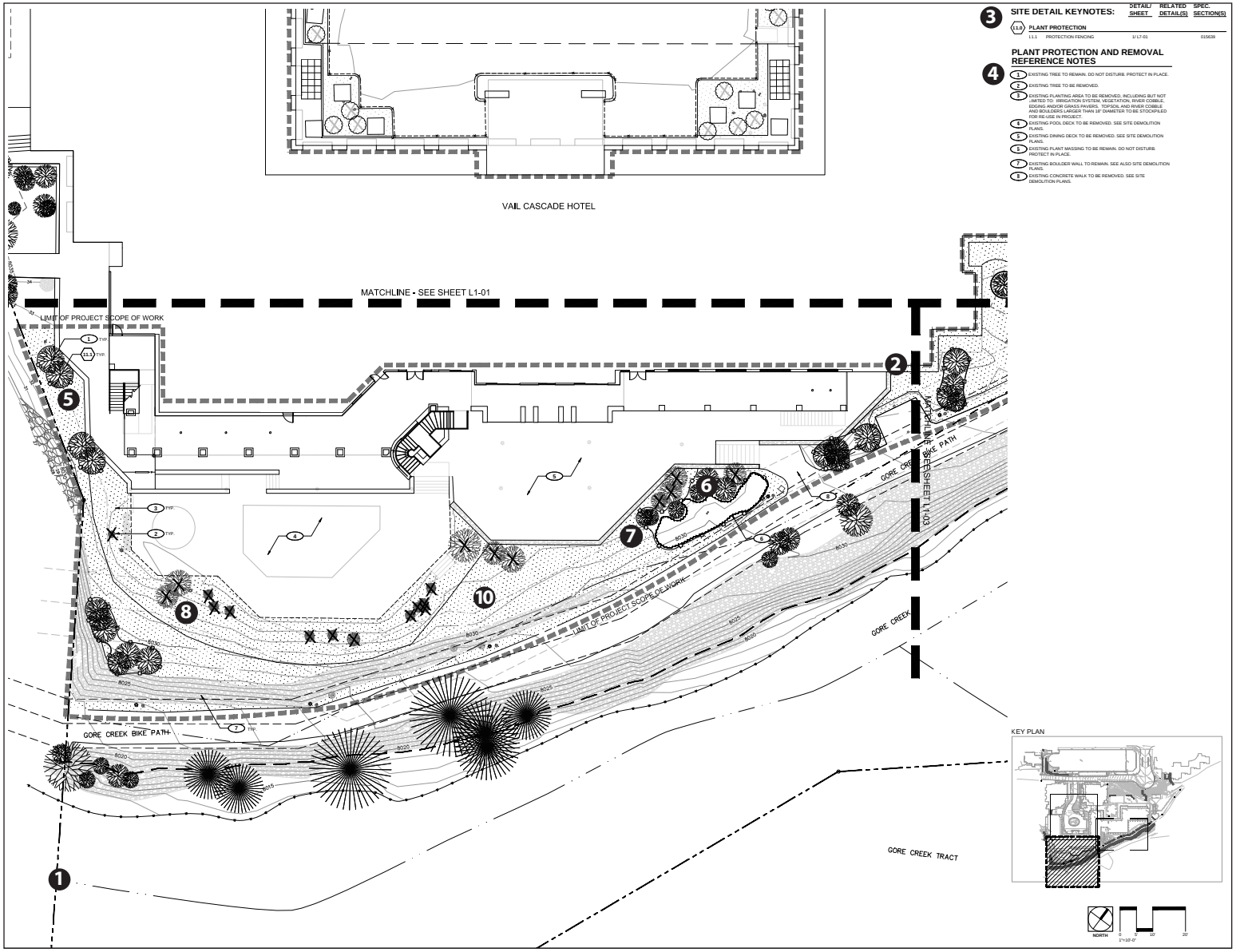
Survey Discipline

Always, with few exceptions, prepare this plan on the original unaltered survey. The survey may need to be screened, depending upon quality of the drawing, extent of plant protection work, or need to clarify and focus proposed work requirements. The survey drawing will be fully prepared by a registered surveyor, with a diverse collection of symbols. The landscape architect should utilize simple overlay symbols to define plant protection requirements. These symbols should be carefully considered to avoid confusion with original survey content. The landscape architect should not redraft existing plant symbols.

Sample Graphic Depiction of Preferred Approach of Plant Protection and Removal



Example of DD Plant Protection and Removal Plan



LEGEND

SERIES REQUIREMENTS

1. Survey Base Sheet
2. Limits of Work (if able to define) or Limit of Project Scope of Work Line
3. Site Detail Keynote List
4. Preliminary Site Reference Notes (for example purposes only, should be project specific)

SERIES REQUIREMENTS

5. Individual Trees and Plants to Be Protected

   Tree and Plant Massing Areas to Be Protected
7. Tree Protection Fences
8. Individual Trees and Shrubs That Are to Be Removed
9. Tree and Plant Massing Areas to Be Removed
10. Selective Clearing of Landscape or Planting Areas
11. Individual Trees (Plants) to Be Transplanted

*Note: This sample depicts only the drawing area for this sheet. For title block requirements refer to preceding Title Block section.

CONSTRUCTION DOCUMENTATION PLANT PROTECTION AND REMOVAL PLAN

Objective

The CD Plant Protection and Removal Plan explicitly itemizes the detailed contractual requirements for removal, protection, transplanting, and care of existing trees, shrubs or other existing plants designated because of their inherent value.

General Requirements

Verify that all possible measures have been considered to protect existing plants, including the configuration and extent of the proposed design.

Finalize and confirm a fully developed set of graphic symbols, Site Detail Keynotes, and Reference Site Notes to indicate contractual requirements. Include supporting decisions and plant protection methods such as protection fencing, transplanting, boxing and tree wells, compaction mitigation, root aeration zones, root and branch pruning, allowable disturbance within tree and plant protection zones, construction access control, and damage penalties.

Complete final and exhaustive interdisciplinary coordination and quality control review.

Specific Requirements

The requirements below represent any distinct improvements to the Design Development Plant Protection and Removal Plan, and are defined to complement those DD requirements, as defined earlier. Refer to these requirements in order to review and confirm the overall completeness of the CD sheet.

Core Requirements

Core requirements include those elements that are typically necessary on all Plant Protection and Removal Plans.

Final **limits of Project Scope of Work Line or Limit of Work Line** (if determined), as agreed on by the landscape architect, civil engineer, contractor(s), and owner.

Special Conditions Requirements

Special conditions requirements include detailed plant protection and care practices. These requirements must be derived from careful study by the landscape architect, often in collaboration with arborists or horticulturists.

- **Confirmed locations for tree wells or tree islands**, where grading operations require that protective walls be constructed to maintain existing grade within drip lines. Tree wells are used where grades around existing trees need to be raised, and tree islands refer to situations where grades around existing trees need to be cut.
- **Areas requiring compaction mitigation**, for example, areas where construction activity may unavoidably occur. Define or specify compaction reduction strategy. For example, 6–12" deep mulch will help to distribute the weight of construction equipment.
- **Pavements to be removed** that will require special care around tree roots, coordinated with the Site Demolition Plan. Note that the identification of pavements to be removed on both the Site Demolition Plan and the Plant Protection and Removal Plan represents an uncommon need to identify similar requirements in two locations within the documents. In this case, the demolition contractor may need to work with plant protection specialists to complete the demolition while providing necessary root care.
- **Locations of potential tree root pruning:** Determine and minimize anticipated pruning depth as required by construction excavation.
- **Trees potentially requiring construction branch pruning:** If these are not identified, the contractor will be required to prune any branches that interfere with construction, at the direction of the landscape architect. Note that the contractor shall make such determinations as per the direction and/or coordination with the landscape architect.
- Normally, the contractor will be required by contract to make specific determinations of **trees potentially requiring guying** during construction, based upon performance specifications that require guying under certain conditions. The landscape architect, however, may highlight unique cases where guying is likely, in order to establish a bid cost for the work.
- **Areas requiring aeration**, beneath tree crowns. These are usually areas that are compacted as a result of pavement conditions. Aeration is not a very common practice and consequently must be clearly identified as a contractual requirement.
- **Locations for vegetation protection signage**, when identification of critical protection areas is important to highlight. Otherwise, specification should designate spacing interval of protection signage.

Unique Construction Management Issues

The several issues identified below are generally the responsibility of the general contractor and may not be identified by the landscape architect on Construction Documents. However, these issues are important and should be resolved prior to construction. The landscape architect may not have adequate information to make proper recommendations regarding contractor means and methods. In addition, there may be liability implications associated with these determinations.

- **Acceptable location(s) for topsoil storage**, located in a flat, well-drained area, separated from potentially contaminating construction activities, and accessible by front-end loaders for site distribution. Topsoil may be stored on site for months, if not years, and will need to be protected from washout or contamination.
- **Acceptable location(s) for stockpiling project construction materials**, away from plant protection areas. If shown by others, coordinate the location and reference in a general note. Note that, in most cases, the landscape architect will not be required to make this decision and should only do so in cases where sensitive plant zones or other limitations suggest limited suitable areas for stockpiling.
- **Site construction access route**, evaluated to determine relationships and potential impacts to tree protection areas. Note that the site construction access route is not the responsibility of the landscape architect, and it is generally not defined within the Construction Documents. If, however, particular site concerns or challenges exist, the landscape architect may need to coordinate the access route with contractors. Construction staging and contractor parking should be given the same level of attention, especially as these elements may impact existing plants.

Graphic Requirements

- **Vegetation protection signage**, with locations designated with symbol as defined on landscape architect's standard CAD standards, together with Keynote indicating detail reference.
- **Trees to be boxed**, designated with a rectangle around existing tree as defined on landscape architect's standard CAD standards, at the surveyed tree trunk symbol.
- Areas requiring **compaction mitigation**, defined with symbol as defined on landscape architect's standard CAD standards, together with a reference note indicating intent.
- Areas beneath tree crowns requiring **aeration**, designated with symbol as defined on landscape architect's standard CAD standards, together with a reference note indicating intent.
- Locations of potential **tree root pruning**, indicated with symbol as defined on landscape architect's standard CAD standards, together with a reference note indicating intent. A linear symbol should be used, designating the precise location of the intended cut. The location should be dimensioned from the tree trunk(s).
- Acceptable locations for **topsoil stockpiling**, designated with outline symbol as defined on landscape architect's standard CAD standards, together with a reference note indicating intent.
- **Plan symbols** described above to match size and line weights of shown on legend.

Best Practices

Coordination

Field Verification

Field locate (flag or stake) proposed buildings, foundations, footings and other structural elements, and hardscape improvements to evaluate impacts and potential solutions where adverse impacts are observed.

Associated Documents

Review civil utility plans to determine if any proposed utility lines will traverse designated plant protection areas, especially those areas within critical root zones. Adjustments may need to be made to utility layouts. In some cases, where proposed utilities must occur within plant protection areas, but do not cross critical root zones, a requirement for hand excavated utility trenches may be included. In more sensitive areas, requirements for air spading may be necessary.

These requirements and references to required plant protection measures must be included in all specification sections where work may impact plants. These include but are not limited to mechanical, irrigation, lighting and electrical, paving, earthwork, and demolition sections.

Review and confirm specified damage penalties for loss or damage to plants not scheduled for removal. Consider modifying damage penalties to suit project needs, that is, more severe penalties for special or prized trees. Refer to *Reference Guide for Plant Appraisal*, latest edition, copyright 1993 by the International Society for Arboriculture. Coordinate these issues with Plant Protection specifications.

Strategies

On-Site Reviews

Prior to completion of final Plant Protection and Removal Plan, and on projects where plant preservation is a critical success factor, walk the entire site with the client, and if one has been retained, an arborist, to review detailed tree protection intentions. Make adjustments to the site plan and Grading Plan to save additional trees and plants, or adjust the Plant Protection and Removal Plan as necessary.

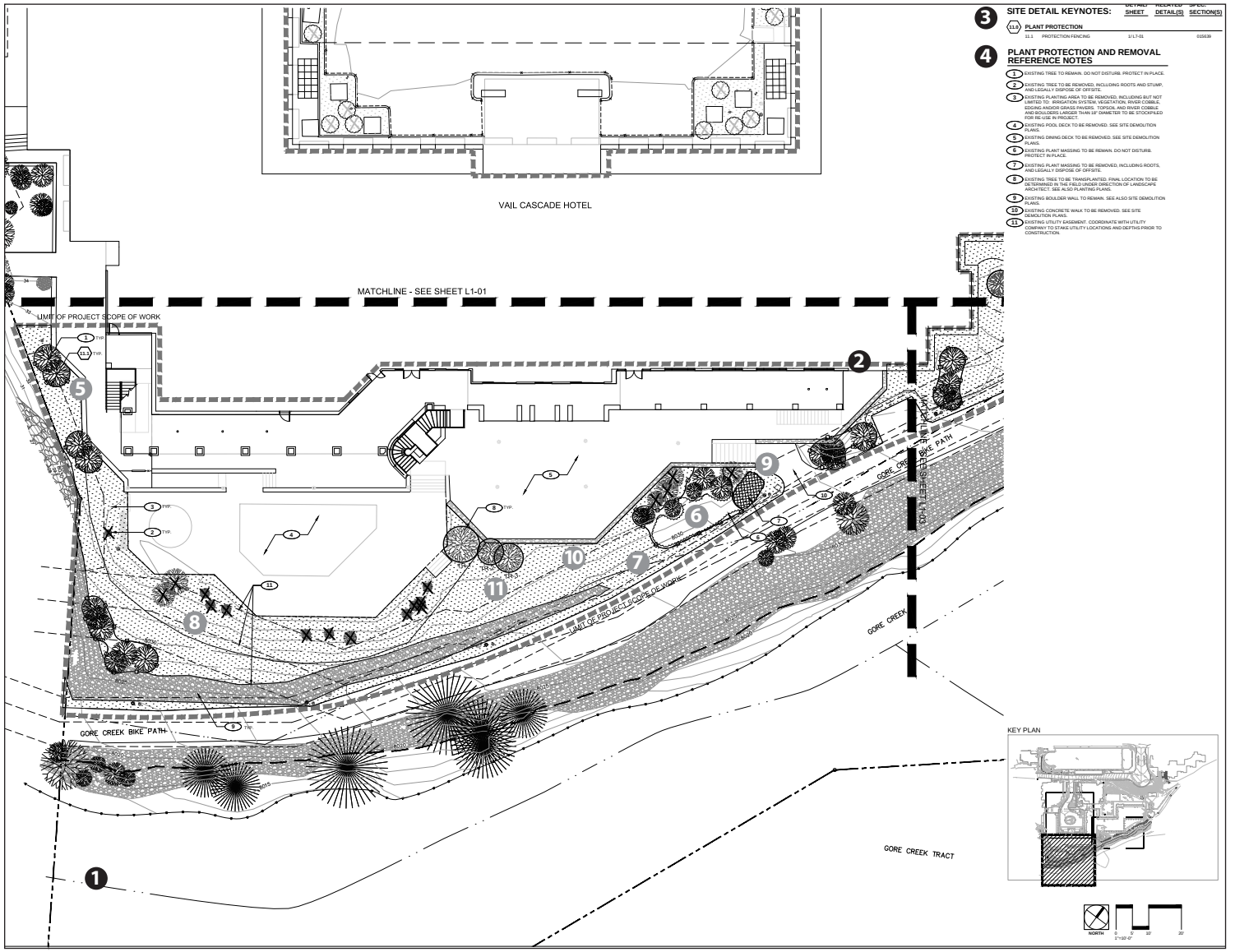
Prior to actual construction, conduct another walk of the site with the contractor and, if possible, an arborist, identifying and tagging trees to be removed. Identify any trees not noted properly on the Plant Protection and Removal Plan, and revise the plan as necessary.

The contractor may assume that any unmarked trees should remain on the site and that he is not contracted to remove and haul them away. In a large area designated for clearing, however, some individual trees and plants may not be graphically identified for removal. The landscape architect should consider the use of a general note to clarify this issue, defining requirements for undesignated trees and plants in an area designated for removal. That may require an on-site clarification and plant-tagging process.

Construction Period Watering

Supplemental watering for existing trees and plants may be important in the event of a nonoperational irrigation system and construction-related stresses. Watering during and after construction may be the most important factor in preserving the health of existing trees. Include a general note and/or specification to require supplemental watering.

Example of a CD Plant Protection and Removal Plan



LEGEND

SERIES REQUIREMENTS

1. Survey Base Sheet
2. Limits of Work (if able to define) or Limit of Project Scope of Work Line
3. Site Detail Keynote List
4. Site Reference Notes (for example purposes only, should be project specific)

SERIES REQUIREMENTS

5. Individual Trees and Plants to Be Protected
6. Tree and Plant Massing Areas to Be Protected
7. Tree Protection Fences
8. Individual Trees and Shrubs That Are to Be Removed
9. Tree and Plant Massing Areas to Be Removed
10. Selective Clearing of Landscape or Planting Areas
11. Individual Trees (Plants) to Be Transplanted

Boldface items represent key distinctions between Construction Documentation documents and Design Development documents.

There are no significant distinctions between DD and CD drawings.

*Note: This sample depicts only the drawing area for this sheet. For title block requirements refer to preceding Title Block section.

DESIGN DEVELOPMENT SITE DEMOLITION PLAN

Objective

The Design Development Site Demolition Plan identifies primary decisions regarding the treatment of existing conditions, for review and coordination with the Client and collaborators prior to beginning Construction Documentation.

General Requirements

The DD Site Demolition Plan reflects the landscape architect's intimate and comprehensive understanding of existing conditions, in terms of both their inherent value and the relationship of those conditions to the proposed design.

The DD plan clearly identifies items to be protected, removed and disposed of, recycled, relocated, or salvaged based upon current design intentions. If items are salvaged for the owner, plans may indicate where and how they are to be stored until reused on site. Note that the Site Demolition Plan includes all hardscape-related items and the Plant Protection and Removal Plans include all vegetation-related items. Protection and Control Plans are sometimes used in the industry to comprehensively define plant, site, environmental, and/or building areas to be protected and/or access and circulation and sedimentation control requirements. If the project warrants, Protection and Control Plans can be included, with Site Demolition Plans including only items to be removed.

Key Distinctions between DD and CD Site Demolition Plans

The landscape architect should be strategic in making content decisions for the Design Development documents. These guidelines suggest individual strategies for each of the DD sheets, subject to the unique role of that sheet in the design and documentation process.

Primary relationships between the DD and CD Site Demolition Plans are summarized:

1. The DD Site Demolition Plan approximates the CD Demolition Plan in terms of content. All decisions regarding the disposition of existing conditions should be made. Supporting information such as dimensions to utility disconnects, sequencing schedule, and exhaustively detailed instructions may be completed during Construction Documentation. Therefore, a fully developed system of CD-level graphic symbols should be utilized.

2. Preliminary interdisciplinary coordination and a quality control review of the DD Site Demolition Plan should be completed, with a final and more exhaustive review completed at the CD phase. Preliminary DD-level coordination focuses on making basic decisions concerning the demolition program. Final, CD-level coordination focuses on the well-resolved documentation of these decisions.

3. Initial DD-level quality management review should focus on the soundness of demolition decisions and the primary means to communicate those decisions. Final quality management editing may be completed during Construction Documentation to reduce the likelihood of conflicting, unclear or missing directives.

4. The DD Site Demolition Plan should include a preliminary set of Reference Notes. Importantly, Reference Notes define specific demolition requirements. A fully developed set of Reference Notes will be completed during the CD phase. These detailed instructional Keynotes include requirements such as precise locations of saw cutting and utility capping. These notes provide additional instructions or clarification of requirements to bidding contractors.

Specific Requirements

- **Survey base sheet** to show all existing conditions to remain, including above-and below-grade structures, pavements, plants, topography, utilities, boring locations, monuments, benchmarks, or other reference datum, and all legal conditions and restrictions such as property line bearings and distances, recorded easements, zoning setbacks, deed restrictions, adjacent property owners, and zoning districts if relevant to the project layout. Do not modify base sheet to change or obscure content.
- **Preliminary limits of Project Scope of Work Line,** as agreed by landscape architect, civil engineer, contractor(s) (if applicable), and owner. Note that limits of work may not coincide with property lines, for example, when areas within the property area have been designated as non-work areas. Accurate determination of limits of work requires the investigation of a number of issues that the landscape architect may not have immediate access to, including contractor staging, mobilization, construction access, traffic control, and other construction-related issues. Consequently, the DD limits of work may be revised as they are better informed at the CD phase.

- **Preliminary limits of demolition,** as coordinated with collaborating disciplines such as civil engineer and architect. Note that limits of demolition are defined as those areas outside of which no demolition disturbance may take place.
- **Sheet matchlines,** identifying the relationship of the subject plan sheet to the immediately adjoining plan sheets, with a label on the side of the line you are matching your sheet to that reads "Matchline—Refer to Sheet L2-x." Show consistent, but minimal dimension of work outside matchline, for example, 1" on a full-sized sheet.
- **Preliminary Site Demolition Reference Notes** to supplement graphic instruction and General Notes. The DD Site Demolition Plan may utilize a set of initial Reference Notes that communicate primary, rather than exhaustively annotated intent. While the use of Reference Notes may not be fully developed, the DD Site Demolition Plan must graphically identify every element to be protected, removed, salvaged, or relocated.

  Reference Notes may reference typical demolition details if necessary. Note, however, that Reference Notes are not typically used for this purpose, as Detail Keynotes serve this purpose.

Examples of site demolition Reference Notes are provided below (see the generic description of Reference Notes in Chapter 9, Key Documentation Practices). Note that these are only sample notes and do not represent a comprehensive list. They address likely topics. As such, they should not be copied by landscape architects for project applications. The landscape architect should customize Reference Notes to suit individual project needs. The landscape architect should organize Reference Notes to follow a logical order of site demolition construction activities.

Examples of Site Demolition Reference Notes

1. Remove and dispose of designated pavement in its entirety, including sub-bases.
2. Saw cut pavement at joint nearest to proposed improvements.
3. Remove and stockpile pavers for reuse in project. Dispose of broken pavers. Sub-base shall be removed.
4. Protect existing pavement(s) during construction. Pavement to be maintained and integrated with new construction.
5. Existing element (project specific—landscape architect to identify element) to be carefully removed and salvaged for reuse in project. Reference Materials Plan for new location. (Note that the landscape architect may also utilize graphic references such as salvage charts to organize and reference elements to be salvaged and relocated.)

- **Site Detail Keynote References,** with references to any typical demolition details, for example, over-structure partial demolition detail. Note that Detail Keynote references on the DD Site Demolition Plan are not typically extensive, as this plan does not generally include any new construction. There may be a need, however, for site demolition details.
- **Graphic definition** of all structures, pavements, utilities, and other items to be protected, demolished and removed, recycled, salvaged, or relocated, as per graphic requirements below.
- **Access to buildings** on the project site that are to remain operational during construction, and identification of any components or systems to remain operational, for example, access driveways to subgrade parking, emergency access routes or ventilation structures.
- **Existing utilities to remain** that are to be kept in service, identified, and/or coordinated with the civil engineer.
- Preliminary graphic locations of disconnection and sealing of each **utility service to be removed**, and/or coordinated with civil engineer. Dimensioning of these locations to be defined at the Construction Documentation phase.
- Intentions concerning **rock outcroppings** or boulders found on site should be identified.

Graphic Requirements

- **Survey base sheet**, utilized to show all existing conditions, including above-and below-grade structures, pavements, plants, topography, utilities, restrictions, monuments, benchmarks, or other reference datum. Do not modify base sheet to change or obscure content.

  Existing conditions, if desired may be graphically screened to maximum 50 percent as original unaltered survey, in order to better highlight demolition requirements. The landscape architect may also elect to incorporate existing conditions at full value, if that better serves graphic objectives.
- **Limit of Project Scope of work line** represented by equally spaced dashed bold line, with "Limit of Project Scope of Work" note. Consider screening this line to distinguish it from the matchlines that separate sheets.
- **Limit of site demolition line** represented by equally spaced dashed bold line, with "Limit of Site Demolition" note. Limit of site demolition area may occur within the larger limit of work area. Consider screening this line to distinguish from matchlines that separate sheets.

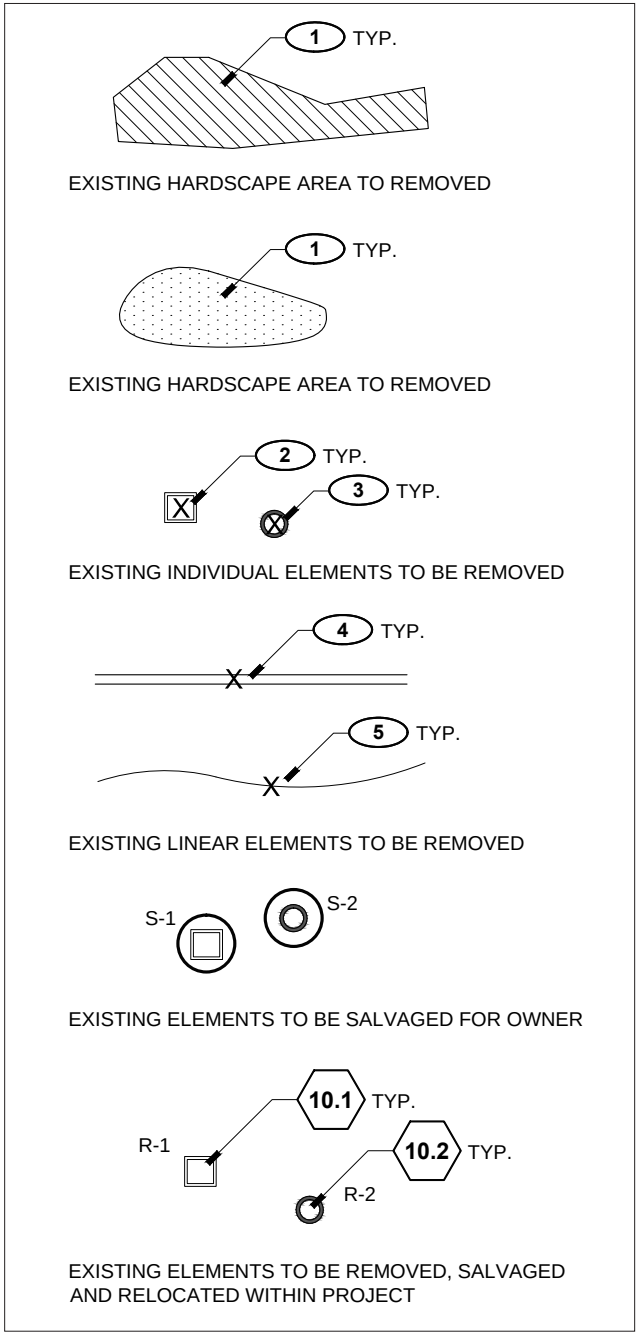
- **Symbols** overlaid on the unaltered survey, used to represent existing conditions to be protected, removed or salvaged, shall be as specifically noted below.
- **Line-weight hierarchy**, rigorously applied to distinguish demolition requirements from existing conditions.

  Line-weight hierarchy from lightest to heaviest:

  1. Screened survey base showing existing conditions, including subgrade conditions.
  2. Graphic patterns and symbols communicating demolition requirements, for example, removal or salvaging.
  3. Keynotes and leader lines.
- Existing **components to remain** in an area, in their entirety, represented without graphic symbol overlay and Reference Note(s) if desired for reinforcement, to indicate their protection.
- Existing **components to be removed and disposed** in an area, in their entirety, overlaid with diagonal crosshatching and with Reference Note(s) if desired for reinforcement, to indicate removal and disposal. All existing conditions screened back per landscape architect's CAD standards as original unaltered survey.
- Individual **pavement area(s) to be removed**, for example, sidewalk, represented with diagonal crosshatch, and Reference Note(s) if desired for reinforcement, indicating removal and disposal. Depending upon the complexity of the project, different hatch symbols may be required to differentiate existing systems to be removed.
- Individual **components to be removed and disposed**, for example, flagpole, overlaid with an "X," centered on the component.
- Individual **components to be removed and recycled**, for example, steel bollards, overlaid with an "X" centered on the component, and text "RC" to indicate recycled.
- **Linear systems to be removed and disposed of**, for example, a pipe, marked with "X" at regular intervals, and reference note(s) to indicate removal and disposal.
- Individual **components to be removed and salvaged** for the owner's keeping, represented with a circle centered on the component, and the letter "S" a numeric suffix*, for example, "S1." Incorporate the reference number in a chart included on the General Information Sheet, with the chart titled "Elements to be Salvaged from Site for Owner's Use." Include Reference Notes and item descriptions.
- **Individual components to be removed and relocated**, represented with a square symbol surrounding the component to be removed, and the letter "R" with a numeric suffix, for example, "R1." The reference number should be positioned adjoining the square. Incorporate the reference number in a chart included on the General Information Sheet, the chart to be titled "Existing Elements to be Relocated On-Site" and include reference keys and item descriptions. Items to be relocated should be clearly depicted on the Site Materials Plan with associated reference symbols. Note that a reference to a site construction detail keynote may be included on the chart to define new installation requirements.
- **Subgrade Components** to be removed, salvaged, or protected shown dashed and marked as noted previously.

*Note that most projects will not likely require a large and complex set of salvaging operations. Consequently, use of a numbering and chart system is not often necessary. If however, the owner would like to itemize salvaged items to protect his or her interests, then this system should be used.

SAMPLE GRAPHICS



Best Practices

Design

Understanding Site Assets and Liabilities

Verify the survey base information with a detailed site visit. Confirm all surface features, including existing vegetation. Measure key relationships, for example, distances between buildings to remain and improvements to be removed. Place emphasis on conditions upon which the proposed design is based.

Record pre-demolition existing conditions with photographs and a well-annotated survey plan. That will allow the design team to make informed site demolition decisions from the design office when site access is not readily available. Whenever possible, obtain utility location, depth, and dimensional information, as well as subgrade as-built architectural information, particularly for complex urban and redevelopment projects. For true renovation projects, the fit of proposed conditions to existing conditions can be important to the final visual quality of the project. Establish detailed drawings to illustrate the relationship between existing conditions and proposed systems.

Identify cultural, archaeological, or other artifacts of potential value to the community prior to the development of a site demolition strategy. Incorporate any preservation or salvaging requirements.

Sustainable Practices

Where possible, reuse existing materials found on site for new construction and specify the use of either recycled materials/products or materials/products that contain recycled on-site materials. While large amounts of waste are generated during the demolition and construction process, the industry is improving recycling rates. That progress comes with growth in recyclable goods markets and improvements in sorting materials at off-site facilities into reusable products.[6]

Where existing conditions present environmental or community benefit, minimize impacts to these conditions in order to safeguard their value. For example, even a marker or plaque identifying the site's history or other important attributes may be important to preserve or salvage for reuse. Or, on a site with a creek or stream, the removal of infrastructure such as small check dams, erosion, or flood control may need to be evaluated for short- and longer-term environmental impacts.

[6] "Code Of Best Practice for Waste Processing in The Construction and Demolition Industries." Waste Management Association of Australia. www.wmaa.asn.au/uploads/documents/Construction and Demolition Best Practice Guidelines.pdf.

Consider the possibility that the property owner or developer prepare a Waste Management Plan, as part of the design and Construction Documentation effort. The Waste Management Plan will establish detailed strategies to maximize the reuse and recycling of existing site materials, and establish environmental controls to guide the demolition process. The Waste Management Plan may be incorporated into the Contract Documents and establish various requirements for both the general and subcontractors. For example, on-site material sorting processes and associated bins or stockpile areas will be established, and all subcontractors will be required to follow these protocols. Monitoring and tracking (recording) of these recycling efforts may be necessary in order to validate the contract between the owner and the general contractor, and/or to validate LEED compliance.

Work in environmentally sensitive areas requires special attention to existing conditions and associated demolition work. These areas include coastal areas, wetlands and varied ecosystem habitats. These sites may include both natural and man-made features which will need to be retained. In some jurisdictions, formal agreements may need to be made between the authority or agency and developer to define what elements require protection and which may be removed. These decisions are often part of a community-based process, whereby the community or interest groups help to define community assets.

Some demolition work in environmentally sensitive areas may require specialized consultants such as biologists, habitat experts, or even archeologists.

Coordination

Plant Protection

Plant protection measures must be completely in place prior to any demolition work. A number of plant protection documentation practices have been recommended to ensure that this requirement is met. While these guidelines do not include recommendations for specifications, it is important to establish cross-referencing requirements between the Site Demolition Plan, Plant Protection Plan, and specifications such as planting, soils, and hardscape sections.

Coordinate the Site Demolition Plan with the Plant Protection and Removal Plan, and/or the Protection and Control Plan, if utilized. Cross-reference these plans in the General Notes if applicable. When the Site Demolition Plan and the Plant Protection and Removal Plan are both utilized, the Site Demolition Plan should graphically show all existing trees and/or elements to remain.

If plant protection is required, this depiction should be included on the Plant Protection and Removal Plans, rather than the Site Demolition Plan, as these requirements should be established prior to demolition work. Note that in some cases the landscape architect may choose to develop a Protection and Site Control Plan. The Protection and Control Plan may be used to address minimal tree protection needs and significant site control needs. Site control needs may include access to buildings that are to remain operational during construction and other control needs such as erosion control. This plan may also be titled the Plant Protection and Control Plan. This plan is distinguished from the Site Demolition Plan in that the Protection and Control plan is focused on necessary pre-demolition protection and control requirements, and the Site Demolition Plan is focused on removal.

Soils Protection

Soils protection measures must be completely in place prior to any demolition work. Documentation practices are necessary to ensure that this requirement is met, but are not always so clear or effective. Current industry practices are typically defined only within specifications, namely the Earthwork, Site Preparation, Site Clearing, and Earth Moving sections. Plan-based soils protection documentation is not proposed within these guidelines, as soils protection is required in plant protection areas and areas outside limit of work and limit of demolition lines. These areas must be clearly defined on plans, and detailed restrictions must be clearly defined within specifications.

Example of Soil Protection Specification Language

In areas where plants have been designated to be protected or to remain, or in areas outside of construction activity, the contractor shall not disturb existing soils, that is, no grading work shall be performed, no soils shall be removed, and no soils shall be contaminated with foreign substances.

Relationships to Proposed Design

Overlay the Site Demolition Plan with the Site Materials Plan to evaluate and confirm relationships between existing conditions to remain and proposed construction. It is likely that conflicts will be identified at this stage of the process. Do not include proposed improvements on the Site Demolition Plan.

The Site Demolition Plan will likely address existing and proposed utilities. The landscape architect must collaborate with civil engineers to define and document intentions. Overlay the proposed Site Utility Plan with the

Site Demolition Plan to coordinate this interface. Do not include proposed improvements on the Site Demolition Plan.

If applicable, conduct a site walk with the client to review and confirm Design Development Demolition Plan intentions and their relationship to proposed construction.

In conjunction with the specifications, and if necessary for the project, require that general contractor develop and submit a Vehicle Movement Plan that defines safe and environmentally responsible routes for moving construction materials to and from the site.

Technical

Contamination and Hazardous Materials

Upon review of the unaltered survey, the landscape architect shall consult with the owner to determine if hazardous materials, abandoned fuel tanks or other subgrade conditions that may affect construction are present.

If contamination or hazardous conditions are determined to exist, or where existing conditions present adverse or deleterious environmental impacts, establish remediation strategies with specialized consultants. Integrate and coordinate remediation actions with the Site Demolition Plan. For example, contaminated sites may require soil removal or a protective "cap" layer over the contaminated substrate. In some complex circumstances others may prepare this plan. For liability reasons, the landscape architect should consider use of an environmental consultant to lead the technical aspects of this effort.

The landscape architect may recommend that the property owner or developer prepare a Hazardous Materials Report to inventory hazardous materials found in the site, including asbestos, lead, and soil contaminates. The report should include recommendations for removal and remediation. Specialized consultants, licensed to perform this type of work, will likely be necessary. It is important that the landscape architect seek the expertise of these consultants when any evidence of hazardous materials or other forms of contamination exists. Certifications that the work has been completed satisfactorily may be issued by environmental consultants.

Strategies

Always Use a Site Demolition Plan

Existing conditions for undeveloped sites without man-made features such as buildings, roads, or utilities and little associated demolition work will still require a Site Demolition Plan. It is important that bidding contractors precisely understand the site demolition work scope, regardless of the magnitude of the work.

If most of the site is to be demolished, it is tempting for the landscape architect to save time and note "All is to be demolished, only those items noted to remain." That practice is problematic because the bidding contractors will have little basis for establishing an accurate bid. If the detailed nature of the site demolition work scope is left for individual contractors to interpret, a range of interpretations may result in an uneven set of bid submittals. In other cases, it may be tempting for the landscape architect to include a limited number of site demolition notes on other plans such as the Site Grading Plan and/or in the project specifications. This practice is risky because these notes may be overlooked by the contractor(s).

Only one Site Demolition Plan should be developed, led and coordinated by the landscape architect. This plan should comprehensively reflect all site demolition requirements, including civil, architectural, structural, and other components. While the landscape architect should draft the plan, as defined contractually, he should individually define those items that are covered in the landscape architect's contract with the client. He should coordinate the demolition of additional components such as subgrade utilities with applicable consultants. In some cases, the team may determine that project circumstances suggest that the Site Demolition Plan be prepared by another consultant such as the civil engineer.

Avoid Assumptions

The contractor may assume that any unmarked materials or components should remain on the site, and that he is not contracted to remove and haul them. Consider a general note to address this issue. If such a general note is developed, it should be included on the General Information Sheet with the Demolition General Notes and should be carefully coordinated with specification language to avoid redundant or conflicting requirements.

The Unaltered Survey

It is useful to reinforce the importance of always, with few exceptions, preparing this plan on the original unaltered survey. The survey may need to be screened, depending upon quality of the drawing, extent of demolition work, or to clarify and focus our proposed work (see *Graphic Requirements* above). The survey base drawing will largely be prepared by a surveyor, with a diverse collection of symbols.

Example of DD Site Demolition Plan

LEGEND

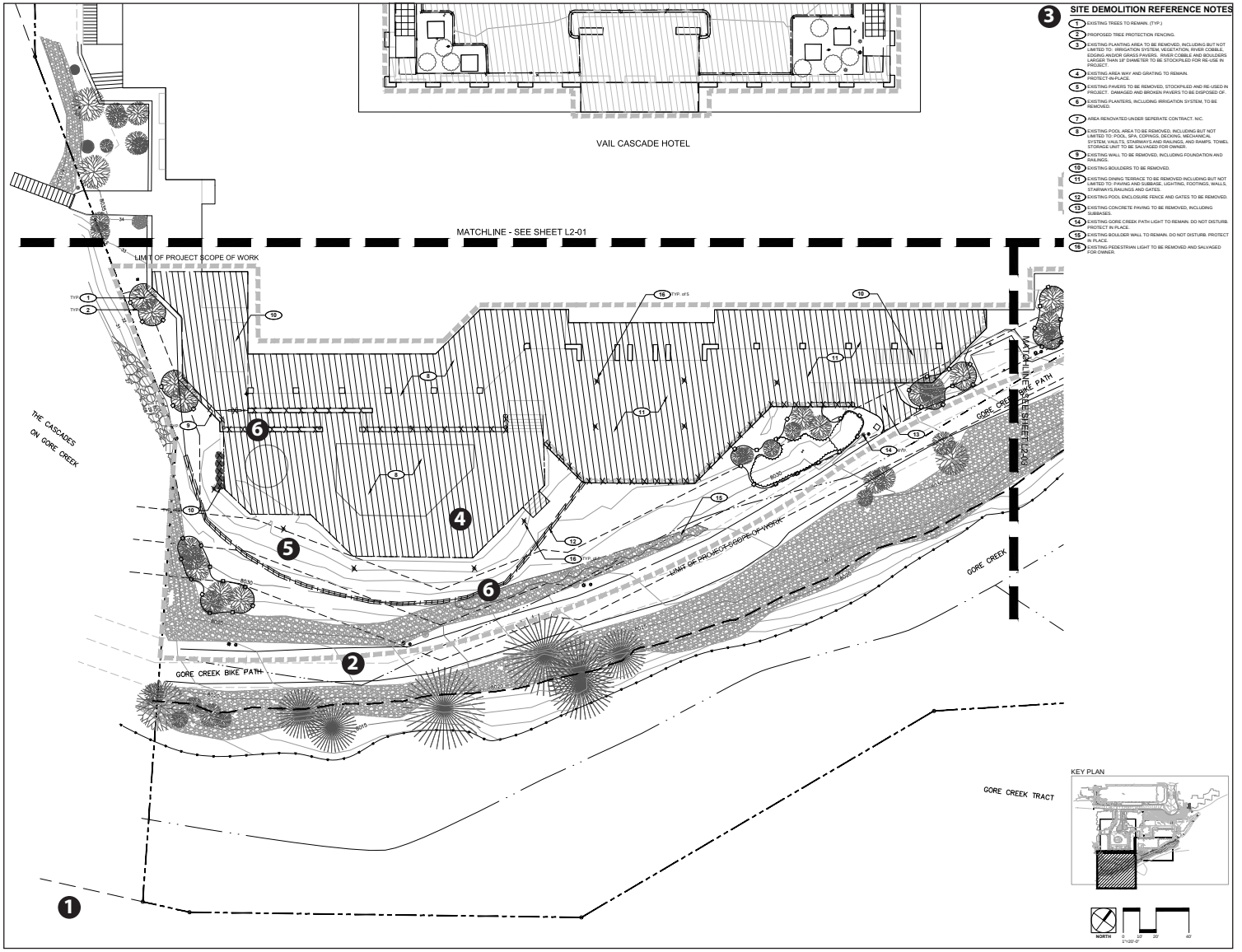
SERIES REQUIREMENTS

1. Survey Base Sheet
2. Limits of Work (if able to define) or Limit of Project Scope of Work Line
3. Preliminary Site Reference Notes (for example purposes only, should be project specific)

SERIES REQUIREMENTS

4. Hardscape to be Removed
5. Individual Components to Be Removed
6. Linear Components to Be Removed
7. Individual Components to Be Removed and Recycled
8. Individual Components to Be Removed and Salvaged

*NOTE: This sample depicts only the drawing area for this sheet. For title block requirements refer to preceding Title Block section.



CONSTRUCTION DOCUMENTATION SITE DEMOLITION PLAN

Objective

The Construction Document Site Demolition Plan resolves all detailed contractual requirements regarding the treatment of any existing conditions that are affected by proposed construction, separate from trees and plants.

General Requirements

The CD Site Demolition reflects the landscape architect's final study and understanding of existing conditions, both in terms of the site's inherent value, and the relationship of those conditions to the proposed design.

The CD plan explicitly and comprehensively itemizes contractual requirements for removal, protection, recycling, or salvaging existing components and conditions. The plan describes how removed materials are to be disposed of, and if stored on site, where and how they are to be protected until reused on site. If components are salvaged for the owner, the Site Demolition Plans may indicate where and how they are to be stored until reused on site.

Detailed information that was not provided or finalized at the DD phase should be completed, such as specific dimensions, utility disconnects, quantifying data into charts, and a comprehensively developed set of Reference Notes. Reference Notes provide the contractor with location-specific instructions that are not communicated elsewhere in the drawings or specifications.

Final quality control review and editing should be completed, including a thorough review of relationships between the Site Demolition Plan and associated plans such as the Plant Protection and Removal Plan, the Site Layout Plan, and others. The quality control emphasis should be directed to the relationships and fit between existing conditions to remain and proposed improvements. These relationships are challenging to resolve seamlessly.

Full interdisciplinary coordination is completed, with emphasis on those disciplines involved with site demolition work such as civil engineering and architecture. Recall that preliminary coordination is conducted at the DD phase.

Specific Requirements

The requirements that follow represent any distinct improvements to the Design Development Site Demolition Plan and are defined to complement those DD requirements, as described previously. Refer to these requirements in order to review and confirm the overall completeness of the CD sheet.

- Final **limits of project scope of work**, as agreed on by landscape architect, civil engineer, contractor(s), owner, and contractor, if applicable. Note that the DD limits of project scope of work may be revised as they are better informed at the CD phase.
- Final **limits of demolition**, as coordinated with collaborating disciplines such as civil engineer and architect.
- Final **Site Detail Keynote List**, with references to any typical site demolition details,
- Final **Site Demolition Reference Notes** to supplement graphic instruction and General Notes.
- Dimensioned locations of disconnection and sealing of each **utility service to be removed**, and/or coordinate this with the civil engineer. Also include dimensioned extent of other systems to be removed.

Graphic Requirements

The graphic requirements that follow highlight any distinct improvements to the Design Development Site Demolition Plan and are defined to complement those DD requirements:

- Limits of **pavement to be partially removed** indicated with a reference note defining the saw cut and removal intentions, and a plan symbol denoting the location of saw cut.

Best Practices

Refer to "Design Development Best Practices" for the Site Demolition Plan. These practices should be confirmed at the Construction Documentation phase.

Example of CD Site Demolition Plan

LEGEND

SERIES REQUIREMENTS

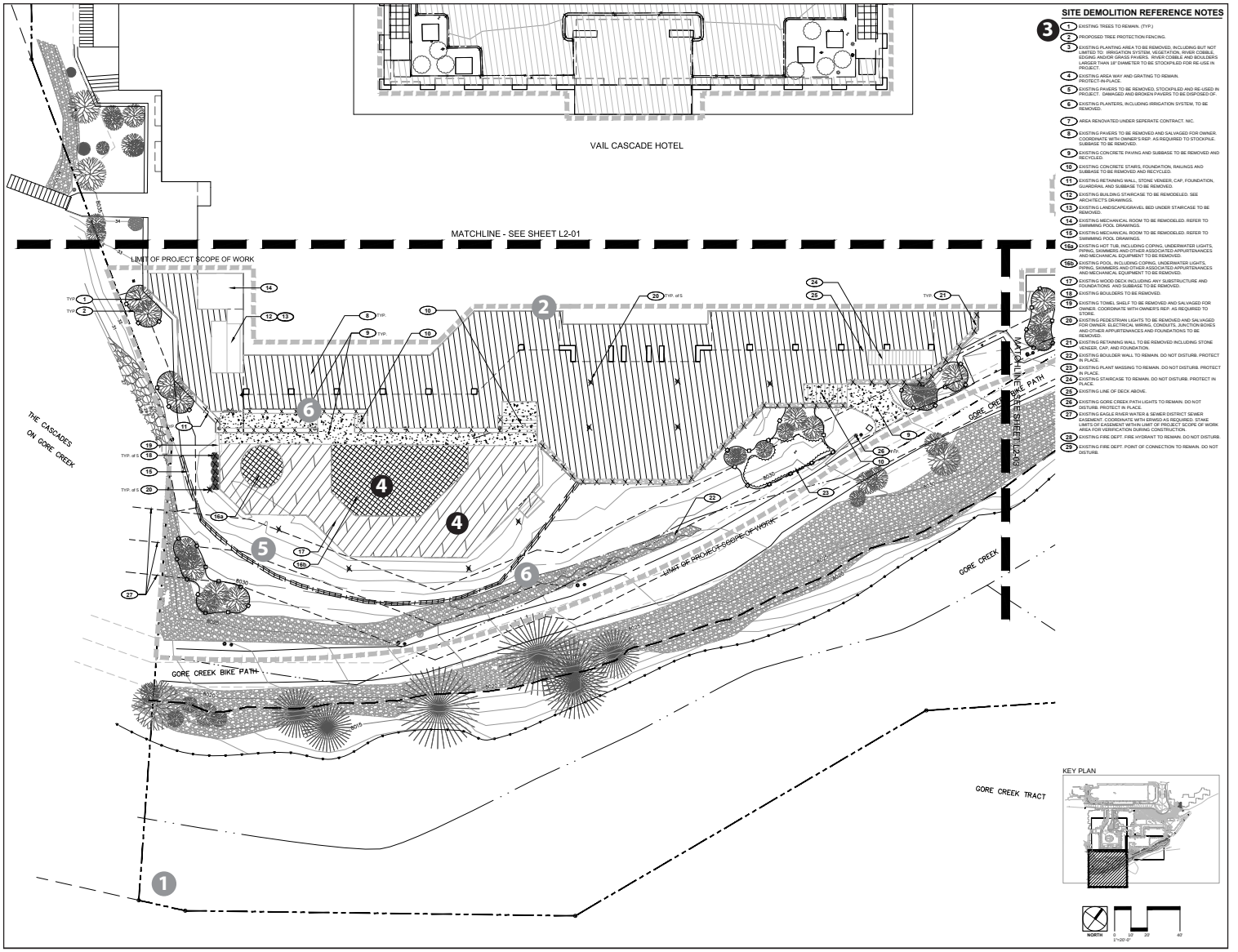
1. Survey Base Sheet
2. Limits of Work (if able to define) or Limit of Project Scope of Work Line
3. **Site Reference Notes (for example purposes only, should be project specific)**

SERIES REQUIREMENTS

4. **Hardscape to be Removed (Identify by material type where possible)**
5. Individual Components to Be Removed
6. Linear Components to Be Removed
7. Individual Components to Be Removed and Recycled
8. Individual Components to Be Removed and Salvaged

Note: **Boldface** items represent key distinctions between Construction Documentation documents and Design Development documents

*NOTE: This sample depicts only the drawing area for this sheet. For title block requirements refer to preceding Title Block section.



DESIGN DEVELOPMENT SITE MATERIALS PLAN

Objective

The Design Development Site Materials Plan vividly and comprehensively defines the site hardscape design program, with the use of well-considered symbols and Site Detail Keynotes. The plan is used both as a design medium and as a technical document.

General Requirements

The DD Site Materials Plan graphically introduces the full landscape architectural work scope and directs the client and design team to associated detailed drawings within the set. The DD Site Materials Plan should be fully resolved, reflecting the completion of all design decisions, in order to conduct pricing, coordination and detailed documentation. The plan identifies all materials, components, systems, and finish selections proposed on the project, and thus plays an integral role in the development of specifications.

A fully developed symbols and pattern system is organized to define and distinguish the proposed program, without extraneous rendering detail. The plan graphically illustrates all proposed landscape architecture work, and for reference and coordination, also shows all associated civil, architectural, and structural elements, drawn accurately and to scale. Final plan forms are studied and resolved by the interdisciplinary design team. Interfaces between all components and systems are resolved, defined as jointing or connection details. Interdisciplinary collaboration and coordination is an essential component of the Design Development phase, and the Site Materials Plan plays an important role in that effort.

An equally important purpose of the plan is to clearly and directly guide the client and interdisciplinary consultant team to associated documentation within the set, including enlargement plans, sections, details, and work by others. That requires a well-resolved keynote system, with Site Detail Keynotes used to reference all proposed components and systems. Note the complementary role of a carefully developed set of plan symbols and a Detail Keynote system in communicating the landscape architecture program.

The DD Site Materials Plan is designed to work in tandem with the Site Layout Plan. In simplest terms, the Site Materials Plan defines "what" is to be built, and the Site Layout Plan defines "where" to locate that construction. Therefore, no layout information should be included on the Site Materials Plan, unless the landscape architect determines that the project is simple enough to combine the Layout and Materials Plans as a single plan.

Key Distinctions between the DD and CD Site Materials Plans

The landscape architect should be strategic in making content decisions for the Design Development documents. These guidelines suggest individual strategies for each of the DD sheets, subject to the unique role of that sheet in the design and documentation process.

Primary relationships between the DD and CD Site Materials Plans are summarized here:

- The Design Development Site Materials Plan should be very well developed, as a strong basis for development of the Site Materials Plan construction document. In this regard, the DD Site Materials Plan is not significantly different from the CD Site Materials Plan.
- While the DD Site Materials Plan may include some illustrative elements such as people, automobiles, shadows, and color, the CD Site Materials Plan should not include these elements. The DD plan is partly intended to communicate and evaluate design intent, and as such, benefits from scale and illustrative support elements. The CD plan is not a design document; all graphics are utilized solely to communicate and distinguish the extent of the construction program. The graphic transition from Design Development to Construction Documentation requires careful consideration.
- In order to evaluate design intent the DD plan should show real (accurate and to-scale) patterns, textures, and jointing. The CD plan should shift to the use of abstract symbols to communicate the limits of materials and systems. Note that the landscape architect should consider the use of CD plan enlargements to show accurate and typical conditions, for example, paving patterns and relationships to adjoining construction such as wall jointing or railing posts.
- The DD plan includes complete Detail Keynote identification of all materials and components, with the CD plan including any revisions or quality control edits to this system.
- Detail references, including section references, elevation references and plan enlargement references may be initiated at the DD phase and subsequently completed for all landscape architectural sections, elevations, and plan enlargements contained within the documents at the CD phase.
- If Reference Notes are used, they can be used sparingly, for conditions requiring special contractual emphasis at the CD level. Recall the principle suggesting that the Site Materials Plan defines "what" is to be built and the Site Layout Plan defines "where" to locate that construction.

Plan symbols and Detail Keynotes alone are usually sufficient to define "what" is to be built. The Site Materials Plan should include Detail Keynotes only, not describing any positioning intent. That is reserved for the Layout Plan.

- The CD Site Materials Plan should fully illustrate and resolve all cast-in-place concrete joint locations (the DD plan shows all preliminary control and expansion joint locations); wall cap jointing; locations of guardrail, handrail, and fence post locations; and identification of conditions that occur at the transition or interface between systems and unique conditions. Note that the landscape architect will benefit from resolving some of these conditions at the DD level. These detailed conditions can also be shown on other drawings such as enlarged plans and elevations.

Specific Requirements

Survey base sheet to show all existing conditions to remain, including above-and below-grade structures, pavements, plants, topography, utilities, monuments, benchmarks, or other reference datum, and all legal conditions and restrictions such as property line bearings and distances, recorded easements, zoning setbacks, deed restrictions, adjacent property owners, and zoning districts, if relevant to the project layout.

Note that the survey base needs to be adjusted to reflect site demolition and plant removal changes to the site, that is, removed items should not appear on the survey base sheet.

Preliminary limits of project scope of work, as agreed by landscape architect, civil engineer, contractor(s), and owner. Note that limits of project scope of work may not coincide with property lines, for example, when areas within the property area have been designated as non-work areas. The DD limits of project scope of work may be revised as they are better informed at the CD phase. If adequate information is not available at the DD phase to intelligently determine the limits of work, the landscape architect may elect to not show these limits at the DD phase.

A limit of work line delineates all areas of permitted contractor activity and includes areas disturbed for control measures and improvements, as well as construction staging areas and all means and methods necessary to accomplish the work. Accurate determination of limits of work requires the investigation of a number of issues that the landscape architect may not have immediate access to, including contractor staging, mobilization, construction access, traffic control, and other construction-related issues.

Sheet matchlines, identifying the relationship of the subject plan sheet to immediately adjoining plan sheets, with a label that reads "Matchline" (Refer to Sheet L3-*xx*). Show consistent but minimal dimension of work outside matchline, for example, 1-inch on a full-sized sheet. Overlapping will help to orient the reader to adjoining sheet relationships (see *Graphic Requirements* below).

Enlargement plan references, to identify areas where material information is provided at a larger scale.

Preliminary Site Detail Keynote List, with references to all proposed details, components and systems. The Keynote List organizes the project's proposed systems under clear headings and references both details and specifications. (Note: the Site Detail Keynote List is described more fully elsewhere within these guidelines.) The keynote references on the DD Site Materials Plan must be comprehensively developed, as this plan is the primary reference for identifying the landscape architecture program.

Initial detail references, including section references, elevation references, and plan enlargement references, for representative or key landscape architectural sections, elevations, and plan enlargements, respectively, contained within the documents.

Reference Notes are used sparingly on the Site Materials Plans, as these instructional notes are generally reserved for the Site Layout Plan. Remember, the Site Layout Plan and Site Materials Plan are designed to work in complementary fashion. Generally speaking, the Site Materials Plan defines the program and the Layout Plan defines where to locate that program, with the use of dimensions and Reference Notes. In unique cases where a Layout and Materials Plans are combined into a single plan, Reference Notes will be required to complement the dimensions and Detail Keynotes.

Note that Reference Notes may be used to identify specific interdisciplinary coordination needs, for example, jointing relationships between paving systems and façade elements or to call to attention specific items requiring special consideration during construction.

Example Site Materials Plan *Reference Notes* are provided below (see generic description of Reference Notes in Chapter, 9 Key Documentation Practices). Note that these are sample notes and do not represent a comprehensive list. They address likely topics. Therefore, they should not be used by landscape architects for project applications. The landscape architect should customize the Reference Notes to suit individual project needs. The landscape architect should establish Reference Notes by approximating a logical order of construction.

Example of Site Materials Reference Notes

1. Existing paving to remain. Do not disturb.
2. Existing utility feature (define) to remain. Do not disturb.
3. Proposed paving shall minimize disturbance to existing trees and root system.

- Graphic definition of all **landscape architecture improvements** such as pavements, walls, fences, steps, railings, curbs, drainage structures, signs, mounted furnishings, fixtures, planters and pots, site structures, and elements, as per graphic requirements below.
- **Pavement jointing patterns**, as defined below under *Graphic Requirements*.
- Graphic definition of all **non-landscape architecture improvements** that occupy the site. The landscape architect should consider showing and coordinating site elements completed by other disciplines when they are integrally related to the landscape architecture work. These include architectural elements such as buildings, columns, subgrade structures, and overhead elements; civil improvements such as the curb and gutter, drainage structures, street and parking area light poles, utility vaults, boxes, and associated elements; irrigation infrastructure (not irrigation heads); electrical infrastructure; lighting infrastructure (see notes below); traffic infrastructure; mechanical and architectural elements; structural elements; site structures; telecommunication and audiovisual infrastructure; security elements; and art features. These include above- and below-grade components, graphically defined and distinguished, including all pavements, wall types, jointing conditions, furniture, lights, and other features.

  Work by others should be included in the landscape architect's Site Materials Reference Notes and referenced on the Site Materials Plan. Note that work by others should not be graphically symbolized (patterned), but should be replicated directly from collaborating disciplines' drawings per the landscape architect's CAD standards.

- **Site lighting components**, if not provided on the Site Lighting Series Drawings, with plan symbols and detail keynote references. Note that the Site Layout Plan locates lights, and the Site Electrical Plan, completed by the electrical engineer, defines the infrastructure needs for the lighting.
- **Site furnishings**, with plan symbols and Site Detail Keynote References.
- **Pavement jointing patterns**, as defined below under *Graphic Requirements*.
- **Planting areas**, as defined below under *Graphic Requirements*.

Graphic Requirements

Plan

- **Survey base sheet**, utilized to show all existing conditions, including above-and below-grade structures, pavements, plants, topography, utilities, restrictions, monuments, benchmarks, or other reference datum. Do not modify the base sheet to change or obscure content.

  Existing conditions, if desired may be graphically screened to a maximum of 50 percent of the original unaltered survey, in order to better highlight demolition requirements. The landscape architect may also elect to incorporate existing conditions at full value, if that better serves the graphic objectives. Note that the survey base should be adjusted to reflect demolition and tree removal changes to the site, that is, these items should be removed from the base plan.

  Symbols overlaid on the unaltered survey are used to represent existing conditions to remain or proposed improvements, and shall be as specifically noted below.

- **Work limit line** represented by an equally spaced dashed bold line, with a "Limit of Project Scope of Work" note. Consider screening this line to distinguish it from the matchlines that separate sheets.
- **Sheet Matchlines**, identifying the relationship of the subject plan sheet and immediately adjoining plan sheets, with a label (on the side of the line that you are matching your sheet to) that reads "Matchline—Refer to Sheet L3-*x*." Show a consistent, but minimal, dimension of work outside the matchline, for example, 1-inch on a full-sized sheet.
- **A line-weight hierarchy**, rigorously applied to distinguish three-dimensional components, material changes, jointing, pattern symbols, and keynote symbols.

  The line-weight hierarchy from lightest to heaviest:

  1. Screened survey base showing existing conditions, including subgrade conditions
  2. Jointing within a material system

3. Material systems (edges or changes from one system to another)
4. Level changes, three-dimensional components, changes in plane
5. Keynotes and leader lines
6. Building and structures

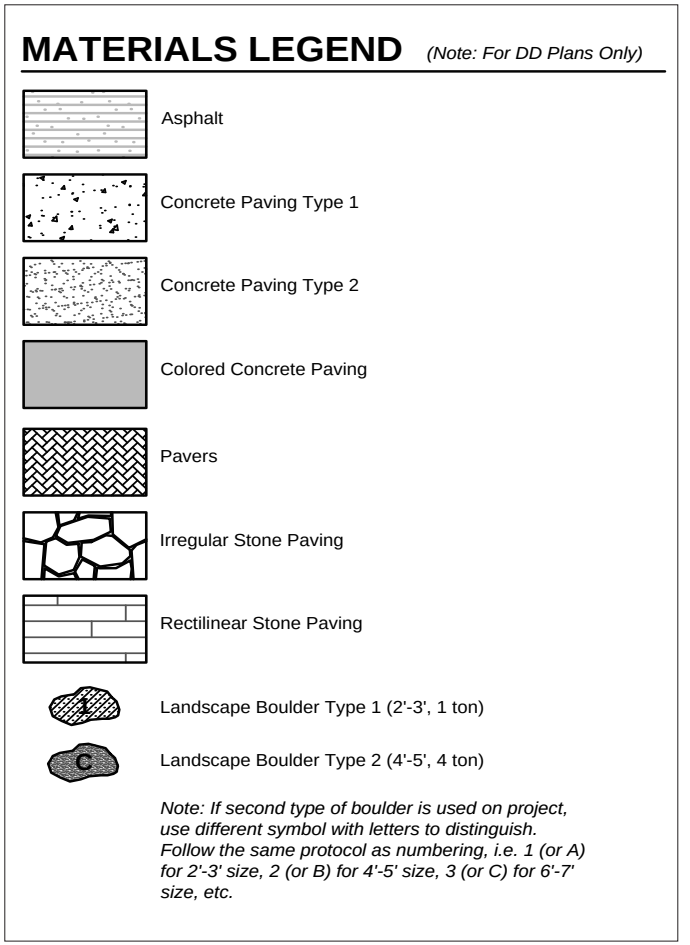
- **Consultant improvements**, screened or full bleed, depending upon importance of relationship to landscape architecture improvements.
- **Ground plane (on-grade) structures** distinguished from above- or below-grade components.
- **Below-grade components** (utilities, subgrade structures, etc.) shown with screened dash; on-grade components shown with full-tone solid line; above-grade components (building overhangs, trellises, etc.) shown with full-tone dash. Include delineation of all subgrade architecture and overhanging floors and roof lines.

  All proposed on-grade or above-grade **utility structures** and components shown for reference and conflict identification.
- **Symbols and patterns**, used on the Site Materials Plan to distinguish and define the limits of materials and components and to evaluate proposed design solutions. The DD Site Materials Plan is not developed solely for illustrative intent. Symbols should be selected to effectively transition to the CD plan. The DD Site Materials Plan may be used by the landscape architect as a base plan for further illustrative embellishment as a design presentation tool. Hatch symbols, if used, to depict illustrative representation of materials or patterns, should be drawn to scale.

  All elements should also be drawn to scale (no diagrammatic symbols), for example, furnishings, drainage structures, and lighting.

  Plan hatch and pattern symbols should precisely match scale of hatch and pattern on symbols legend.
- **Labels**, used only to identify major project spaces, features, buildings, roads, or streets, and water courses/ways. These represent the project program that is not identified on the Site Detail Keynote List. For example, it is appropriate to label the entry plaza, clubhouse, employee parking, swimming pool, and service area. It is not appropriate to label concrete walkway, pedestrian light, erosion control area, or handicap ramp. These elements are defined both by symbols and Site Detail Keynotes.

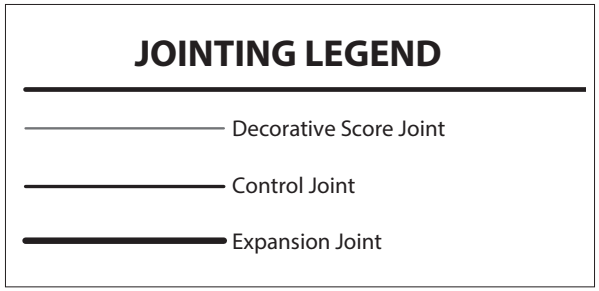
SAMPLE SYMBOLS



- **Building footprint**, graphically portrayed to reflect specific project needs. In most cases the building will be shown simplified, with perimeter walls only, in order to place graphic emphasis on landscape architectural improvements. In some cases, it may be important to show doors and windows, and maybe even the interior program. If interior conditions are shown, they should be graphically screened. In other cases, it may be useful to include the column grid, for potential relationships to site work. Note that column grid relationships are most important to show on the Site Layout Plan.

- **Pavement materials**, distinguished with pattern symbols, including finish distinctions within same material, for example, broomed versus sandblasted concrete. Refer to landscape architect's CAD standards for material symbols. Where an excessive or complicated number of symbols exist, consider simplifying graphic by reducing (consolidating) graphic patterns and utilizing Keynotes to distinguish different finishes within the same material.
- **Pedestrian and vehicular pavement systems**, distinguished with plan symbols and Keynotes.
- **Pavement jointing patterns** shown accurately and to scale, unless size of paving unit is too small to be read at plan scale. If that is the case, utilize diagrammatic symbol and associated detail keynote to direct the reader to enlarged plans, where actual pattern and associated requirements are represented.
    - Pavement joints at unit paving, identified only by Site Detail Keynote reference and detail definition included separately within the documents. No special line symbol to be used to define joint type in unit paving field, unless joint type varies within that field. For example, if prevailing joint type is a grout joint, but an expansion joint is required at predetermined locations, then utilize a symbol to define the expansion joint, as distinguished from the grout joint. Include that symbol on the legend on the General Information Sheet, and include a Site Detail Keynotereference for the "Expansion Joint at Paver" detail.
    - Concrete pavement joints, for example, expansion joints distinguished from control joints. Note that concrete joints are shown for reference on the Site Materials Plan, but the Site Layout Plan defines joint locations, either dimensionally and/or with the use of Site Detail Keynote Reference Notes.

SAMPLE JOINTING SYMBOLS



- **Curb and ramp types**, distinguished with symbols and Keynotes. For example, a header curb, an integral curb and gutter, and a rollover curb may be used. Three different symbols, with associated Site Detail Keynotes, should be used to distinguish these components.
- **Wall types**, distinguished with different symbols and Keynotes, for example, cast-in-place concrete wall with precast cap, and stone veneer wall with stone cap. Include wall cap jointing, with intended relationships to pavement jointing or other components.
- **Handrails and guardrails**, drawn accurately, that is, top and bottom extension at stairs, distance from face of wall. Stair handrail and guardrail post locations, clearly symbolized.
- **Site furnishings**, depicted with readily identifiable symbol, shown to scale and precisely matching symbols legend. Difficult-to-read symbols should be highlighted with a letter code, for example, trash receptacles may be shown as circle with "TR."
- **Planting areas** defined generically with a consistent hatch or other symbol and identified with "PA" for "Planting Area." Detailed landscape materials, for example, planting, mulch, and subdrainage should not be shown. That information should be shown on Planting Plans. Note that trees may be shown on Site Materials Plans where they occur in hardscape conditions, for example, at streetscapes and plazas. These trees should be graphically screened and Detail Keynoted.

Detail Keynotes and Reference Notes

- **Master Site Detail Keynote List**, located to right of plan, in consistent location on all sheets, organized with titles to precisely match detail titles, and accurate reference to detail and sheet number and specification section(s).
    - **Plan Detail Keynotes** consist of a 3/8" hexagon with 3/16" numeric reference to detail keynote legend.
    - A text mask is provided behind plan-based Keynotes for improved keynote legibility over plan graphics. Text masks are a CAD device used to obscure any plan graphic symbols from reading inside the hexagon symbol, avoiding graphic competition with the keynote number reference.
    - Keynotes are organized graphically on plans to align horizontally and vertically in groups as necessary.
    - Site Detail Keynotes are positioned on or near designated material. Avoid excessively long leader lines.
    - Keynote leader lines are aligned parallel where angled; a 60-degree angle (from horizontal) is preferred.

Best Practices

Design

Integrated Design and Documentation

The Site Materials Plan should be used as a key Design Development design review reference and should be examined together with specifications, site details, enlargement plans, material samples, and consultant drawings to conduct a detailed review. The landscape architect may pair the Design Development Site Materials Plan with material and component images and samples to conduct a focused client review and approval process.

Use the Site Materials Plan to identify key three-dimensional assemblies, that is, locations where complex or unresolved relationships between various systems and components occur. Illustrate these areas within the site details with axonometric drawings. This facilitates the determination of connection and interface details.

The Site Materials Plan should be used as the key reference for establishing Design Development specifications. Utilize the plan and Site Detail Keynote List to methodically define specification requirements.

Material Selection

The process of evaluating and selecting materials requires diligence. The process culminates with preparation of specifications and client approval. Initially, the process is a response to project objectives, principles, and performance metrics, as described within these guidelines. The landscape architect should investigate material limitations, size, color, durability, strength, and other attributes. Material boards should be developed to present to the client and collaborators. These boards include actual color, texture, and size of selected hardscape materials.

As preferred materials are determined, material availability, and standard sizing should be confirmed. Durability of the selected material in existing projects and environmental conditions should be confirmed. In establishing material sources, note that public clients may require "approved equal" substitution flexibility or nonproprietary performance-based systems to be defined. That process allows the contractor to submit a material or product that meets specified requirements, but may not match the specified proprietary product.

Sustainable Design

The Site Materials Plan is the most practical location within the drawings to consolidate the program of sustainable design elements. Acknowledging that sustainable design is a comprehensive and integral approach to design, this plan should be used during the DD phase to analyze and evaluate all aspects of sustainable design: economic, environmental, social, and aesthetic.

Regarding sustainable materials, the landscape architect may choose to define, highlight, or even categorize select materials, systems, and components by sustainability topics. These may include reused materials, recycled material content, local materials, rapidly renewable materials, certified, wood, porous pavement, low albedo pavements to mitigate urban heat island temperatures, and lights that reduce light pollution and require less energy.

Coordination

Interdisciplinary Materials

Coordinate landscape material selection with architectural materials, for example, colors, finishes, styles, products, fabrication, and so on with the client/owner, consultant team, and governing codes or jurisdiction as required.

Coordinate other consultant materials, particularly colors and finishes, including all above-grade utility infrastructure components.

Develop an integrated and well-resolved approach for all interdisciplinary program and design elements including civil, architectural, mechanical, electrical, plumbing, swimming pools and water features, irrigation system, audiovisual, telecommunications, structural, signage, art, and traffic signal infrastructure. Resolve any conflicts or undesirable effects collaboratively.

Technical

Regulatory Requirements

Determine all applicable codes, zoning, and other legal requirements that may affect the site design. Utilize the Site Materials Plan to depict responses to these requirements, for example, guardrails, handrails, fire lane(s), and accessibility requirements such as ramps.

Review all current ADA requirements for material requirements, including audible, visual, and tactile devices; slip resistance; and detectable surfaces; and ensure compliance where required.

Identify, review and comply with codes that address requirements for signs, pavement striping, and curb painting. Note, however, that these may be depicted on Others' Drawings.

Submittal Coordination

Identify all material selections that will require contractor samples, a mock-up, and shop drawing approvals in the Specifications.

Strategies

Graphic Effectiveness

Use descriptive but minimal plan symbols to readily distinguish all proposed material systems. Begin to transition from illustrative graphics to drawing with a well-established hierarchy of line weights, simple patterns, and symbols to clearly illustrate the design intent.

The DD Materials Plan should depict materials accurately and to scale in order to effectively communicate and evaluate design intent. Some small-scale elements such as unit paving patterns may need to be depicted on enlarged details. In this scenario, the Site Materials Plan may depict certain materials with a simple hatch pattern.

Refer to *Key Distinctions between DD and CD Site Materials Plans* above for notes on the graphic transition from the DD to CD plans.

Plan symbols should be well developed prior to initiating full plan development, indicating a logical progression of work. The complete program of materials, finishes, and components should be graphically itemized and evaluated, side by side. The landscape architect's CAD standards may be used as a point of departure, but they should be modified as needed to make the overall system work well together.

Material and Component Availability

Verify the availability and proposed application of materials. Verify the actual (versus nominal) dimensions of material, for example, paving units, and wood and metal components. Establish a working relationship with product representatives, manufacturers, and suppliers for each material in order to review and confirm detailed applications and specifications.

Example of a DD Site Materials Plan

LEGEND

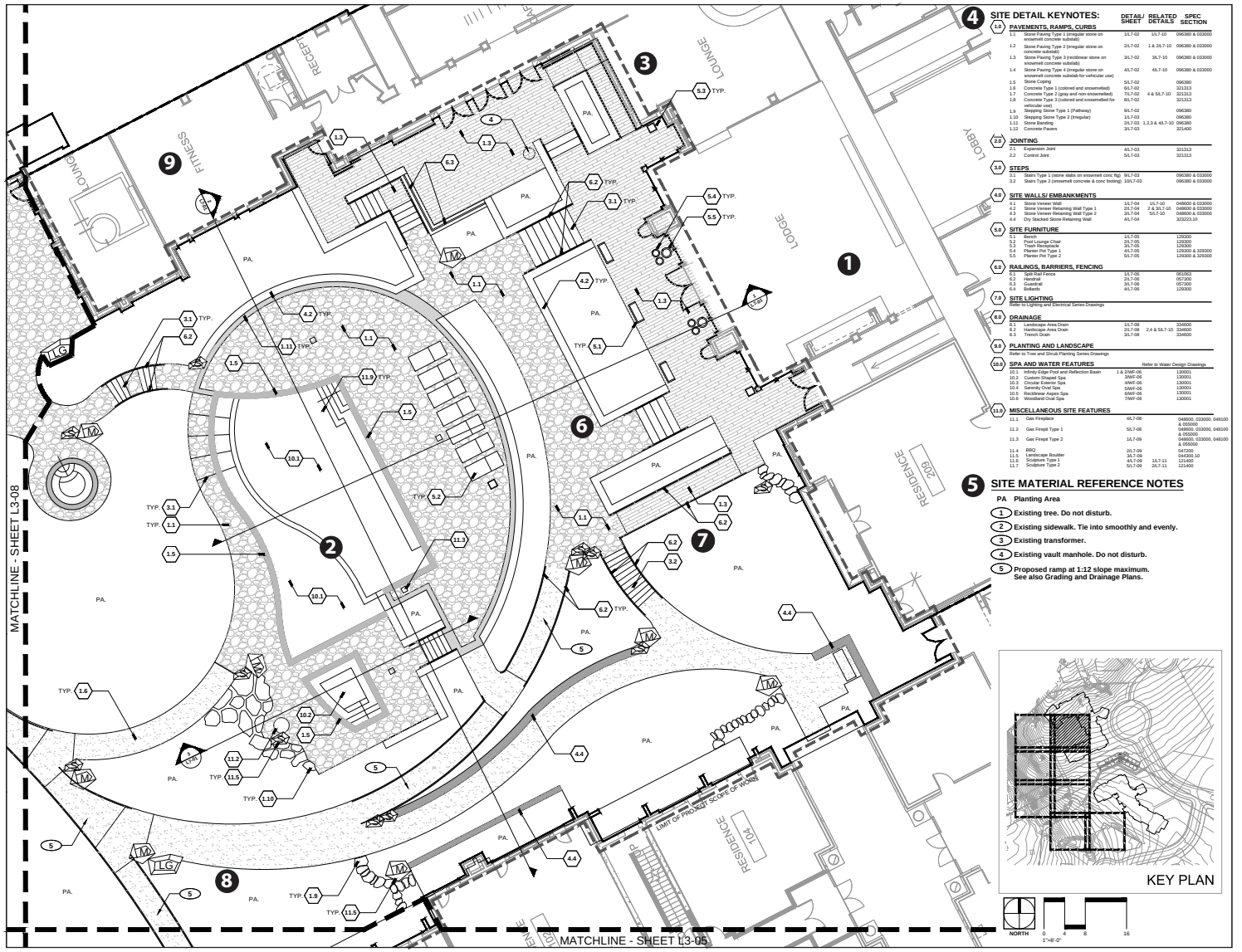
SHEET REQUIREMENTS

1. Survey Base Sheet
2. Proposed Site Improvements
3. Limits of Work (if able to define) or Limits of Project Scope of Work
4. Preliminary Site Detail Keynote List
5. Preliminary Site Reference Notes

SERIES REQUIREMENTS

6. **Material Pattern, Hatch, or Symbol**
7. Keynote Callouts
8. Reference Note Callout
9. Composite Reference Sections

*Note: This sample depicts only the drawing area for this sheet. For title block requirements refer to preceding Title Block section.



4 SITE DETAIL KEYNOTES:

		DETAIL/ SHEET	RELATED DETAILS	SPEC SECTION
1.0	**PAVEMENTS, RAMPS, CURBS**			
1.1	Stone Paving Type 1 (irregular stone on snowmelt concrete substab)	1/L7-02	1/L7-10	096380 & 033000
1.2	Stone Paving Type 2 (irregular stone on snowmelt substab)	2/L7-02	1 & 2/L7-10	096380 & 033000
1.3	Stone Paving Type 3 (rectilinear stone on snowmelt concrete substab)	3/L7-02	3/L7-10	096380 & 033000
1.4	Stone Paving Type 4 (irregular stone on snowmelt concrete substab for vehicular use)	4/L7-02	4/L7-10	096380 & 033000
1.5	Stone Coping	5/L7-02		096380
1.6	Concrete Type 1 (colored and snowmelted)	6/L7-02		321313
1.7	Concrete Type 2 (gray and non-snowmelted)	7/L7-02	4 & 5/L7-10	321313
1.8	Concrete Type 3 (colored and snowmelted for vehicular use)	8/L7-02		321313
1.9	Stepping Stone Type 1 (Pathway)	9/L7-02		096380
1.10	Stepping Stone Type 2 (Irregular)	1/L7-03		096380
1.11	Stone Banding	2/L7-03	1,2,3 & 4/L7-10	096380
1.12	Concrete Pavers	3/L7-03		321400
2.0	**JOINTING**			
2.1	Expansion Joint	4/L7-03		321313
2.2	Control Joint	5/L7-03		321313
3.0	**STEPS**			
3.1	Stairs Type 1 (stone slabs on snowmelt conc ftg)	9/L7-03		096380 & 033000
3.2	Stairs Type 2 (snowmelt concrete & conc footing)	10/L7-03		096380 & 033000
4.0	**SITE WALLS/ EMBANKMENTS**			
4.1	Stone Veneer Wall	1/L7-04	1/L7-10	048000 & 033000
4.2	Stone Veneer Retaining Wall Type 1	2/L7-04	2 & 3/L7-10	048000 & 033000
4.3	Stone Veneer Retaining Wall Type 2	3/L7-04	5/L7-10	048000 & 033000
4.4	Dry Stacked Stone Retaining Wall	4/L7-04		323223.10
5.0	**SITE FURNITURE**			
5.1	Bench	1/L7-05		129300
5.2	Pool Lounge Chair	2/L7-05		129300
5.3	Trash Receptacle	3/L7-05		129300
5.4	Planter Pot Type 1	4/L7-05		129300 & 329300
5.5	Planter Pot Type 2	5/L7-05		129300 & 329300
6.0	**RAILINGS, BARRIERS, FENCING**			
6.1	Split Rail Fence	1/L7-06		061053
6.2	Handrail	2/L7-06		057300
6.3	Guardrail	3/L7-06		057300
6.4	Bollards	4/L7-06		129300
7.0	**SITE LIGHTING**			
	Refer to Lighting and Electrical Series Drawings			
8.0	**DRAINAGE**			
8.1	Landscape Area Drain	1/L7-08		334600
8.2	Hardscape Area Drain	2/L7-08	2,4 & 5/L7-10	334600
8.3	Trench Drain	3/L7-08		334600
9.0	**PLANTING AND LANDSCAPE**			
	Refer to Tree and Shrub Planting Series Drawings			
10.0	**SPA AND WATER FEATURES**			Refer to Water Design Drawings
10.1	Infinity Edge Pool and Reflection Basin	1 & 2/WF-06		130001
10.2	Circular Interior Spa	3/WF-06		130001
10.3	Circular Exterior Spa	4/WF-06		130001
10.4	Serenity Oval Spa	5/WF-06		130001
10.5	Rectilinear Aspen Spa	6/WF-06		130001
10.6	Woodland Oval Spa	7/WF-06		130001
11.0	**MISCELLANEOUS SITE FEATURES**			
11.1	Gas Fireplace	4/L7-08		048600, 033000, 048100 & 055000
11.2	Gas Firepit Type 1	5/L7-08		048600, 033000, 048100 & 055000
11.3	Gas Firepit Type 2	1/L7-09		048600, 033000, 048100 & 055000
11.4	BBQ	2/L7-09		047200
11.5	Landscape Boulder	3/L7-09		044300.10
11.6	Sculpture Type 1	4/L7-09	1/L7-11	121400
11.7	Sculpture Type 2	5/L7-09	2/L7-11	121400

5 SITE MATERIAL REFERENCE NOTES

PA Planting Area

1. **Existing tree. Do not disturb.**
2. **Existing sidewalk. Tie into smoothly and evenly.**
3. **Existing transformer.**
4. **Existing vault manhole. Do not disturb.**
5. **Proposed ramp at 1:12 slope maximum. See also Grading and Drainage Plans.**

CONSTRUCTION DOCUMENTATION SITE MATERIALS PLAN

Objective

The CD Site Materials Plan graphically introduces the full program of landscape architectural improvements and directs the contractor to associated detailed drawings within the set.

General Requirements

The CD Site Materials Plan is derived from a well-developed DD Site Materials Plan. Primary improvements to the CD plan are derived from quality management review and coordination between disciplines, and between drawings and specifications.

The plan should graphically illustrate all proposed landscape architecture work, and for reference and coordination, also show all associated civil, architectural, and structural elements, drawn accurately and to scale.

All components, both above and below grade should be graphically defined and distinguished, including all pavements, wall types, jointing conditions, furniture, lights, and other features. Component, material, and finish selections should be resolved and rigorously coordinated with specifications.

The CD Site Materials Plan should fully illustrate and resolve all cast-in-place concrete expansion and control joint locations; wall cap jointing; locations of guardrail, handrail, and fence post locations, and identification of conditions that occur at the transition or interface between systems and unique conditions.

Any illustrative symbols used at the DD phase, such as people or automobiles, should be removed from the CD plan. Final symbols should be reviewed and confirmed. Recall that the DD plan may utilize real (accurate and to scale) patterns and textures in order to evaluate design intent, whereas CD plan symbols place more emphasis on clearly distinguishing materials and components, so more generic patterns are recommended. If necessary, enlargement plans may be employed to depict accurate and to scale patterns.

An equally important purpose of the plan is to clearly and directly guide the contractor to associated documentation within the set, including enlargement plans, sections, details and work by others. That requires a fully resolved keynote system. In addition, detail references, including section references, elevation references and plan enlargement references should be completed for all landscape architectural sections, elevations, and plan enlargements contained within the documents.

Specific Requirements

- Final **limits of project scope of work**, as agreed on by landscape architect, civil engineer, contractor(s), owner, and contractor, if applicable. Note that the DD limits of project scope of work may be revised, as they are better informed at the CD phase.
- Comprehensively resolved **Site Detail Keynote List**, with references to all proposed details, components, and systems.
- Exhaustive **detail references**, including section references, elevation references, and plan enlargement references, for all landscape architectural sections, elevations, and plan enlargements contained within the documents.
- Final graphic definition of all **landscape architectural improvements** such as pavements, walls, fences, steps, railings, curbs, drainage structures, signs, mounted furnishings, fixtures, planters and pots, site structures, and elements, per *Graphic Requirements* below.
- Fully resolved **jointing patterns**, as defined below under *Graphic Requirements*.
- **Concrete pavement joints**, for example, expansion joints to be distinguished from control joints. Note that the Site Layout Plan defines joint locations.
- **Wall cap jointing**, identifying individual cap pieces where used, for example, precast or stone units (not identified on the Design Development Site Materials Plan).
- Limits of **pavement sectional changes**, for example, from 4" thick concrete to 6" thick concrete.
- **Post locations**, including guardrail, handrail, and fence post locations.

Graphic Requirements

Plan

The primary differences from DD to CD include evolution of the plan geometries, material definition and replacement of hatches or patterns with more generic ones.

Best Practices

Design

Use the Site Materials Plan to define all proposed systems and key relationships between materials, components, and systems that require sectional and three-dimensional study.

Example of a CD Site Materials Plan

LEGEND

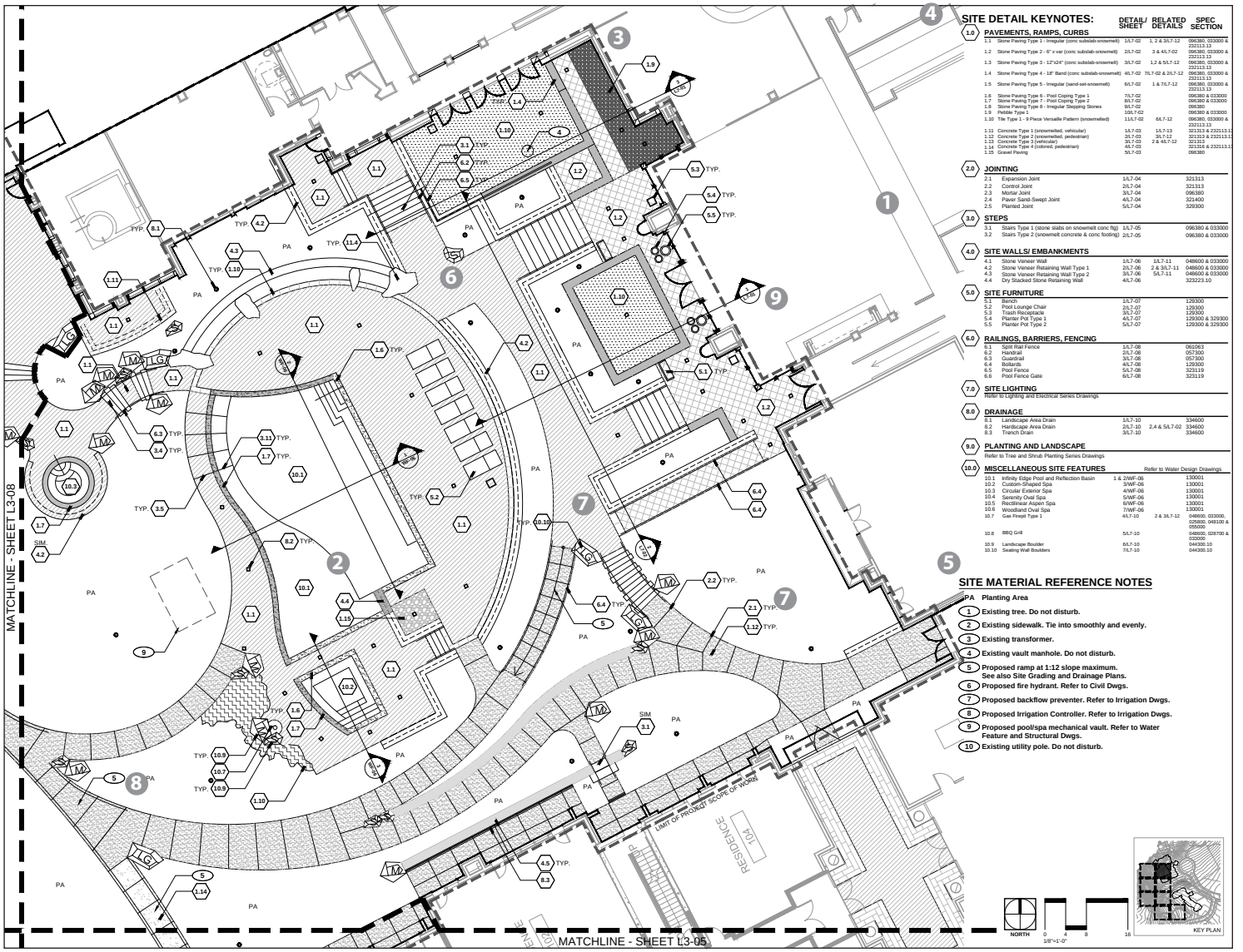
SHEET REQUIREMENTS

1. Survey Base Sheet
2. Proposed Site Improvements
3. Limits of Work (if able to define) or Limits of Project Scope of Work
4. Preliminary Site Detail Keynote List
5. Preliminary Site Reference Notes

SERIES REQUIREMENTS

6. **Material Pattern, Hatch, or Symbol**
7. Keynote Callouts
8. Reference Note Callout
9. Composite Reference Sections

*Note: This sample depicts only the drawing area for this sheet. For title block requirements refer to preceding Title Block section.



SITE DETAIL KEYNOTES:

		DETAIL/ SHEET	RELATED DETAILS	SPEC SECTION
1.0	**PAVEMENTS, RAMPS, CURBS**			
1.1	Stone Paving Type 1 - Irregular (conc subslab-snowmelt)	1/L7-02	1, 2 & 3/L7-12	096380, 033000 & 222113.13
1.2	Stone Paving Type 2 - 6" x var (conc subslab-snowmelt)	2/L7-02	3 & 4/L7-02	096380, 033000 & 222113.13
1.3	Stone Paving Type 3 - 12"x24" (conc subslab-snowmelt)	3/L7-02	1,2 & 5/L7-12	096380, 033000 & 222113.13
1.4	Stone Paving Type 4 - 18" Band (conc subslab-snowmelt)	4/L7-02	7/L7-02 & 2/L7-12	096380, 033000 & 222113.13
1.5	Stone Paving Type 5 - Irregular (sand-set-snowmelt)	6/L7-02	1 & 7/L7-12	096380, 033000 & 222113.13
1.6	Stone Paving Type 6 - Pool Coping Type 1	7/L7-02		096380 & 033000
1.7	Stone Paving Type 7 - Pool Coping Type 2	8/L7-02		096380 & 033000
1.8	Stone Paving Type 8 - Irregular Stepping Stones	9/L7-02		096380
1.9	Pebble Type 1	10/L7-02		096380 & 033000
1.10	Tile Type 1 - 9 Piece Versaille Pattern (snowmelted)	11/L7-02	6/L7-12	096380, 033000 & 222113.13
1.11	Concrete Type 1 (snowmelted, vehicular)	1/L7-03	1/L7-13	321313 & 232113.13
1.12	Concrete Type 2 (snowmelted, pedestrian)	2/L7-03	3/L7-12	321313 & 232113.13
1.13	Concrete Type 3 (vehicular)	3/L7-03	2 & 4/L7-12	321313
1.14	Concrete Type 4 (colored, pedestrian)	4/L7-03		321316 & 232113.13
1.15	Gravel Paving	5/L7-03		096380
2.0	**JOINTING**			
2.1	Expansion Joint	1/L7-04		321313
2.2	Control Joint	2/L7-04		321313
2.3	Mortar Joint	3/L7-04		096380
2.4	Paver Sand-Swept Joint	4/L7-04		321400
2.5	Planted Joint	5/L7-04		320300
3.0	**STEPS**			
3.1	Stairs Type 1 (stone slabs on snowmelt conc ftg)	1/L7-05		096380 & 033000
3.2	Stairs Type 2 (snowmelt concrete & conc footing)	2/L7-05		096380 & 033000
4.0	**SITE WALLS/ EMBANKMENTS**			
4.1	Stone Veneer Wall	1/L7-06	1/L7-11	048600 & 033000
4.2	Stone Veneer Retaining Wall Type 1	2/L7-06	2 & 3/L7-11	048600 & 033000
4.3	Stone Veneer Retaining Wall Type 2	3/L7-06	5/L7-11	048600 & 033000
4.4	Dry Stacked Stone Retaining Wall	4/L7-06		323223.10
5.0	**SITE FURNITURE**			
5.1	Bench	1/L7-07		129300
5.2	Pool Lounge Chair	2/L7-07		129300
5.3	Trash Receptacle	3/L7-07		129300
5.4	Planter Pot Type 1	4/L7-07		129300 & 329300
5.5	Planter Pot Type 2	5/L7-07		129300 & 329300
6.0	**RAILINGS, BARRIERS, FENCING**			
6.1	Split Rail Fence	1/L7-08		061063
6.2	Handrail	2/L7-08		057300
6.3	Guardrail	3/L7-08		057300
6.4	Bollards	4/L7-08		129300
6.5	Pool Fence	5/L7-08		323119
6.6	Pool Fence Gate	6/L7-08		323119
7.0	**SITE LIGHTING**			
	Refer to Lighting and Electrical Series Drawings			
8.0	**DRAINAGE**			
8.1	Landscape Area Drain	1/L7-10		334600
8.2	Hardscape Area Drain	2/L7-10	2,4 & 5/L7-02	334600
8.3	Trench Drain	3/L7-10		334600
9.0	**PLANTING AND LANDSCAPE**			
	Refer to Tree and Shrub Planting Series Drawings			
10.0	**MISCELLANEOUS SITE FEATURES**			Refer to Water Design Drawings
10.1	Infinity Edge Pool and Reflection Basin	1 & 2/WF-06		130001
10.2	Custom-Shaped Spa	3/WF-06		130001
10.3	Circular Exterior Spa	4/WF-06		130001
10.4	Serenity Oval Spa	5/WF-06		130001
10.5	Rectilinear Aspen Spa	6/WF-06		130001
10.6	Woodland Oval Spa	7/WF-06		130001
10.7	Gas Firepit Type 1	4/L7-10	2 & 3/L7-12	048600, 033000, 025800, 048100 & 055000
10.8	BBQ Grill	5/L7-10		048600, 028700 & 033000
10.9	Landscape Boulder	6/L7-10		044300.10
10.10	Seating Wall Boulders	7/L7-10		044300.10

SITE MATERIAL REFERENCE NOTES

- PA Planting Area
- 1 Existing tree. Do not disturb.
- 2 Existing sidewalk. Tie into smoothly and evenly.
- 3 Existing transformer.
- 4 Existing vault manhole. Do not disturb.
- 5 Proposed ramp at 1:12 slope maximum. See also Site Grading and Drainage Plans.
- 6 Proposed fire hydrant. Refer to Civil Dwgs.
- 7 Proposed backflow preventer. Refer to Irrigation Dwgs.
- 8 Proposed Irrigation Controller. Refer to Irrigation Dwgs.
- 9 Proposed pool/spa mechanical vault. Refer to Water Feature and Structural Dwgs.
- 10 Existing utility pole. Do not disturb.

Coordination

The Site Materials Plan represents a consolidated opportunity to show and coordinate all multidisciplinary components that are proposed on or below the site. Use the plan to define these coordination needs.

Strategies

The Site Materials Plan is intended to function together with the Site Layout Plan to define and locate the proposed program. As such, they serve different, but complementary purposes. The Site Materials Plan should graphically not read too vividly but simply distinguish all site work at a glance.

The Site Materials Plan should be represented solely with the use of simple plan symbols and Keynotes. Text notes, dimensions, or extraneous graphic information should be avoided. Limit the use of annotation on the plan (except for existing conditions information such as road names) in lieu of Detail Keynotes.

Use consistent terminology between Detail Keynotes, detail references, specifications, and other sheets, including those prepared by consultants.

DESIGN DEVELOPMENT SITE LAYOUT PLAN

Objective

The Design Development Layout Plan previews the horizontal position of the site work and is intended to function as a precursor to the Construction Document Layout Plan, establishing a layout strategy and system to be more fully developed at the Construction Documentation phase.

General Requirements

The Design Development Layout Plan is used to define intended relationships between proposed site work and all other disciplines. Potential conflicts should be identified and resolved at this stage, for final documentation during the Construction Documentation phase. Because the Design Development Site Layout Plan is much cleaner than the Design Development Site Materials Plan, it represents a more practical opportunity to illustrate and coordinate relationships across the full interdisciplinary program.

The plan establishes and initiates the fundamental layout strategy to be used for Construction Documentation. Review and confirm this layout strategy with architects, engineers, and contractors, if available. Refer to *Layout Systems* below for description and evaluation of potential layout systems.

The DD plan includes the primary organizing components of the proposed site layout system, for example, baselines, centerlines, points of beginning, primary coordinate points, or overall dimension strings. Combination systems may be used. Only major dimensions are included, to establish primary intent, key spaces, and relationships. An adequate number of dimensions and layout instructions are included in order to evaluate the viability of the proposed system. Major systems dimensions, some of which are typical, are included, for example, sidewalk widths and parking spaces, for review and confirmation. A typical dimension should be included for each system included on the Site Detail Keynote List.

The DD plan utilizes a current and fully developed site plan base, including all site improvements designed by the landscape architect, together with civil improvements, structural improvements if applicable, and architecture. All existing conditions to remain should be included on this plan.

Key Distinctions between DD and CD Site Layout Plans

The landscape architect should be strategic in making content decisions for the Design Development documents. These guidelines suggest individual strategies for each of the DD sheets, subject to the unique role of that sheet in the design and documentation process.

Primary relationships between the DD and CD Site Layout Plans are summarized here:

- The DD Layout Plan establishes and tests the primary layout method(s) to be further developed during the CD phase, for example, "coordinate" or "baseline" system.
- The DD Layout Plan illustrates key dimensions and layout considerations associated with the plan, for example, the overall size of a primary space, or the basic dimensions associated with a streetscape. The CD Plan provides exhaustive layout information to locate every proposed component, form, and system.
- The DD Layout Plan provides a set of initial Site Reference Notes to describe primary layout intentions and requirements. The CD Layout Plan provides an exhaustive set of Site Reference Notes, comprehensively communicating contractual layout requirements.
- The DD Plan should be used to identify key layout coordination needs between landscape architecture and other disciplines, that is, potential conflicts and relationships. Key relationships to civil, architectural, and other applicable layout systems should be identified, to be fully resolved at the CD phase.

Specific Requirements

- **Survey base sheet** to show all existing conditions to remain, including above-and below-grade structures, existing rock outcroppings, and boulders, pavements, plants, topography, utilities, monuments, benchmarks, or other reference datum, and all legal conditions and restrictions such as property line bearings and distances, recorded easements, zoning setbacks, deed restrictions, adjacent property owners, and zoning districts, if relevant to the project layout. Do not modify base sheet to change or obscure content.
- Any applicable **zoning and code requirements** for governmental approvals, for example, setbacks, rights-of-way, easements, fire lanes, quantifiable open space requirements, and so forth. This information is important to include on the Site Layout Plan, as it directly impacts proposed site layout.
- **Preliminary Limits of Work,** as agreed by landscape architect, civil engineer, contractor(s) (if applicable) and owner. Note that limits of work may not coincide with property lines, for example, when areas within the property area have been designated as non-work areas. Accurate determination of limits of work requires the investigation of a number of issues that the landscape architect may not have immediate access to, including contractor staging, mobilization, construction access, traffic control and other construction-related issues. Consequently, the DD limits of work may be revised as they are better informed at the CD phase.
- **Sheet Matchlines**, identifying relationship of subject plan sheet to immediately adjoining plan sheets, with label that reads "Matchline (Refer to Sheet L4-*xx*). Show consistent, but minimal dimension of work outside matchline, for example, 1" on a full size sheet. Overlap will help to orient the reader to adjoining sheet relationships (see *Graphic Requirements* below).
- **Enlargement plan references,** for areas where layout information is provided at a larger scale. Note that Site Detail Keynotes and section references are not included on the Site Layout Plan unless this sheet is intended as a consolidated Site Layout and Materials Plan.
- **Preliminary Site Reference Notes** to supplement graphic instruction and General Notes. Site Reference Notes provide instructions to the contractor regarding construction implementation. As numerical references, these "notes" replace the historic use of exhaustive annotation notes on the drawings. The DD Layout Plan may utilize a set of initial Site Reference Notes that communicate primary, rather than exhaustively annotated intent. While the use of DD Site Reference Notes may not be fully developed, the DD Layout Plan must graphically identify all proposed landscape architectural elements. Site Reference Notes should be organized in a logical sequence, for example, as they relate to construction operations or sequencing.

  Examples of Site Layout Reference Notes are provided here (see the generic description of Reference Notes in Chapter 9, Key Documentation Practices). Note that these are sample notes only and do not represent a comprehensive list. They address likely topics. Therefore, they should not be used by landscape architects for project applications. The landscape architect should customize Site Reference Notes to suit individual project needs. The landscape architect should organize Site Reference Notes by following a logical order of construction.

Examples of Site Layout Site Reference Notes

1. Centerline of building doorway to be basis for landscape architecture baseline A.
2. Existing tree to remain. Do not disturb. Proposed improvements shall be located outside drip line of tree.
3. Final location of site furnishings (define) to be determined in field under direction of landscape architect.

- Graphic definition of all **landscape architectural improvements** such as pavements, walls, fences, steps, railings, curbs, drainage structures, signs, mounted furnishings, fixtures, planters and pots, site structures, and elements, as per the *Graphic Requirements* below.
- A graphic definition of all **non-landscape architectural improvements** that occupy the site. The landscape architect should consider showing and coordinating site elements completed by other disciplines when they are integrally related to the landscape architecture work. These include architectural elements such as buildings, columns, subgrade structures, and overhead elements; civil improvements such as the curb and gutter; drainage structures; street and parking area light poles; utility vaults, boxes, and associated elements; irrigation infrastructure (not irrigation heads); electrical infrastructure; lighting infrastructure; traffic infrastructure; mechanical and architectural elements; structural elements; site structures; telecommunication and audiovisual infrastructure;

security; and art features. These include above- and below-grade components, graphically defined and distinguished, including all pavements, wall types, jointing conditions, furniture, lights, and other features.

- **Subgrade improvements,** including wall footings, vaults, and other subgrade foundations. Note that complete structural intent may not be resolved at the DD phase.

Buildings

If proposed building(s) are to be located on the Site Layout Plan, establish the layout method to be used to site these buildings.

Pavements

- **All pavement systems** designed by the landscape architect, those designed by the civil engineer and any pavement areas that may be included with the building contract with designed relationships to landscape architectural systems.
- **Concrete pavement jointing patterns**, as defined below under *Graphic Requirements*. Include all concrete jointing for rigorous quality control review, both expansion and control joints, with typical locational (dimensional) information. Unit paving jointing should not be shown on this plan.
- **Curb and gutter**, including jointing and relationships to cast-in-place concrete pavements, coordinated with civil engineer.

Stairs

All **exterior stairs**, with accurately determined riser and tread dimensions, with landings per code requirements. Include stair pavement jointing, for example, cast-in-place concrete, stone, or precast concrete clad.

Walls

All **site walls**, including freestanding and retaining. Include wall cap jointing, and intentions for relationships of cap jointing to pavement jointing.

Site Furniture

Site furnishings, including seating elements, trash receptacles, drinking fountains, bicycle racks, planter pots bollards, and other elements.

Railings, Fences, and Metal Work

- All **guardrails, handrails, and other railings**, with both top rail and post locations defined. Note that Enlargement Plans and elevations may be necessary to supplement information provided on the Site Layout Plan.

Site Lighting

All lights, unless Site Lighting Plan series is provided, including freestanding, ground and wall mounted, and suspended. Note that the Site Layout Plan locates lights and the Site Electrical Plan, prepared by the electrical engineer, defines the infrastructure needs for the lighting. For reference, show and coordinate locations of electrical transformers, cabinets, and any other electrical infrastructure located on the site.

Planting

Planting areas as defined below under *Graphic Requirements*. Plants should not be shown on the Site Layout Plan, only boundaries of planting areas when they are integral components to hardscape design..

Streets and Parking

Streets and parking shown for reference, but laid out by civil engineer on civil plans. Include parking lot stall striping, including typical dimensions. Show other traffic control lines or markings. Include ADA required handicap stalls.

Systems not Applicable on this Plan

A limited number of site systems should not be included on this plan, including underground utilities such as pipes; plants; detailed irrigation infrastructure, for example, spray heads; elevation information; and when defined on a separate plan, site lighting and site furnishings.

Layout Systems

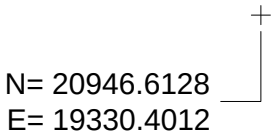
A number of basic site layout systems have been highlighted below to define applicability and appropriateness to various site design circumstances. It is customary and beneficial to combine systems in order to simplify the layout presentation. For example, baseline and coordinate systems may be effectively integrated, as may baseline and stationing, as may coordinate and traditional dimensioning systems.

Coordinate System

Overview

The coordinate system is composed of a grid oriented precisely north–south and east–west, which is used to locate points two-dimensionally. The grid is tied to a national, regional, or state grid system and is used to locate points in two-dimensional space. It is also possible to establish a site-based grid system, independent of governmental systems by using an arbitrary point of beginning on the site. Normally, these points are located on the site with satellite positioning systems, such as the Global Positioning System (GPS).

Northings identify points' locations along a north–south direction, and eastings locate points along an east–west direction. Northings and eastings do not locate a point vertically. These points are used to locate components and systems in the field. For example, points can be assigned to parking-lot corners, light-post centers and beginning and end points of walls.



Sample Coordinate System Graphics

Applicability

- Use this system when diverse or highly irregular project geometries exist and where a primary organizing element that could be used as a baseline such as a streetscape is not practical.
- Use this system where landscape design is less directly tied to a building(s), that is, is "floating" independent of strict building relationships.
- Use the coordinate system if a simpler system such as traditional dimensioning is not practical, and if the contractor is capable of using coordinate layout.
- Use this system where diverse topography complicates and increases chance of error with dimension-based layout systems.
- Use it for small-scale work, such as residential gardens; note that some contractors may not have skills or survey equipment to utilize a coordinate grid system.

Evaluation

Pros

The coordinate system is very efficient and simple for the landscape architect to apply. As a non-hierarchical system, it can be organized without a need for a complicated layout strategy.

The Coordinate System is very clean graphically, as it does not rely upon strings of dimensions and associated information.

Cumulative errors that would result from strings of dimensions that rely upon integration with one another are eliminated. Each coordinate point generally occurs independent of all other coordinate points and measurements. [7]

[7] "Strom, Steven, Kurt Nathan, and Jake Woland. *Site Engineering for Landscape Architects*. Hoboken, NJ: John Wiley and Sons, 2010, P. 299.

Cons

The coordinate system presents risky and poorly defined relationships to building systems, that is, where landscape points are "floating" independent of defined relationships to a building(s).

As a non-hierarchical system, the level of importance within the system is not well defined. As a result, critical dimensions and relationships may not be clear. It would be possible, for example, for the contractor to lay out a large extent of the project without realizing that there might be an overall problem with the layout, such as an unforeseen relationship to an existing street or building.

The system may not be so well suited to the layout of complex, nonorthogonal geometries, such as compound curves, because the cumulative and integrated organization of the layout is not clear. A traditional stationing system, such as that used for roadway layouts, may be better suited for this purpose. The stationing layout system relies upon establishing a starting point and a series of intermittent points to establish beginnings and ends of curves. A series of angles and distances complement the use of stationing points. The system relies upon a set of geometric and algebraic formulas, not described within his publication.

Protocols

Complement the use of coordinate system with "verify" and "typical" dimensions to ensure the layout intent and relationships to actual conditions. For example, where street lights are located with coordinates, typical dimension from back of curb must be included to verify the relationship.

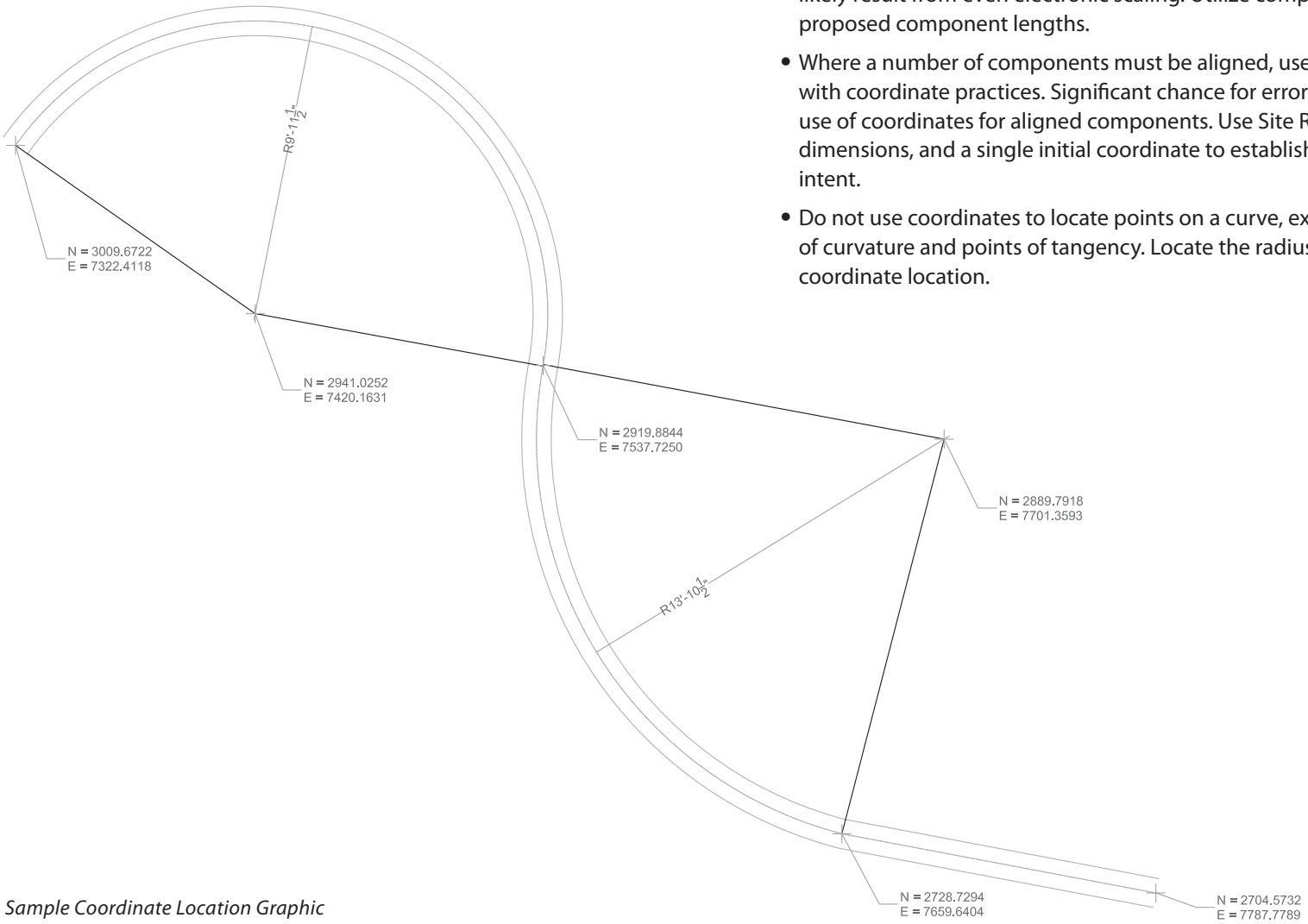
The coordinate system may be based upon a hypothetical grid imposed upon the site, only if U.S.G.S. grid network or regional or state grid is not available. In that case, a grid should be established based upon a benchmark located on a corner of the site, and two right angle baselines departing from the benchmark. The benchmark shall serve as the point of beginning and shall occur as Northing 0.0 and Easting 0.0. This point should be located in a corner of the property, ideally at a corner survey position.

A grid may be drawn very lightly on the Site Layout Plan, for orientation, graphically screened as background to the proposed site plan and layout information.

As a GPS-based system, the coordinate system does not rely upon an on-site monument for construction surveying and layout, because each point can generally be determined independently. It is recommended, however that the surveyor locate or establish actual reference monumentation on the site and verify the accuracy of that position. Fixed on-site reference monumentation can then be used as a survey and layout control tool. The surveyor should also confirm legal description(s) of the property from the deed.

Principles

- When locating an object, locate one corner of the object with a coordinate point. Do not locate more than one corner, but instead provide bearings to define plan orientation if not aligned with primary project orientation.
- If dimensions of components are not defined in details, do not attempt to dimension by digitally scaling from one point to another. Errors will likely result from even electronic scaling. Utilize computation to confirm proposed component lengths.
- Where a number of components must be aligned, use extreme care with coordinate practices. Significant chance for error exists with sole use of coordinates for aligned components. Use Site Reference Notes, dimensions, and a single initial coordinate to establish the alignment intent.
- Do not use coordinates to locate points on a curve, except for points of curvature and points of tangency. Locate the radius point with a coordinate location.



Sample Coordinate Location Graphic

Architectural Grid System

Overview

The architectural grid system utilizes the proposed building grid (usually column grid) system to organize and lay out proposed site construction. In this case, the architectural grid is usually extended into the site as column centerlines. These column centerlines are usually labeled with letters, numbers or an alpha-numeric combination. Architectural grid dimensions may vary between x and y directions, that is, the grid may not be square.

Site components are usually dimensioned perpendicular from the grid lines. Unless noted otherwise, the contractor will assume that components are located at 90 degrees from the grid lines. Two grid lines should be paired in perpendicular directions in order to establish layout devices along two axes.

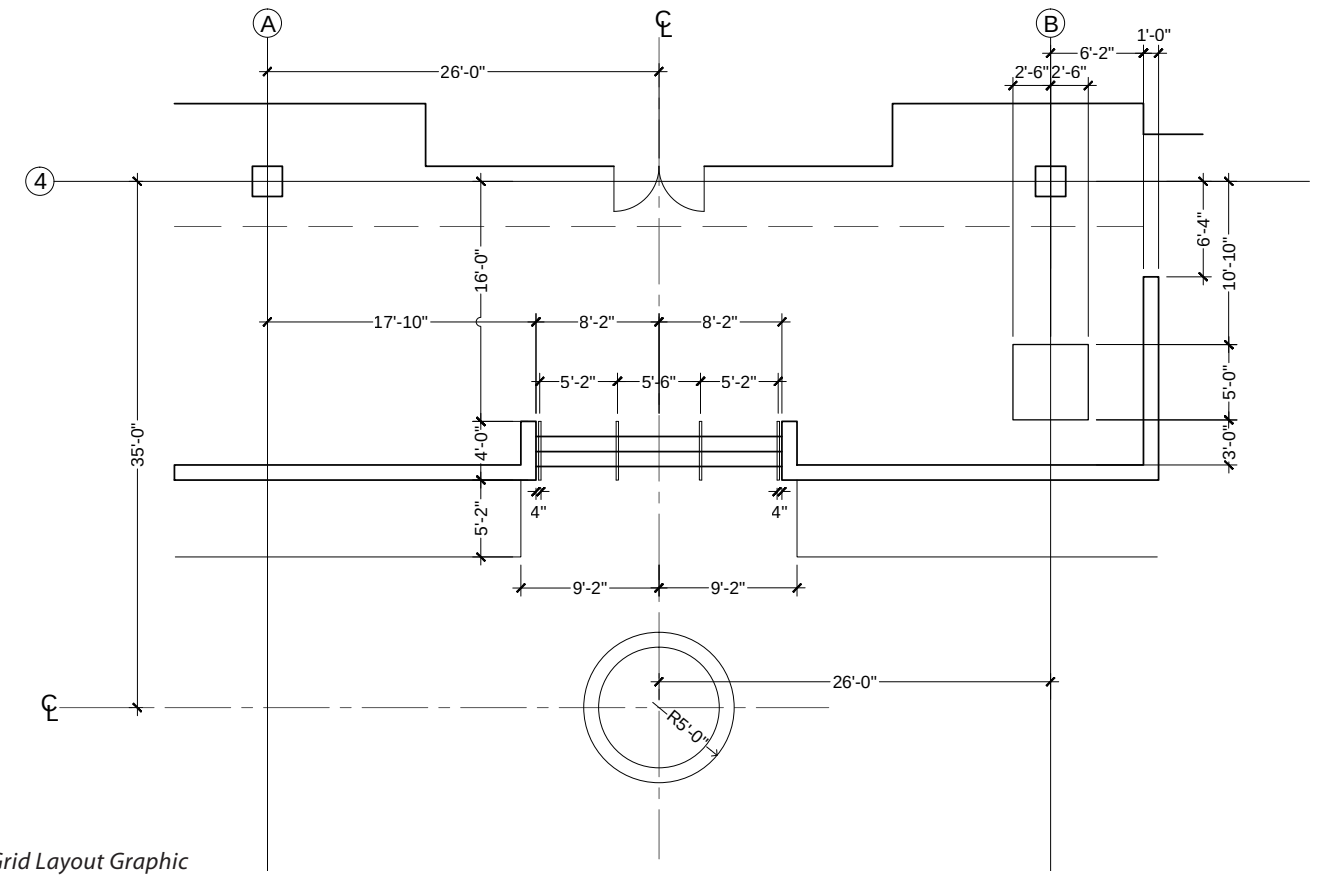
Applicability

Architectural grids are used where strict and integral relationships between building(s) and site systems exist, for example, with plazas organized as extensions of building lobbies. In these scenarios, building construction generally precedes site development, and consequently, site work can be laid out from the built column grid.

The architectural grid system is a preferred system when plan geometry is simple, is orthogonal, or is patterned to reflect building modules.

Protocols

The architectural grid system should be established initially by defining the architectural grid itself, on the Site Layout Plan. This system must be provided by the building architect and should not be graphically manipulated by the landscape architect.



Sample Architectural Grid Layout Graphic

It is important that centerlines be used to define the grid, rather than finished faces of columns, walls, and other elements, as these finished conditions can vary depending upon construction tolerances and, in some cases, field decisions.

The grid may also be used to establish either a baseline and/or point of beginning, which can be used for site layout. In this case, the intersection of two grid lines may be used to establish this point of beginning. The baseline should then be fixed to the point of beginning with a bearing angle, usually 90 degrees. The baseline may then be extended indefinitely into the site.

The landscape architect may use the architectural grid for layout both parallel to and perpendicular to the grid lines. To define locations along the length of the baseline, stationing points should be used. To define locations perpendicular to the baseline, dimensions, or strings of dimensions from the baseline should be used.

Evaluation

Pros

The architectural grid system is simple and typically clear, as it is derived from a single organizing element, a constructed building. The system is usually very efficient and simple for the landscape architect to apply. As a non-hierarchical system, it can be organized without a need for a complicated layout strategy.

The architectural grid system can work well for interdisciplinary layout coordination, such as between the landscape architect and architect to establish the interface between site and building systems, or between the landscape architect and structural engineer, where site development is tied to a structure such as a parking garage.

Cons

A layout hierarchy generally does not exist amongst the grid lines themselves. Without hierarchy, the relative importance of layout requirements is not clear.

The system may not be so well suited to the layout of complex, non-orthogonal geometries such as compound curves because the system is primarily used to indicate right-angle offsets from the established grid lines. The architectural grid system, however, may be used in combination with other systems to define non-orthogonal geometries. A stationing system, such as used for roadway layouts, may be better suited for this purpose. The stationing layout system relies upon establishing a starting point and a series of intermittent points to establish beginnings and ends of curves. The starting point may be located relative to the grid lines.

The architectural grid system is generally not used until building construction is well underway, for example, columns are constructed. That may or may not work with phasing and schedule requirements for site construction.

Baseline System

Overview

The baseline is simply intended to function as a primary organizing line from which proposed construction can be measured and located in the field. Components are usually dimensioned perpendicular from the baseline. Unless noted otherwise, the contractor will assume that components are located 90 degrees from the baseline. Two baselines should be paired in perpendicular directions in order to establish layout devices along two axes.

Applicability

The baseline organization is a preferred system when plan geometry is simple, orthogonal, or tied directly to a longitudinal organizing element within the plan.

Use when a primary organizing element exists, such as a roadway or readily identifiable feature such as a major building to remain on the site, with a central position relative to proposed site improvements.

The baseline system is preferred where strict relationships to building(s) are necessary. In that case the baseline can be developed as an extension of a building column grid line.

Protocols

The baseline(s) should be established as an actual line derived from two fixed points that are available prior to site construction. The contractor will stake the two fixed points and string the baseline between these two points.

A horizontal benchmark may be used to establish a point of beginning for the baseline. The baseline should then be fixed to the point of beginning with a bearing angle, usually 90 degrees. The baseline may then be extended indefinitely.

The landscape architect may use the baseline for layout both parallel to and perpendicular to the baseline. To define locations along the length of the baseline, stationing points should be used. To define locations perpendicular to the baseline, dimensions, or strings of dimensions from the baseline should be used.

The baseline system may be combined with a stationing system in order to reduce the number of running dimensions. For example, locations along the length of the baseline may be stationed, for example, 0 + 45.5, and located laterally with a dimension from the baseline. The combined system is preferred for linear work such as streetscapes.

The baseline may be struck as a centerline of a prominent component of the site design, for example, a primary walkway or promenade.

Choose logical baselines, that is, lines derived from a strong and evident position such as a building or street centerline.

Evaluation

Pros

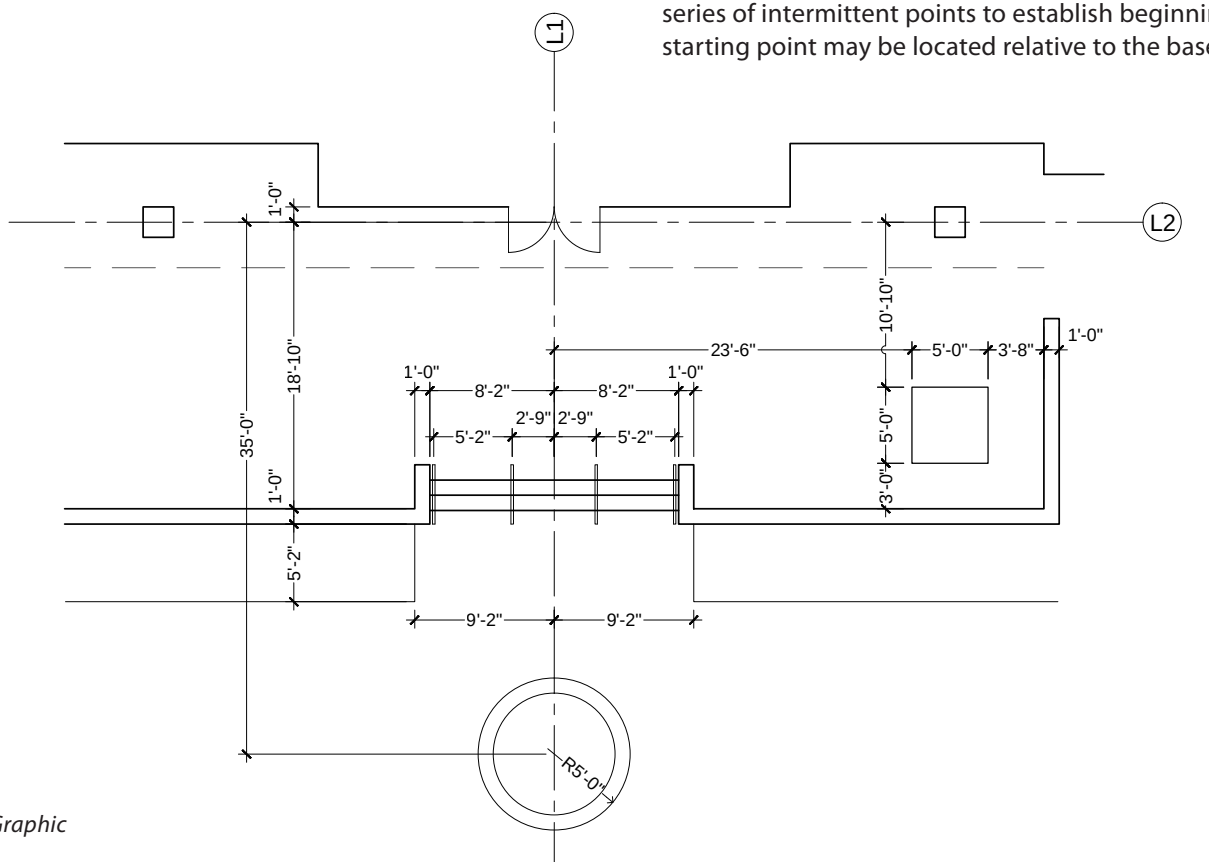
The baseline system is simple and typically clear, as it is derived from a single organizing element. The system is usually very efficient and simple for the landscape architect to apply. As a non-hierarchical system, it can be organized without a need for a complicated layout strategy.

The baseline system can work well for interdisciplinary layout coordination, such as between the landscape architect and civil engineer for a street project, or between the landscape architect and architect to establish the interface between site and building systems.

Cons

While the baselines serve as beginning layout locations, a layout hierarchy generally does not exist beyond the baselines themselves. Without a hierarchy, the relative importance of layout requirements is not clear.

The system may not be so well suited to the layout of complex, non-orthogonal geometries, such as compound curves, because the system is primarily used to indicate right-angle offsets from the established baselines. The baseline system, however, may be used in combination with other systems to define non-orthogonal geometries. A stationing system, such as used for roadway layouts, may be better suited for this purpose. The stationing layout system relies upon establishing a starting point and a series of intermittent points to establish beginnings and ends of curves. The starting point may be located relative to the baseline(s).



Sample Baseline System Graphic

Stationing System

Overview

Utilize baseline techniques described above. Baseline may be straight or curved. If curved, utilize a traditional bearing and angle layout technique, with a data summary chart. A stationing system is distinguished from a pure baseline in that the baseline normally positions points perpendicularly from the baseline, whereas a stationing system positions points along the length of the baseline.

Applicability

A stationing system is useful when combined with other systems.

As with the coordinate system, for small-scale work such as residential gardens, some contractors may not have skills or equipment to utilize a stationing system.

Evaluation

Pros

It is a simple, graphically clear system.

Cons

The contractor is required to compute distances between points, rather than read and measure distances.

Cumulative errors may occur along the length of the baseline.

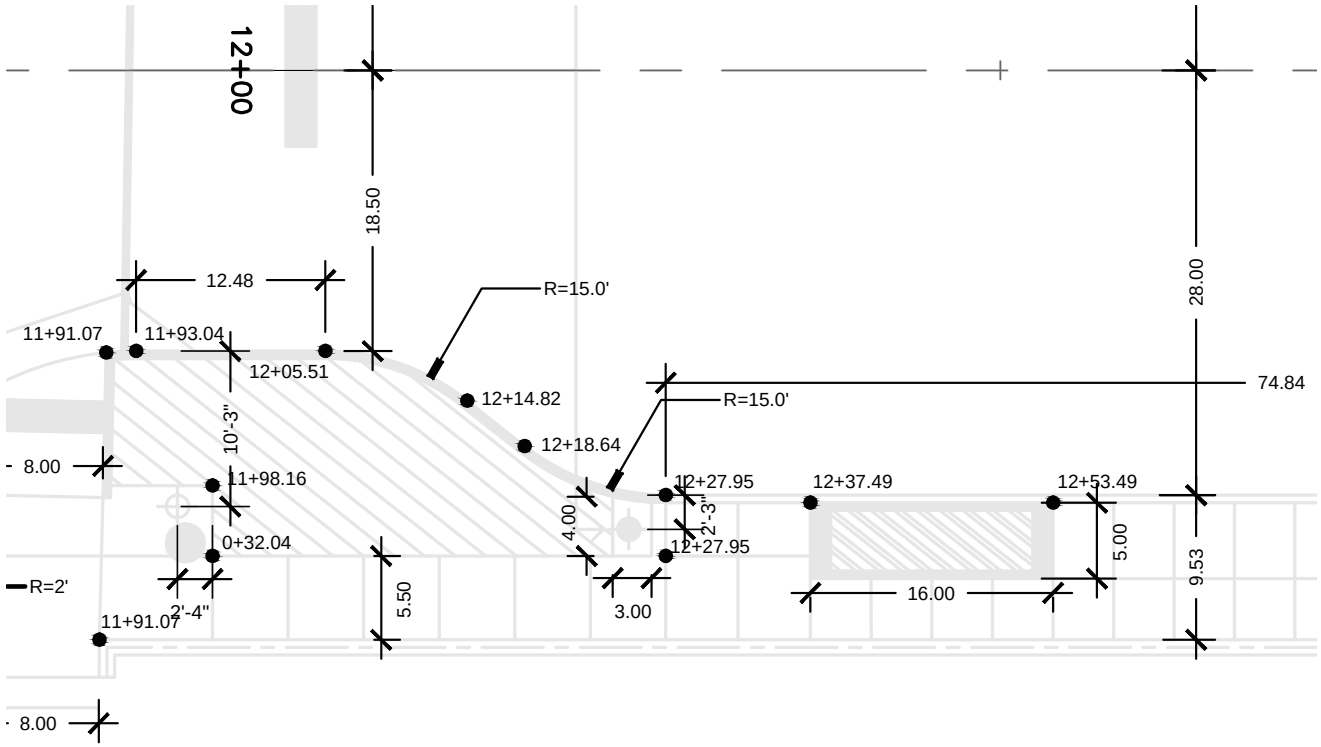
Offset System

Overview

The offset system establishes a uniformly spaced set of offset dimensions from a baseline. In that way it is similar to a baseline system but uses regular interval dimensions perpendicular to baseline. Offsets may be established from imaginary baselines or fixed existing conditions such as site walls.

Applicability

The offset system is used primarily to lay out individual components of a landscape architectural project and does not usually work well as the sole layout system for a project.



Sample Stationing Graphic

Use it for irregular conditions that require only semi-precise layout, such as metal edging or informal pathways or landscape beds. Minimize the use of this system.

Evaluation

Pros

It is simple and easy to use.

Cons

It does not present opportunity to select key layout points but only those that occur at the prescribed interval.

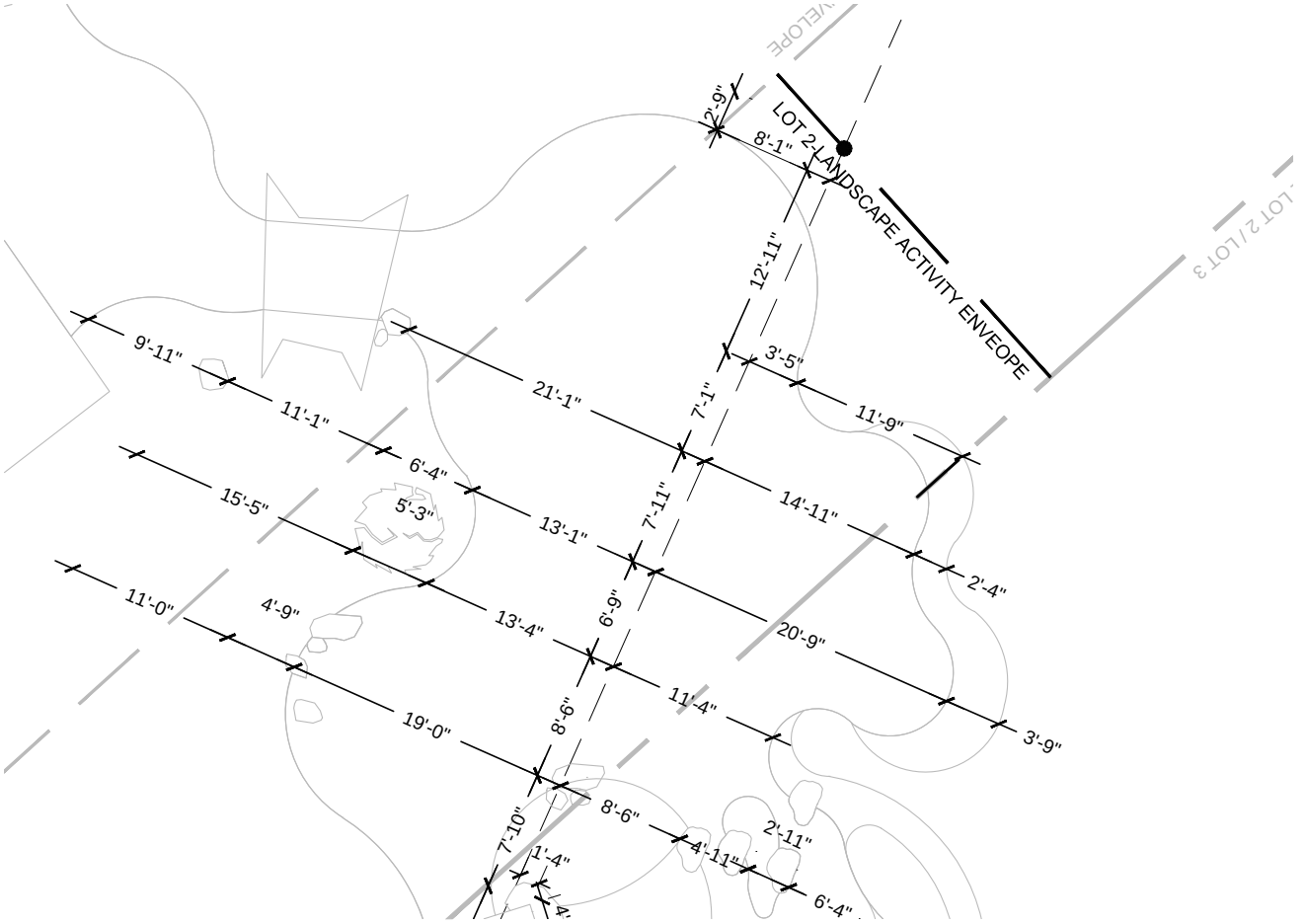
It is a crude system for radial layout because radius information is not provided.

The number of points used to describe shapes limits construction accuracy. Increasing interval spacing may increase accuracy but will not ensure smooth radial conditions. It is not recommended for most applications that require precise layout.

Traditional Layout with Dimensions, Radii and Reference Notes

Overview

Site layout can be accomplished by providing dimensioning and radius information for the entire landscape architecture program. Reference Notes should be used to supplement the use of dimensions to communicate nondimensional information such as alignment or equal spacing requirements.



Sample Offset Graphic

Importantly, dimensions will need to be tied to existing conditions from which the Contractor can measure, or from components that will be constructed in a sequence that allows these relationships to occur. For example, dimensions can be tied to a street or building which is constructed as part of the overall contract. Without these relationships, the proposed landscape is only "floating" in space, not anchored in a fixed location.

Applicability

Combine this system with a coordinate system or baseline system where readily available dimensions are advantageous to contractor.

Use it for simpler project types, such as residential work, where the contractor may not utilize sophisticated layout technology.

Use it where a direct relationship to building is available.

Evaluation

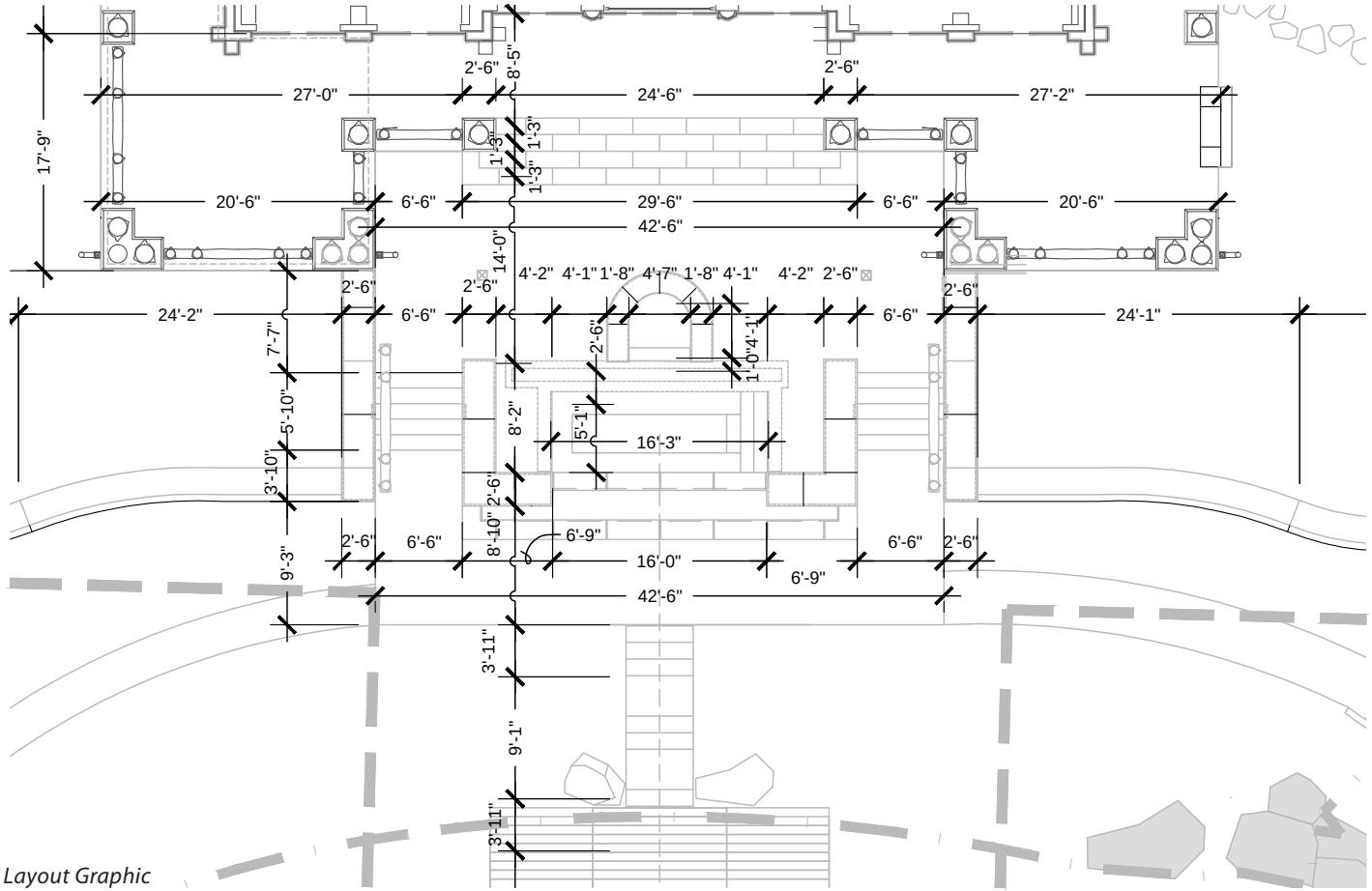
Pros

It is generally simple and easy to use.

Cons

It has no hierarchy.

There is no sequencing definition, for example, from point of beginning or baseline to associated layout information.



Sample Traditional Layout Graphic

Layout and Dimensioning

Layout Protocols

Point of Beginning: A point of beginning should be established on the project site. The point of beginning may be used as a starting reference point for site layout. The site layout point of beginning may be different from the survey point of beginning. In a metes and bounds survey, a point of beginning may likely be located from a known physical point within or near the surveyed site. For example, the center point of a street intersection may be used as a point of beginning. From that point, a corner of the surveyed property may be located with dimension(s). From there, the site boundary is established with a set of directions (angles) and distances, working around the edge of the property and returning to the original corner.

The landscape architect may use a number of approaches to establishing a point of beginning on the project site. The point of beginning should be convenient and accessible. Typical sources for establishing the point of beginning include:

- An existing benchmark, for example, a property-line corner—locate the point of beginning with dimensions from this corner.
- Existing building or other prominent site feature—dimension point of beginning from the building face, column grid, or building corner.
- All components should be dimensioned from a known reference point, for example, a building grid, building-based baseline, or coordinate point. All dimension strings must be tied to reference point, baseline or gridline.

Note that if a coordinate system is used for layout, the point of beginning will not be necessary, as all points will be located individually.

Reference building grid lines for site layout.

Hierarchy: A site layout dimensioning hierarchy should be established in order to define the most important or key information. The hierarchy, from most to least important is as follows:

1. Baselines and points of beginning
2. Central and evident
3. Tied to established reference point
4. Establishes relationships to majority of site dimensions and layout information
5. Baselines labeled, for example, "Baseline A," "Baseline B"
6. Overall dimensions of spaces
7. Locations of components
8. Sizes and shapes of components not described in details, for example, decks and plazas.

Dimensioning Protocols

Note dimensions in architectural scale (feet and inches), for example, 6'-4." Where a dimension is less than 1 foot, note dimension in inches only, for example, 8", not 0'-8". Do not use fractions less than 1/8" for site layout—site work construction tolerances are limited to this threshold. Show fractions with a diagonal slash, for example, 3/4". Engineering dimensions (feet and tenths) are generally not used for site scale layout plans. When metric dimensions are used, define these dimensions to the hundredths unit, for example, 12.35 meters.

Use actual instead of nominal dimensions, except for masonry applications such as stone paving. Nominal masonry dimensioning will allow flexibility with sizing joints. Masonry shop drawings must be completed with actual dimensions. Actual dimensions are measured to the finished edge of fabricated components. Nominal dimensions are used in the construction industry to refer to rounded dimensions, sometimes the prefinished dimension, for example, with lumber. For example, a wood stud is generally referred to by its nominal dimensions, a "2 by 4." Actual dimensions for the 2" x 4" are 1½" x 3½".

Label angles in degrees and minutes, for example, 17' 37". Denote angles with arrowheads, not dimension ticks.

Note "typical" dimension once in each line of a string of typical dimensions, or where repetitive use is commonly understood, for example, dimension to center of light from face of curb. (It is not necessary to label "typical" for every dimension in a set of typical conditions.) It is recommended that the stated typical dimension be included in only one location on each Layout Plan sheet, positioned in a prominent location so that the dimension can be readily found.

Note "equal" dimensions where consistently even spacing is required between points in each line of a string of equal dimensions. Either note "Equal" with the dimension once, with an accompanying "Typical" note, or note by enumerated equal "parts," for example, 14 Equal, 2 Equal. Include overall dimension in string.

Locate radius points (not floating) with dimensions or coordinate points, unless the radius point is clearly identifiable as part of a continuous alignment such as a simple sidewalk condition.

Do not cross dimensioning lines or extension lines. Break dimension lines where they must cross one another. Break dimension or extension line of lower priority, that is, smaller dimension farther from subject element. (Note that the landscape architecture firm's CAD standards may not allow automated dimension breaking. As a result, this technique is not currently practical.)

Use Northings and Eastings to locate construction points per the landscape architect's CAD standards. Include an abbreviation to identify the point, for example, RP (radius point) or CP (control point) for other points such as wall corners. In some cases, a brief annotated description may be necessary, for example, "Center of inlet at low point." Identify points in decimals to one-hundredths. Align northing and easting information in columns, as noted:

N=4899.43
E=5327.56

Use "verify" dimensions only at end of string of dimensions where final relationship to building or other component must be confirmed prior to construction, OR use verify to confirm overall work area dimensions, for example, existing right of way, or distance between buildings.

Where extensive radial conditions are proposed, such as walls or walks, organize layout information in a chart. Identify each wall or walk with a reference number, and provide curve reference numbers (may be more than one curve), radius point locations, radius lengths, curve lengths, tangent point locations, and lengths. Provide wall references on plan in rectangular block. Transitions from curve to curve, or curve to tangent marked with 1/4" long tick, perpendicular to the curve or tangent.

Dimensions should be given between centerlines, between surfaces, or from edges to centerlines. Organize all dimensions to face of walls at proposed grades, not to centerlines of walls. Site work should generally be dimensioned to finished faces of constructed components such as walls, curbs, or steps. Dimension to centerlines of columns, grid lines, lights, center-based site furniture, trees, railings, and pavement joints.

When laying out battered walls, dimension to finished face of wall at proposed finish grade, in applications where grade does not vary dramatically along the wall face. For applications where finished grade does vary dramatically, dimension wall to edge of cap or top of wall, and include Site Reference Notes to highlight intent. For stone veneer walls with irregular finish, maintain dimension to finished face of wall but include a general note indicating that the dimension represents the average location at the irregular veneer.

Graphic Requirements

Intent

The Site Layout Plan graphic is intentionally spare in order to allow layout annotation to read clearly. Recall that the Site Layout Plan is intended to work in tandem with the Site Materials Plan, where all materials, components, and systems are graphically rendered to vividly contrast these systems. Where the Site Materials Plan uses symbols, patterns, and Site Detail Keynotes to communicate these elements, the Site Layout Plan utilizes area outlines and a series of dimensions and Site Reference Notes to locate the landscape architecture program.

A graphic hierarchy should be developed to define the layout system and direct the reader to its physical origin, or in some cases, point of beginning. Focus on baseline or primary dimensions to place emphasis on key organizational intent.

General

- All elements are **drawn to scale** (no diagrammatic symbols), for example, furnishings, drainage structures, and lighting.
- All proposed elements are **depicted where the base meets the grade** (for example, battered walls) and at the widest projection (for example, at the cap if battered or cap overhang is proposed). Distinguish components that meet grade from above-grade components by dashing above-grade components.
- **Ground plane structures should be distinguished from above- or below-grade components.** Below-grade components are shown with a screened dash; above-grade (overhead) components are shown with a full-tone dash. Delineate all subgrade architecture and overhanging floors and roof lines.
- Pavement jointing and other **materials beneath surface-mounted components,** such as site furniture, are shown graphically uninterrupted for clarity of intentions.

Plan

Existing conditions, if desired may be graphically screened a maximum of 50 percent of the original unaltered survey, in order to better highlight layout requirements. The landscape architect may also elect to incorporate existing conditions at full value, if that better serves graphic objectives. Note that the survey base should be adjusted to reflect demolition and tree removal changes to the site, that is, these items should be removed from the base plan.

For the base plan, utilize greatly simplified illustration of proposed site plan improvements, with steps, walls, and other level changes. No pattern symbols should be used to distinguish materials. However, paving pattern starting or resetting locations may be required to be graphically depicted for clear direction. Proposed improvements may also be graphically screened in order to better highlight layout requirements.

Limit of project scope of work line represented by an equally spaced dashed bold line, with a "Limit of Work" note. Consider screening this line to distinguish it from the matchlines that separate sheets.

Sheet matchlines are used to identify the relationship of the subject plan sheet to the immediately adjoining plan sheets, with label that reads "Matchline (Refer to Sheet L4-*xx*)." Show a consistent, but minimal, dimension of work outside the matchline, for example, 1" on a full-sized sheet. Overlapping will help to orient the reader to adjoining sheet relationships (see *Graphic Requirements* below).

The line-weight hierarchy, from lightest to heaviest, is intended to distinguish three-dimensional components, material changes, and jointing, and allow layout information to read well. The hierarchy should be rigorously applied to distinguish three-dimensional components, material changes, jointing, symbols, and instructional annotations. The line-weight hierarchy is:

1. Screened survey base showing existing conditions, including subgrade conditions.
2. Jointing within a material system*.
3. Material systems (edges or changes from one system to another).
4. Level changes, three-dimensional components, changes in plane.
5. Layout and dimensioning guidelines, leader lines, extension lines, centerlines.
6. Building and structures.

*Within the overall line weight hierarchy, a subhierarchy may be established for proposed construction jointing, like at pavements and walls. For example, at cast-in-place concrete pavements, a line-weight hierarchy and/or line type selection may be used to distinguish expansion joints, construction joints and control or score joints.

Consultant improvements are shown screened or full bleed, depending upon importance of relationship to landscape architecture improvements. Work by others should not be graphically symbolized (patterned), but should be copied directly from collaborating disciplines drawings.

Ground plane (on-grade) structures are shown distinguished from above- or below-grade components. Below-grade components (utilities, subgrade structures, etc.) shown with screened dash, on-grade components shown with full-tone solid line, and above-grade components (building overhangs, trellises, etc.,) shown with full-tone dash. Include delineation of all subgrade architecture and overhanging floors and roof lines.

All proposed on-grade or above-grade utility structures and components are shown for reference and conflict identification; they are shown precisely as they are illustrated on civil engineer's or other consultant's drawings.

Component symbols and ground plane area outlines only are used on the Site Layout Plan to distinguish and define the limits of materials and components. The DD Site Layout Plan is not developed for illustrative intent. Hatches and other patterns should not be used to define plan areas. Component symbols, however, such as those used for furnishings, lights, and utility infrastructure should match those used on the Site Materials Plan. All these elements should be drawn to scale (no diagrammatic symbols).

Site Reference Notes, as necessary to describe where to locate the proposed program elements. Site Layout Reference Notes may be used to describe the origins of the utilized layout system or other components of the plan that may affect or correlate to the proposed program.

Dimension lines, extension lines, and "ticks" are used per the landscape architect's CAD standards. "Dimension and extension lines are used to identify the distance between two points. A dimension line ties two extension lines together. Extension lines extend at a right angle from the dimension line to the face, edge or centerline of an object and establishes the limits of the dimension line. Extension lines should not be used as dimension lines except where they are used as offsets from a baseline."[8]

Ticks are also referred to as "tick marks" or "tick symbols" and are used to highlight the dimensioned length by marking the intersection of the dimension line and extension line.

[8] "Strom, Steven, Kurt Nathan, and Jake Woland. *Site Engineering for Landscape Architects*. Hoboken, NJ: John Wiley and Sons, 2010, P. 294.

Additional Graphic Protocols

Dimensions should read from the bottom or right side of the sheet. Space parallel dimensioning lines equally, 3/8" apart.

Arrange dimensions that pertain to a particular element or area in a grouping to display associated dimensions. Organize these dimensions in a nested format so smallest dimensions occur closest to the dimensioned element or area, and cumulatively larger dimensions occur farthest away. Always include an outermost dimension to indicate the total cumulative dimension.

The **building footprint** is graphically portrayed to reflect specific project needs. In most cases, the building will be shown in a simplified way, with perimeter walls only, in order to place graphic emphasis on landscape-architectural improvements. In some cases, it may be important to show doors and windows, and maybe even the interior program. If interior conditions are shown, they should be graphically screened. In other cases, it may be useful to include the column grid, for potential relationships to site work. Column grid relationships are most important to show on the Site Layout Plan.

Pavement materials are distinguished with an outline at each change of material. Include distinctions between pedestrian and vehicular systems within the same pavement material. Material hatches should be provided on the Site Materials Plans and patterns described in enlargement plans, sections and elevations within Site Details. Note, however, that starting or resetting points may be referenced as indicated earlier.

Concrete pavement joints, for example, expansion joints, are distinguished from control joints. Note that concrete joints are shown for reference on the Site Materials Plan, but the Site Layout Plan defines joint locations, either dimensionally and/or with the use of Site Reference Notes.

Diverse symbols should not be used to identify various joint types, for example, sand-swept joint, grout joint, and so on. Instead, pavement and jointing details should be used to identify joint systems, and they must be properly keyed on the Site Materials Plan. Concrete expansion joints and control joints should, however, be distinguished.

Curb and ramp types are distinguished with outlines and jointing, and dimensioned either on the Site Layout Plan or within the site details for said system.

Wall types are distinguished with outlines and accurate wall thickness. Include wall cap jointing, with the intended relationships to pavement jointing or other components. Graphically distinguish the wall cap from the face of wall if the cap overhangs the wall face. A dashed line may be used to represent the wall face below the cap.

Handrails and guardrails should be drawn accurately, that is, with the top and bottom extension at stairs, distance from face of wall. Stair handrail and guardrail post locations should be clearly symbolized.

Site furnishings are depicted with a readily identifiable symbol, shown to scale and precisely matching symbols legend.

Planting areas are defined generically with a consistent hatch or other symbol and identified with "PA" for "Planting Area," but only when integral to the hardscape design. Detailed landscape materials, for example, planting, mulch, subdrainage should not be shown. That information should be shown on Planting Plans. Note that trees may be shown on Site Layout Plans where they occur in hardscape conditions, for example, at streetscapes and plazas. These trees should be graphically screened and reference noted.

Best Practices

Design

Integration

The Site Layout Plan is the ideal document to establish a highly resolved and integrated detailed plan, where relationships between pavement jointing, wall jointing, railings, and furnishings are established. These designed relationships should be largely resolved at the Design Development phase. In practice, the Site Layout Plan should be used to confirm and depict decisions made on the Site Materials Plan.

As a two-dimensional depiction, the Site Layout Plan is not an ideal medium for resolving certain three-dimensional relationships. For example, two graphic "dots" on a street corner may not look so significant or important on the plan. In the field, however, these elements may be built, for example, as a poorly resolved conflict between a light pole and traffic signal pole. These types of relationships should be studied in a three-dimensional format. That process requires the landscape architect to depict all elements in two-dimensional format for three-dimensional study, then to define well-resolved contractual requirements for siting these elements.

Develop preliminary layout strategies for pavement patterns such as those required by unit paving. While this exercise results in a documentation approach, the focus is on well-resolved design intentions.

Field Review

Design Development Layout intentions should be evaluated on site with a field visit. Mock up the primary layout organization with stakes, flags, or other devices in order to evaluate position, scale, and relationships to existing conditions.

Coordination

Interdisciplinary

Review and coordinate layout strategy with consultant team to eliminate redundancies and conflicts. Site layout developed by the landscape architect should interface logically with civil layout and potentially, building layout systems. For example, a landscape architectural streetscape may be laid out off a civil road centerline stationing system.

Coordinate site lighting with the electrical engineer. Locate lights, and identify conflicts.

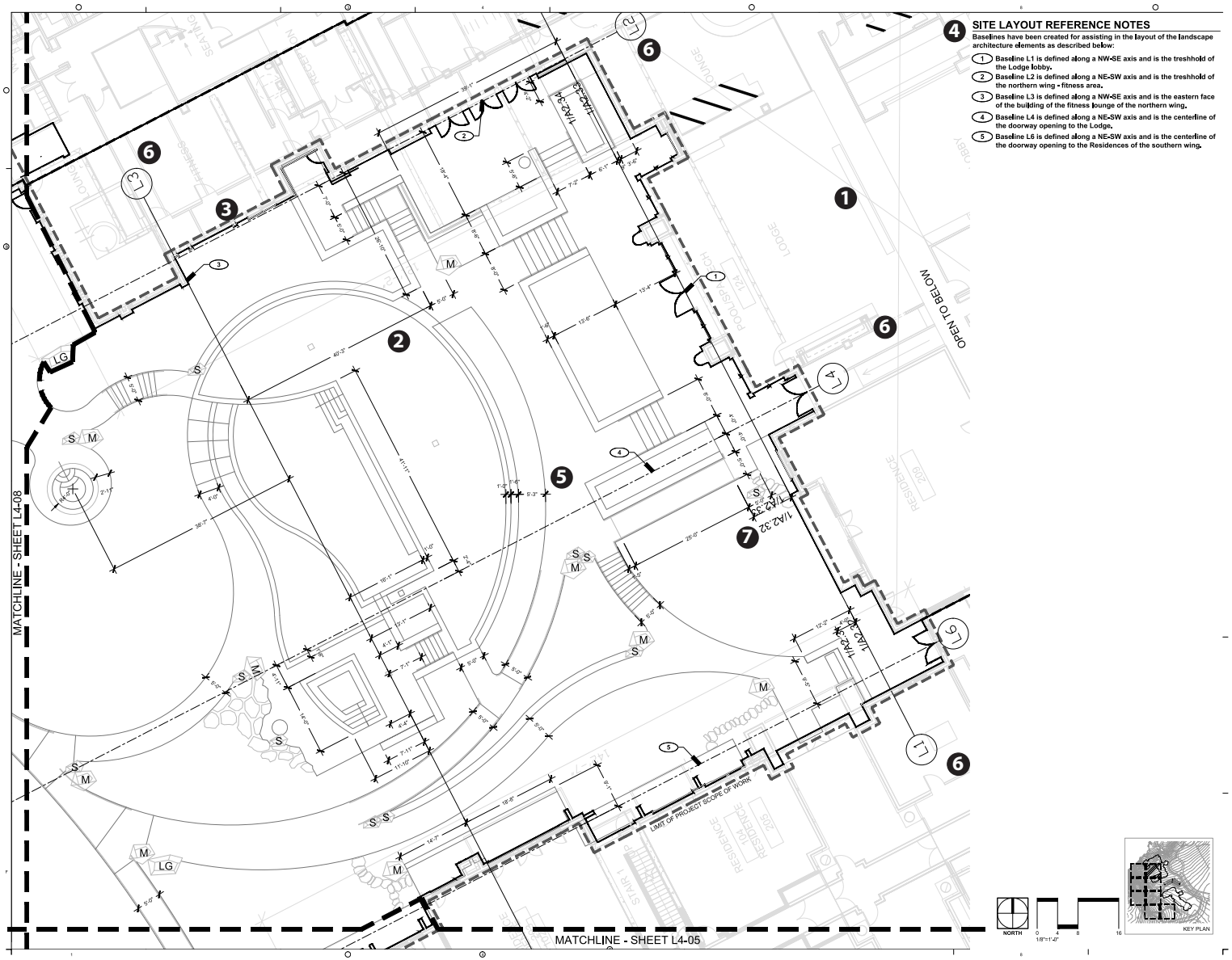
Technical

Remember that the Site Materials Site Plan graphically itemizes the full site improvement program and uses Site Detail Keynotes to direct the contractor to associated construction details. The Site Layout Plan defines the horizontal, two-dimensional positioning requirements of the project program. The Site Grading Plan defines the three-dimensional positioning requirements. As such, these three plans require careful and methodical coordination. It is recommended that the quality control review place emphasis on the relationships between these several plans.

Consider combining the Site Layout and Materials Plans only on simple projects, where the complexity of the project is limited and/or where the documentation fee is extremely limited.

Use the landscape architect's standard and automated CAD dimensioning tools.

Example of a DD Site Layout Plan



LEGEND

SERIES REQUIREMENTS

1. Survey Base Sheet
2. Proposed Site Improvements
3. Limits of Work (if able to define) or Limits of Project Scope of Work
4. Site Reference Notes (for example purposes only, should be project specific)

SERIES REQUIREMENTS

5. Traditional Layout with Dimensions, Radii, and Keynotes
6. Baseline System
7. Offset System

Other items that may be provided, but are not currently depicted, if the project requires it, include:

–Coordinate System

–Architectural Grid System

–Stationing System

*Note: This sample depicts only the drawing area for this sheet. For title block requirements refer to preceding Title Block section.

CONSTRUCTION DOCUMENTATION SITE LAYOUT PLAN

Objective

The Construction Document Layout Plan contractually locates the two dimensional positions of all elements designed by the landscape architect, relative to some known point or points, coordinating the relationships of these components to those designed by others.

General Requirements

The CD Layout Plan comprehensively locates and dimensions the configuration of all proposed features such as roads, parking, walks, paving, steps, walls, and other site elements, including site furniture. The layout method established at the DD phase is fully developed, but with an emphasis on hierarchy and sequencing.

The CD Layout Plan also provides a comprehensive set of rigorously developed Reference Notes, communicating all the detailed instructions for positioning the contractual program.

Layout information (dimensions and notes) are intended primarily to instruct the contractor how to position the project. This information is also used for quantity takeoffs for estimating and bidding, and for quality control review for potential layout conflicts.

The CD Plan should be used to resolve all layout coordination needs between landscape architecture and other disciplines, that is, potential conflicts and relationships. Key relationships to civil, architectural and other applicable layout systems should be fully resolved at the CD phase.

Specific Requirements

- **Final limits of the project scope of work**, as agreed on by landscape architect, civil engineer, contractor(s), owner, and contractor, if applicable. Note that the DD limits of project scope of work may be revised as they are better informed at the CD phase.
- Fully developed **Site Reference Notes**, with annotated descriptions of positioning, extent or other layout requirements. In many cases, Site Layout Reference Notes may supersede the need for certain dimensions, for example, if an element should be aligned with another element, then use a reference note to state that requirement, rather than provide a dimension that may not result in the intended alignment. The Site Layout Reference Notes may describe layout actions, for example, align, locate, relocate, center, remove, verify, coordinate, provide, and begin. Use Site Reference Notes liberally, but with precision.
- **Overview/brief description of layout system organization**, for the contractor's reference. Include in Series Specific General Notes as required.
- **Subgrade improvements,** including wall footings, vaults, and other subgrade foundations. Note that these components may not have been resolved at the DD phase.

Buildings

If proposed building(s) are to be located on the Site Layout Plan, locate the building(s) from a survey-established point of beginning or reference line.

Pavements

Concrete Pavement Jointing Patterns

Pavement expansion, control and score joints, graphically distinguished and dimensioned (refer to *Best Practices* information). In some cases, expansion joint spacing may be defined in specifications, although plan definition is preferred.

These joints should also be shown on the Site Materials Plan but dimensionally defined on the Site Layout Plan.

For over-structure construction, always locate major expansion joints, for example, between building and parking garage, in order to coordinate relationship to surface jointing. Locate additional subgrade joints at substructure or topping slab below finish course only when coordination with surface jointing is necessary. These relationships are rarely necessary.

Stairs

Include stair pavement jointing, for example, cast-in-place concrete, stone or precast concrete clad. Include intended jointing relationships to adjoining pavements. Stair jointing is often overlooked on Construction Documents, and results in inadequate or poorly coordinated joint layout. Also include pavement-wall jointing relationship intentions, with reference-noted descriptions, for example, "Align pavement control joint with wall joint, typical."

Walls

Horizontal layout information should be included for the beginning and end of walls, and changes in wall direction. Note that wall elevations are used to communicate locations where top of wall steps in elevation and where top of wall may change in slope.

Provide jointing and layout information at wall cap units, unless clearly and fully depicted in wall elevations. Cap delineation on walls is typically easier to read on plan drawings than on elevation drawings. Cap information is usually best communicated in enlargement plans. In many cases, a typical cap size will be established on the wall detail, together with a requirement for the contractor to submit shop drawings delineating each cap unit, including nontypical sizes.

Walls are depicted graphically where base of wall meets grade, and at the cap if wall is battered or cap overhang is proposed. Distinguish components that meet grade from above-grade components by dashing above-grade components.

Walls should be located to a finished face.

Site Furniture

The location of all fixed site furniture should be identified. On most occasions, site furniture should be located to the center of the element. Where centers of furniture elements are not evident, and where edge relationships to adjoining elements are important, provide layout information to outermost face of element.

Site furniture should be positioned in relationship to adjoining pavements, walls curbs, or another landscape architectural component. It is acceptable and desirable to locate site furniture in relationship to these elements, even though these elements may be located themselves on the same plan. This layout strategy relies upon a hierarchical and sequential construction process, for example, where walls, curbs, and pavements are constructed prior to the positioning of site furniture. It would not be appropriate to locate elements off other elements which are likely to be constructed after the subject elements, for example, site walls should not be located off proposed site pavements.

In some applications, for example, at streetscapes, site furniture will be positioned in consistent and reoccurring locations. In that case, provide typical layout information only, in one to two instances per sheet.

Include the general location and quantity of nonfixed site furniture such as tables and chairs, for quantity confirmation and general siting parameters.

Railings, Fences, and Metal Work

Show handrails and guardrails, drawn accurately in plan, that is, with the top and bottom stair extension and distance from the face of the wall. Stair handrail and guardrail post locations should be shown with clear symbols. No dimension/layout information is to be provided if components are fully dimensioned in section and elevation drawings. Railing and post information is usually best communicated in enlargement plans.

All fence post locations are shown, including gate posts, dimensioned to centers.

Component symbols such as drains and furnishings, are drawn precisely to scale, coordinated with adjoining systems.

Show pipe sleeves located beneath pavement where necessary.

All metal or steel landscape edging is shown. Note that metal edging is commonly installed by a landscape contractor and should be shown on the Planting Plan also, for reference. Layout information should be provided on one plan only. Include metal edging on the Site Layout Plan if layout complexity or relationships to hardscape require emphasis.

Site Lighting

Provide site lighting layout on the Site Layout Plan only if the Site Lighting Plan series is not provided. Otherwise this information will be shown on the Site Lighting Plan. Locate all lights to the center points of standards or fixtures, or an element that meets the ground such as a pole. If a light product design changes slightly, or the installed size varies slightly from that shown on the drawing, the centering strategy will likely still work.

Reference wall elevations or other applicable drawings, for vertical positioning of lights shown in plan.

Define the intended relationships to other work, including wall and pavement jointing, with Reference Notes.

Planting

Include the planting (tree) layout only where strict relationships to hardscape components are required.

Define layout requirements for subgrade tree trenches, if used.

Streets and Parking

Typically, these are defined by the civil engineer and are not included within the landscape architectural scope of work. If the landscape architect is responsible for street and parking layout, refer to *Best Practices, Strategies, Civil Layout* below.

Systems not Applicable on This Plan

A limited number of site systems should not be included on this plan, including underground utilities; plants; detailed irrigation infrastructure, for example, spray heads; elevation information; and when defined on a separate plan, site furnishings.

Graphic Requirements

Plan

Concrete Pavement Joints: Control joints are shown as single lines, per noted line weight hierarchy. Expansion joints are shown as bold single lines, per noted line weight hierarchy, and at interface between all pavements and fixed structures, unless not required. Score joints are shown as a lightweight single line.

Curb and Gutter Jointing: This is shown with dimensions and intentions for relationships to adjoining pavements and features such as lights. Control joints are shown as single lines, per the noted line-weight hierarchy. Expansion joints are shown bold.

Handrails and Guardrails: All guardrails, handrails, and other railings are shown with both top rail and post locations defined. Note that Enlargement Plans and elevations may be necessary to supplement information provided on the Site Layout Plan.

Wall Cap Jointing: Wall cap jointing, for example, between stone or precast concrete units, is shown with simple lines, lighter line weights than edge of wall cap.

All metal or steel landscape **edging** is shown as bold, dashed lines and laid out with dimension and curve information. In some cases, for improved legibility, the landscape architect may choose to mark the lines with "ED" at logical intervals. This symbol should be identified on the Symbols Legend.

Best Practices

Coordination

Interdisciplinary

For strictly interdisciplinary elements such as water features, art pieces, and architectural and structural elements, use the Site Layout Plan review and coordinate detailed layout requirements and spatial needs with associated consultants.

Note that the DD Site Materials Plan, not the Site Layout Plan, is the most useful medium to coordinate relationships with closely aligned disciplines such as the civil engineer. For example, the Site Utility Plan should be electronically overlaid with the Site Materials Plan to identify conflicts. Conduct utility coordination work session with civil engineer prior to the completion of the Design Development phase. The conclusions of these coordination exercises should be documented on the DD Layout Plan.

Technical

If practical, establish a working relationship with the General Contractor in order to coordinate the technical viability of the intended layout system. For example, a GPS-based coordinate system will require that the contractor utilize a GPS system, including a data collector and survey controller. On occasion a contractor may apply his own layout system, for example, by utilizing the consultant's CAD file to establish a coordinate layout system.

Cast-in-Place Concrete Jointing

The Site Layout Plan is the primary reference for layout of cast-in-place concrete jointing. Concrete jointing serves a critical role in the performance and durability of the concrete pavement system. A number of principles have been developed to guide the proper organization and layout of the jointing systems.

Concrete Joint Types

Expansion joints or isolation joints are full-depth joints that "separate or isolate slabs from other parts of the structure, such as walls, footings or columns; and driveways and patios from sidewalks, garage slabs, stairs, light poles, and other points of restraint. They permit independent vertical and horizontal movement between adjoining parts of the structure and help minimize cracking when such movements are restrained."[9]

Expansion joints are greatly overused by landscape architects and should be spaced no less than 50 feet on center. Several ACI documents state that expansion joints are seldom, if ever, needed in concrete pavements. The *Guide for Design of Jointed Concrete Pavements for Streets and Local Roads* (ACI 325.12R-02))") states:

> Performance studies have indicated that expansion joints are only necessary at relatively fixed structures such as a light pole footing and drop inlet boxes. In the past, designers placed transverse expansion joints to relieve compressive forces in the pavement and to limit blowups. In many cases, however, the expansion joints allowed too much opening of adjacent transverse contraction joints, which led to loss of aggregate interlock and sealant damage. By eliminating unnecessary expansion joints, adjacent contraction joints will remain tight and provide good load transfer and joint effectiveness.

Joints in Concrete Construction (ACI 224.3R-95) states that expansion joints are no longer used in mainline pavements, except that expansion joints with dowels for load transfer are used at bridges. A reference explains this as follows:

[9] *Joints in Concrete Construction*. American Concrete Institute ACI 224.3R.

> At one time, blowups were a major consideration for joints in highway pavements. These typically occurred when incompressible materials entered unsealed joints, often in the winter when joint widths were greatest. In summer, the pavement expanded in response to daily and seasonal temperature changes. For a joint containing incompressible material, compressive stresses developed that led to failure in some cases. Properly designed pavements with sealed and maintained joints are not susceptible to blowups. True expansion joints in pavements are needed only in very unusual conditions of construction or with unusual materials.

The *Guide for Design and Construction of Concrete Parking Lots* (ACI 330R-01)" states that, while isolation joints are sometimes referred to as expansion joints, they are rarely needed to accommodate concrete expansion. When contraction joints are properly spaced, the use of expansion joints should be limited to the role of isolating the slab from other structures or fixed objects.[10]

Contraction Joints, or Control Joints are "intended to create weakened planes in the concrete and regulate the location where cracks, resulting from dimensional changes, will occur." These are typically 1/4 to 1/3 the depth of concrete slab thickness.[11]

Construction joints are "surfaces where two successive placements of concrete meet. They are typically placed at the end of a day's work but may be required when concrete placement is stopped for longer than the initial setting time of concrete. In slabs they may be designed to permit movement and/or to transfer load. The location of construction joints should be planned. It may be desirable to achieve bond and continue reinforcement through a construction joint."[12]

Concrete Jointing Layout: Rules of Thumb

Control joints should be spaced no greater than 2.0 times the thickness of the concrete translated to plan feet. For example, 4"-thick concrete should be jointed at 8'-0" maximum spacing. Some suggest that the thickness multiplier could be as low as 1.5, or as high as 2.5 times the thickness as a plan joint spacing rule of thumb. Larger scaled spacing may result in shrinkage cracking.

Approximate square patterns; never exceed length to width by more than two times. For example, a 2'-0"-wide band should not be jointed at more than 4'-0" on center. Long rectangular units are susceptible to mid-length cracking.

Establish a continuous network or grid. Avoid discontinuous or "T" conditions. The lateral energy and momentum of the control joint often results in a cracking extension through the "T" joint.

Avoid acute angled jointing patterns. They tend to fracture near the apex of the triangle. Seek angles at least 60 degrees where 90 degree angles are not possible.

Hit (connect joints to) all corner conditions, for example, columns, drains, and wall corners. These areas are susceptible to cracking without the use of control joints.

Avoid small pieces of concrete susceptible to cracking. These units may not hold enough mass to perform adequately. When a uniformly spaced jointing pattern results in small leftover pieces, incorporate these units to the adjoining unit by removing the joint.

Strategies

Construction Layout Coordination

In developing a site layout system, it is useful to envision how the project will likely be built and how the contractor will approach the site layout. The contractor should be able to work through the Site Layout Plan sequentially, moving from one layout instruction to another. Primary organizing instructions should precede detailed instructions. Most all Site Layout plans require a beginning point, line, or similar reference, such as a point of beginning or baseline. The baseline should include a point of beginning, as discussed previously.

It is also potentially useful to determine the likely means of construction layout. Will the contractor use a laser survey system, tape-dimensioned stakes, GPS, or other method? Many contractors use sophisticated software that establishes real-time, on-site positioning between CAD drawings and GPS data bases.

Layout Logic

The landscape architect should select a plan layout system that both works with probable construction layout systems and is fitted to the physical circumstances of the design proposal. On projects where a contractor has been selected prior to the development of Construction Documentation, coordinate these choices with him.

Develop a logical system of presenting information where the contractor is most likely to seek it. For example, locate streetscape elements from street centerline or curb line, rather than nearby buildings. Organize dimensions such that they readily relate to the fundamental organization of the design

[10] American Concrete Institute. Accessed January, 2014. www.concrete.org/FAQ/afmviewfaq.asp?faqid=2.
[11] Joints in Concrete Construction. American Concrete Institute ACI 224.3R.
[12] Joints in Concrete Construction. American Concrete Institute ACI 224.3

solution, for example, work from a primary organizational axis, primary building or central organizing space.

All layout should be accessible and constructible by the contractor. Sometimes landscape architects position key station points in inaccessible locations, such as in building interiors where building walls prohibit use of the point as a layout (center point of the radius in the existing building may not work). If radius center points are not accessible, consider an offset system to lay out curves. Confirm that reference points will be in place as subsequent pieces of the construction are required.

Establish dimensioning hierarchy related to construction sequencing. Sequence and hierarchy can be used to establish layout plan logic. Clearly emphasize the point of beginning or baseline with a heavier line weight and graphically distinguished line symbol.

Dimension elements from components that precede them in the construction sequence, or, ideally, from fixed components. For example, sidewalks will likely be built after roads and parking, and may be dimensioned from these components. Parking lots, however, should not be dimensioned from walks.

Review and coordinate the layout system with architect, engineer, and contractor, if possible. Confirm that layout information does not conflict or is redundant with other disciplines. Often the landscape architect, civil engineer, and architect will use different layout systems that make coordination problematic.

Dimension from structural components such as building columns where possible. These components are built at the outset and are readily available for site layout.

The contractor may require dimensions obtained from a known reference such as a road centerline, outside building wall face, or column centerline. Avoid dimensioning from hidden components such as unfinished wall faces or foundations. Do not dimension from a point that the contractor cannot access.

Civil Layout

Roadways and parking areas are typically laid out by the civil engineer on the civil layout plan. If the landscape architect is contracted to provide layout documentation for roadways and parking areas, the documentation should utilize the following practices:

- Roadways are always laid out by centerline and stations, and combined with typical sectional dimensions or references to street sections.
- Roadway layout information shall be described in a chart. Provide the street reference number or name, curve, and tangent references (C1, C2), radius point locations, radii lengths, curve and tangent lengths, and potentially angle of curve in degrees. Chord information is not normally necessary. Provide references on plan in rectangular block. Transitions from curve to curve, or curve to tangent marked with a 1/4"-long tick, perpendicular to the curve or tangent.
- Parking areas may be laid out by combining dimensions, aisle centerlines, and potentially include coordinate points.
- Both roadways and parking areas should be dimensioned to faces of curbs.
- Parking stalls should be noted as a string of typical units, for example, “13 Stalls at 9'-0" each.”
- Profile information, if provided, should not be completed by the landscape architect, but should be referenced on the plans.

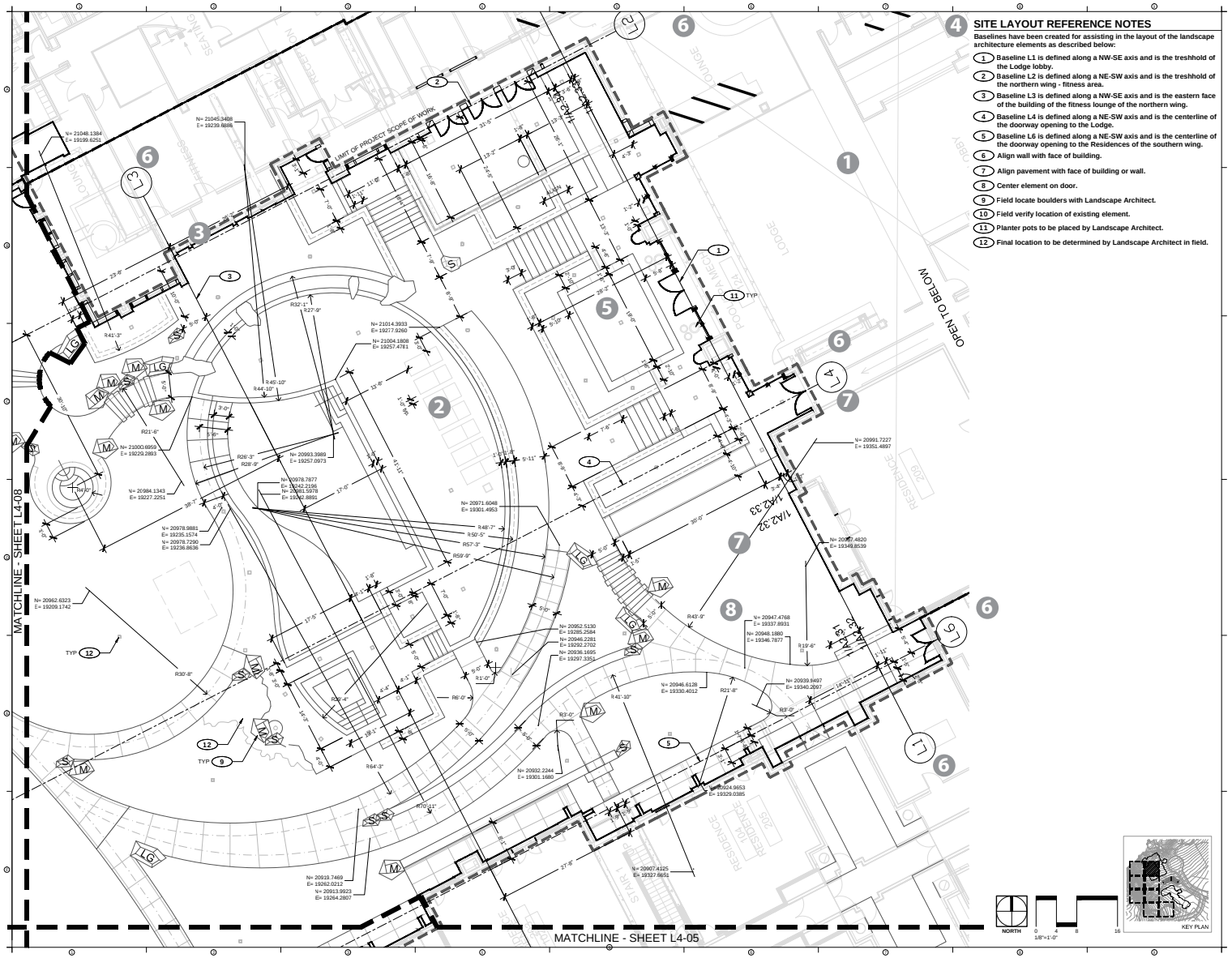
Interdrawing Coordination

Avoid any dimensional redundancies; each component should be located by only one means. Avoid unnecessary dimensions by using “equal” or “verify” where applicable.

Guidelines: Relationships between the Site Layout Plan and Plan Enlargements:

- Do not repeat dimensions on Site Layout Plan that are shown on associated Plan Enlargement.
- Primary dimensions that extend through the enlargement area should also be shown the on the Site Layout Plan.
- The Site Layout Plan should establish the perimeter points for the Plan Enlargement area, that is, locate or position the area. The Enlargement Plan will locate components within the area.
- Do not dimension components that are dimensioned in details.
- Begin dimension(s) from known points and work to “floating” dimensions. Leave floating dimensions as verifiable dimensions. Acknowledge specified tolerances for such dimensions.
- Note that Site Layout Plans and Enlargement Layout Plans are intentionally spare graphically, as described above. Minimize textural material symbols to potentially conflict with dimensional information. Verify that primary symbols legend includes all elements shown on Enlargement Plans.
- Dimensions and layout instructions should be checked for accuracy, completeness, and coordination with other disciplines, through rigorous quality control review processes.

Example of a CD Site Layout Plan



LEGEND

SHEET REQUIREMENTS

1. Survey Base Sheet
2. Proposed Site Improvements
3. **Limits of Work (if able to define) or Limits of Project Scope of Work**
4. **Site Layout Reference Notes (for example purposes only, should be project specific)**

SERIES REQUIREMENTS

5. Traditional Layout with Dimensions, Radii, and Keynotes
6. Baseline System
7. Offset System
8. Coordinate System
9. Other items that may be provided, but not currently depicted, if the project requires it, include:
   –Architectural Grid System
   –Stationing System

Note: **Boldface** items represent key distinctions between Construction Documentation documents and Design Development documents.

There are NO significant distinctions between DD and CD Drawings.

*Note: This sample depicts only the drawing area for this sheet. For title block requirements refer to preceding Title Block section.

DESIGN DEVELOPMENT SITE GRADING AND DRAINAGE PLAN

Objective

The DD Site Grading and Drainage plan establishes primary design intent for vertical organization of the site, stormwater management, water quality measures, and protection of natural resources.

General Requirements

The Site Grading and Drainage Plan exemplifies the fundamental role of the landscape architect in shaping the three-dimensional landscape. Grading and landform manipulation are integral design tools in defining spaces, creating circulation systems, directing or screening views, and mitigating noise or other deleterious impacts. The landscape architect uses grading to establish building sites, parking areas and outdoor spaces, including recreational areas such as sports fields.

The Site Grading and Drainage Plan includes the definition of ground plane elevations, both on pavements and in landscape areas. In addition, elevations are established for all exterior stairs, ramps, curbs, walls, drainage structures and inlets, and other elements such as planters and fixed site furniture. These examples do not represent an exhaustive list, as there is a broad range of surfaces and components that require three-dimensional definition.

The Site Grading and Drainage Plan is also used to define requirements for managing stormwater runoff, minimizing adverse impacts both on- and off-site. These impacts focus on flood control but also include water quality concerns. As global water resource depletion and contamination grow in severity and extent, the role of the landscape architect in sustainable water management is elevated. Beyond controlling stormwater runoff and flooding, sustainable water management includes groundwater recharge; cleansing stormwater from pollutants such as gasoline, oil, hydrocarbons, pesticides, herbicides, and fertilizers; and protecting existing hydrological resources and associated landscapes and habitats.

Landscape preservation and grading design are integrally related. Grading design impacts the protection of existing trees and plants, the stabilization of slopes and erosion and sedimentation control.

As designers collaborate to achieve water quality objectives, they also find opportunities to create aesthetic amenities such as wetlands and other water bodies. If carefully designed, these systems can be designed with wildlife habitat value. The process of comprehensively addressing environmental, community and aesthetic objectives in water management is sometimes referred to as "integrated design." For most projects, this level of attention also results in long-term economic value.

Civil engineers play an important collaborative role in grading, drainage, and sustainable water management. The landscape architect's working relationship with the civil engineer may vary by project. The landscape architect often plays a lead design role, orchestrating the overall three-dimensional organization of the site and collaborating with the civil engineer to determine sustainable stormwater management practices.

The civil engineer works with the landscape architect to determine viable strategies to accomplish measurable performance objectives, evaluating alternative solutions and executing the design intent. That includes hydrological modeling, for example, to determine runoff and infiltration rates and channel flows to size drainage structures, pipes, and other devices.

Specific recommendations for coordinating relationships between civil and landscape Site Grading and Drainage Plans are described below as part of the CD Site Grading and Drainage Plan.

Key Distinctions between DD and CD Site Grading and Drainage Plans

The landscape architect should be strategic in making content decisions for the Design Development documents. These guidelines suggest individual strategies for each of the DD sheets, subject to the unique role of that sheet in the design and documentation process.

Primary relationships between the DD and CD Site Grading and Drainage Plans are summarized here:

1. The DD Site Grading and Drainage Plan should be organized as an in-progress construction document, with similar graphic and information content, albeit with considerably less comprehensive detail.
2. The DD Site Grading and Drainage Plan includes the full development of contour-based grading improvements, including full coordination with the civil engineer, architect, and other specialists such as wetlands experts, irrigation designers, and others.
3. The DD Site Grading and Drainage Plan includes primary or key hardscape and softscape elevations in order to establish overall intent, rather than an exhaustive collection of spot elevations as completed at the CD Site Grading Plan.

4. The DD Site Grading and Drainage Plan defines the direction and degree of slope on hardscape and softscape surfaces as a means of communicating design intent, with less emphasis on a comprehensive set of spot elevations. The CD plan may maintain slope direction and degree of slope information to reinforce intentions, but the landscape architect must confirm that slope percentages are accurately determined. By maintaining slope percentages on the CD Plan, the landscape architect can safeguard the slope requirement, even if spot elevations change. Note that contractors primarily utilize spot elevations to construct hardscape and softscape systems.
5. The DD Site Grading and Drainage Plan includes preliminary elevations for drains and other civil stormwater infrastructure but does not exhaustively resolve subgrade pipe elevations and drainage calculations completed at the CD Site Grading and Drainage Plan. The civil engineer normally maintains contractual responsibility for determining subgrade infrastructure requirements, including pipes and bottom of drainage structures.
6. The DD Site Grading and Drainage Plan includes primary intent for wall locations and heights, but it does not fully resolve the intricacies of all top and bottom of wall finished grade elevations. These elevations are resolved and documented at the CD Site Grading and Drainage Plan. The DD Site Grading Plan also includes primary elevations for other structures such as stairs, ramps, landings, and fixed seating elements. Exhaustively detailed elevations to define the intricacies of these elements are completed at the CD Site Grading and Drainage Plan.
7. The DD Site Grading and Drainage Plan addresses all primary grading relationships to proposed buildings, such as doors, landings, swales, drains and other finish grades, but refines and provides additional detail at the CD Site Grading and Drainage Plan stage.

Specific Requirements

Specific requirements are organized to first identify plan requirements, followed by a more detailed itemization of hardscape and softscape grading requirements. Grading requirements for individual components such as pavements and walls are also defined.

Plan

The **survey base sheet** shows all existing conditions to remain, including above-and below-grade structures, existing rock outcroppings and boulders, pavements, plants, topography, utilities, monuments, benchmarks or other reference datum, and all legal conditions and restrictions such as property line bearings and distances, recorded easements, zoning setbacks, deed restrictions, adjacent property owners, and zoning districts if relevant to the project layout or grading.

Do not modify base sheet to change or obscure content. It is acceptable to add overlay symbols as described below, to communicate grading intent. Distinguish existing conditions to remain from proposed improvements by graphically screening these elements to a degree that allows proposed grading and drainage improvements to read clearly.

The site survey is especially important as a base drawing for the Grading Plan. As clearing and grading operations are often among the first construction activities, it is important that the contractor understand relationships between grading work and existing conditions that will impact grading. The survey base should also include existing grades beyond the limits of the site in order to understand relationships to the project site. Water that enters or leaves the site may need to be accommodated.

All existing trees to remain, and any other vegetation that is not to be disturbed. Potential impacts from grading operations on existing trees cannot be overstated. Indicate the limits of protection, and/or reference Plant Protection Plans. No grading work should occur within the tree protection area.

Note that the survey base should to be adjusted to reflect demolition and tree removal changes to the site, that is, removed items should not appear on the base sheet.

All **existing wetlands, riparian areas, and water bodies** are shown with associated habitat areas and intentions for protecting these elements per requirements of the federal Clean Water Act (CWA), including state level water quality standards. Include FEMA (Federal Emergency Management Agency) designation(s), if any, for flood hazard areas.

Refer to the Site Survey/Existing Conditions Plan for detailed survey requirements.

Intended **relationships between grading and proposed planting** may be important. These guidelines recommend that proposed grading be shown on Planting Plans. Planting, however, should not be shown on Grading Plans, as it may obscure grading requirements.

Preliminary limits of project scope of work, as agreed by landscape architect, civil engineer, contractor(s) (if applicable), and owner are

included. Note that limits of work may not coincide with property lines, for example, when areas within the property area have been designated as non-work areas. Accurate determination of limits of work requires the investigation of a number of issues that the landscape architect may not have immediate access to, including contractor staging, mobilization, construction access, traffic control, and other construction-related issues. Consequently, the DD limits of work may be revised as they are better informed at the CD phase.

Preliminary limits of grading, as coordinated with collaborating disciplines such as the civil engineer and architect. Note that limits of grading are defined as those areas outside of which no grading disturbance may take place. In general, this occurs where proposed contours meet existing contours. However, the landscape architect should carefully examine these limits as grading work does not always "end" at the most peripheral contour line that might be defined on or near the property line. Transitional grading work may be necessary between this proposed contour and any slope connections to existing grade.

Sheet matchlines, identify the relationship of the subject plan sheet to immediately adjoining plan sheets, with a label that reads "Matchline (Refer to Sheet L5-*xx*)." Show consistent, but minimal, dimension of work outside matchline, for example, 1" on a full-sized sheet. Overlapping will help to orient the reader to adjoining sheet relationships (see *Graphic Requirements* below).

Preliminary Site Grading and Drainage Reference Notes to supplement graphic instruction and General Notes. The DD Site Grading and Drainage Plan may utilize a set of initial Site Reference Notes that communicate primary, rather than exhaustively annotated intent. While the use of Reference Notes may not be fully developed, they should define key design grading intentions, for example, the importance of blending proposed with existing grades in a specific area, or the need to intercept stormwater prior to leaving the site in another area.

Example Site Grading and Drainage Reference Notes are provided here (see generic description of Site Reference Notes in Chapter 9 Key Documentation Practices). Note that these are only sample notes and do not represent a comprehensive list. They address likely topics. Therefore, they should not be used by landscape architects for project applications. The landscape architect should customize Site Reference Notes to suit individual project needs. The landscape architect should establish Site Reference Notes by following a logical order of grading operations.

Examples of Site Grading and Drainage Reference Notes

1. Existing trees to remain. Do not disturb.
2. Tie into existing grade. Meet smoothly and evenly.
3. Provide 2 percent maximum slope in all directions.
4. Daylight pipe to existing grade.

A graphic definition of the **full program of proposed site improvements**, including simplified hardscape and softscape surfaces (no jointing), utility infrastructure, and existing plants to remain, all shown screened to a degree that allows proposed grading and drainage improvements to read clearly. All subgrade structures, such as parking garages and vaults, should also be shown. Site furnishings and lighting should not be shown, as they generally do not impact grading.

Preliminary contour grading, with 1-foot contours; or 0.5 or 0.25 -meter contours at all hardscape and softscape areas, as defined in detail below. Include comprehensive plan grading for all circulation systems such as roads, vehicular surfaces, parking areas, and pedestrian paths, with profile information to follow at Construction Documentation, by the civil engineer. Note that the civil engineer typically leads DD grading of vehicular systems, including parking areas.

The plan also includes:

- Primary spot elevations at key hardscape and softscape areas as defined in detail below.
- Primary spot elevations at walls, fences, and railings as defined in detail below.
- Slope direction (indicated with arrows) and slope percentages as defined in detail below.
- Drainage structures and inlet locations, including rim elevations, for landscape architectural work areas, as defined in detail below.
- Subgrade drainage pipe locations to serve landscape drainage, with direction of flow, and connections to the civil storm drainage system. Landscape drainage areas include tree and plant pits, drains behind site walls, and other drains in landscape architect's geographical work areas.
- Areas of cut and fill, including preliminary a Cut and Fill Volume Summary—refer to *Best Practices* below. Note that some landscape architects may not define cut and fill areas on issued DD documents, but rather maintain this analysis as part of their project records.

Cut and fill areas may be designated on a designated Cut and Fill Analysis to serve the DD Site Grading Plan, if the landscape architect desires to present and evaluate that information and coordinate it with the client, consultant, and government agencies.

Hardscape Grading Areas

- **Finished floor elevation** for every accessible level of each building or structure, and relationships to exterior grades defined at primary doors and hardscape conditions contiguous with building. The landscape architect must understand desired relationships between all finished floor elevations and adjacent exterior grades, both hardscape and softscape. Refer to *Best Practices, Coordination* below.
- Preliminary **contour grading**, with 1-foot contours; or 0.5- or 0.25 -meter contours at all paved surfaces, including plazas, sidewalks, roads, and parking areas where applicable (the civil engineer may be responsible).

  Note that the Site Grading and Drainage Plan should include only permanent grades. There may be unique circumstances where temporary grades are established, for example, for erosion and sedimentation control during construction operations. These elevations should only be shown on the Erosion and Sedimentation Control Plan and referenced on the Site Grading and Drainage Plan with a Reference Note where applicable on the plan.
- **Select spot elevations** at key locations, for example, all door thresholds, primary corners of spaces, parking lot corners, major grade transition areas, tops and bottoms of all stairs, key tops and bottoms of walls, rim elevations of all drain inlets, and key interdisciplinary coordination areas such as the tops of curbs and over-structure relationships.
- **Spot elevations**, to one-tenth foot in hardscape areas, for example, 80.4. CD plans will show spot elevations to one-hundredths in hardscape areas. Thousands and hundreds may be omitted for simplicity, for example, 5280.4 may be noted as 80.4. For metric scale plans define meters to the hundredth's unit, for example, 1456.45.
- **Slope direction** (indicated with arrows) and slope percentages for all hardscape areas, for ease of review prior to Construction Documentation. Slope directions for all areas sloping in different directions, indicated with arrow(s). Slope percentages and arrows are important as a working tool at the Design Development phase to allow the reviewer to readily understand intent, rather than calculating slopes himself.
- **Typical cross-slope percentages**, slope direction, and "typical" notation at all sidewalks (1.5 percent preferred) and other areas with typical, or consistently applied, slopes. Note that typical slope percentages are distinguished from unique slope percentages, which vary by area, as described earlier.
- **Minimum and maximum slopes**, defined for surfaces which may be approaching lower or upper thresholds, based upon industry standards, local climate, and materials under consideration. For example, if a pavement slope is graded unavoidably close to 1 percent, then note "1 Percent Minimum Slope" in this area. Or, if an ADA-accessible pedestrian ramp may be legally prohibited from exceeding a 1:12 slope, then note "8.33 Percent Maximum Slope."

  Landscape architects use rise-run and run-rise ratios somewhat interchangeably to define slope degree; an industry-wide protocol has not been firmly established. A "run-rise" ratio defines slope degree, for example, 3:1 where the slope rises 1 foot for every 3 feet of run. A "rise-run" ratio defines slope degree, for example, 1:12 where the slope rises 1 foot for every 12 feet of run.

  Run-rise ratios are generally reserved for softscape slopes, for example, a 4:1 landscape slope or 1:12 ramp. Note that 1:12 reflects a rise-run ratio, reversing the typical run-rise ratio often used to define softscape slopes. Run-rise ratios, such as 12:1 are sometimes used to define hardscape slopes. Otherwise, percentages should be used to define pavement slopes, for example, 2.5 percent.

  Slope percentage identification should be noted in whole numbers, or as whole numbers followed by a decimal and 10th unit, that is, the number of feet of fall or rise in 100 feet horizontal distance. For example, a 7 percent slope should be noted as a 7 percent slope, not a 0.07 percent slope, and a seven and one-half percent slope should be noted as 7.5 percent.

  Refer to *Softscape Grading Areas* below for steep slope requirements
- **Grade breaks** or creases at pavements, clearly delineated as per graphic requirements below. Grade breaks occur on hardscape where design intent suggests a sharp change in slope percentage, rather than a gradual or rolling transition.
- **Drainage structures** and inlet locations, including rim elevations, for landscape architectural work areas.
- **Primary subgrade drainage** pipe locations, with direction of flow indicated, for landscape drains in landscape architectural work areas.
- **Over-structure subdrainage elevations** where hardscape is proposed over a structure such as a parking garage or other subgrade building. Usually, drainage will occur both at the finished surface level, for example,

at a plaza level, and at the top of structure level. The top of structure level is the elevation at the top of an engineered structure prior to the application of waterproofing, protection and a pavement system. Note that the engineer will typically provide elevations at the top of structure, below the finished plaza level.

In some cases the structure may be sloped to drain; in other cases it may be flat. When the structure is flat, it may be important to add a concrete topping slab, to direct water to drain beneath the pavement setting system. When water is not drained effectively at the top of structure, pavement deterioration, structural deterioration and leaking may occur. The situation is especially problematic in freeze–thaw climates, where freezing water expands and destroys pavement setting systems. The landscape architect may desire to provide elevations at the topping slab level, in order to effectively coordinate with plaza level elevations and drain positions.

While pavement system design is beyond the scope of these guidelines, over-structure pavement systems that are designed to allow the unobstructed flow of water at the top of structure level, (below finish course) such as pedestal-set pavers, often perform best.

- **Select top of curb elevations**, closely coordinated with civil plans. Selection may be based upon an established interval or other criteria, for example, where top of curb aligns with key sidewalk elevations.
- **Roadway grading** (when in landscape architect's work scope). Accurately define road cross-section with contour signature, for example, parabolic section, tangential section, reverse crown, or cross-sloped. Curb height and the height of the crown should also be reflected in the plan contour. Include an accurate roadway swale contour signature also.

Stairs and Ramps

- **Stairs:** Spot elevations at top and bottom of stair run, together with a note to indicate number of risers and typical riser height, for example, "5 risers at 6 inches each."
- **Ramps:** Spot elevations at top and bottom of ramp. Also define the slope percentage for the ramp itself.
- **Landings:** Spot elevations at each stair or ramp landing to indicate approximate level of landing.

  Note that determination of top and bottom elevations at stair and ramps requires slope calculation across any included landings. Some landings may require drains and if they do, drain elevations should be established.

Walls, Fences, and Railings

These include primary wall, fence, and railing spot elevations as defined here.

- **Tops of Walls:** Spot elevations at all tops of all walls at each end. Spot elevations should reflect finished surfaces.

  Where walls step, show top of wall elevations at each step, straddling the step line.

  Where tops of walls slope along their length, define slope across the top of wall with a spot elevation at each end of the wall and a slope percentage across the length of the wall top.

- **Cheekwalls:** Spot elevation at stair or ramp cheekwall to indicate typical height above stair or ramp.
- **Finished Grade at Walls:** Spot elevations at finished grade of all walls at each end.

Do not use "Bottom of Wall" ("BW") elevations as that terminology can be interpreted variously, for example, to reflect subgrade finished veneer elevations or other structural elevations. It is recommended that "Finished Grade" ("FG") or "Finished Surface" ("FS") be used to define base elevations at walls. It is important that the landscape architect consistently define finished surfaces on the Site Grading and Drainage Plan, and not vary between finished surfaces and unfinished surfaces, for example, subgrade or top of the wall at the substructure.

Softscape Grading Areas

- **All landform grading intentions**, including measured slopes, hills, knolls, plateaus, terraces, berms, valleys, depressions, and swales, all scaled to meet spatial objectives and contextual landscape conditions. For most sites, proposed grading should be shown with 1-foot or 0.25 -meter contours.

  The Site Grading and Drainage Plan should include only permanent grades. Any temporary grading, for example, to maintain construction period requirements should be referenced on the Erosion and Sedimentation Control Plans.

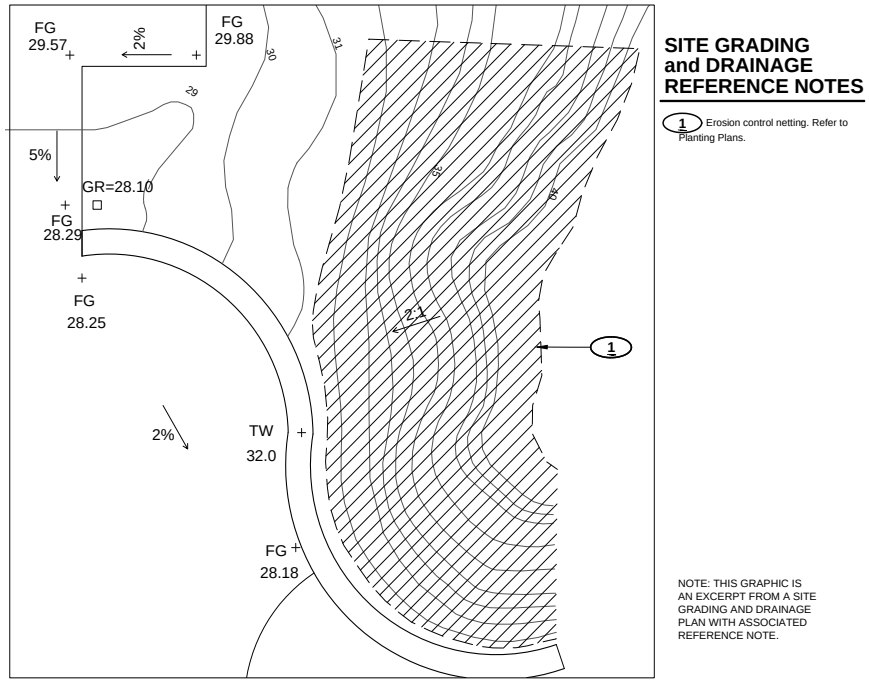
- **Spot elevations,** to one-tenth foot in select landscape areas. Typical locations for spot elevations in landscape conditions are listed. This list is not exhaustive.
  - Tops and bottoms of slopes
  - At walls, including each end and at any change in wall direction
  - Rim elevations for landscape drain inlets

- High points
- Low points
- Bottom of swale elevations, at intervals
- Ridge line elevations
- Elevation(s) at tree trunks for trees in close proximity to development to be saved
- Finish grade elevations at landscape, at all building corners, and at a reasonable interval along building facades
- Finish grade at landscape areas that abut hardscape conditions, paired with hardscape elevations to define relationships, that is, whether landscape is flush with hardscape or recessed.

- **Ridges,** with ridge line elevations carefully determined for intended purposes. The ridge line may vary in elevation and, accordingly, should be defined with a series of high and low point elevations.
- **Edge of roadway grading,** for example, shoulders, swales, and slope connections to existing grades, coordinated with civil road sections.
- **Drainage swales and channels**, with centerlines, direction of flow, and longitudinal slope percentage indicated.

Slopes

- **Degree of landscape slope**, expressed either in percentage terms, or as a ratio. Ratios describe the relationship between horizontal distance (run) to vertical distance (rise), for example, 4:1. It is most common for the run to be referenced before the rise (4:1), although "rise over run" (1:4) is also used. Rise over run is logically derived from the formula used to calculate slope percentage, as ratios may also be expressed in percentage equivalents. For example, a 1:4 (or 4:1) slope is equivalent to a 25 percent slope. Slopes should not be described in angle degrees.
- **Steep slopes**, indicated with note indicating maximum slope in ratio terms, for example, "Maximum Slope 3:1." Identify precise plan limits. Steep slope on pavements should be expressed in percentage terms, for example, "Maximum Slope 4 percent."
- **Erosion control or stabilization** intentions for steep or other slopes requiring protection. Include temporary or permanent seeding, mulching, sodding, ground covers or shrubs, riprap or geotextile fabric or erosion control netting. Graphically identify precise plan limits. Review soil engineering report for recommendations regarding protection or stabilization.



Sample Graphic Depicting Reference Note Indicating Stabilization of a Hillside on Site Grading and Drainage Plans

After a stabilization system is determined and engineered, documentation may be directed to one or more locations within the plan sets. Vegetative control, such as sodding, ground covers, or shrubs, should not be defined on the Site Grading and Drainage Plan, but should be shown on the Planting Plan. Geotextile and rip-rap systems may be shown on Erosion and Sedimentation Control Plan, if prepared, or on the Site Grading and Drainage Plan. In some cases, where revetments such as netting are used, these systems should be communicated on the Site Materials Plans. The Site Grading and Drainage Plan should utilize Site Reference Notes and plan symbols to define different types of erosion control.

- **Top and bottom of slopes**, with spot elevations, contours and Reference Notes to define design intentions for top and bottom (toe) of slope conditions. For example, these conditions may include rounding, flattening, shouldered, or shoulderless. Note the potential role of grading sections to reinforce plan intentions, as defined within these guidelines.

Drainage Infrastructure

- **Drainage structures** and inlet rim elevations, for work areas under the landscape architect's contract, coordinated with civil engineer. Do not indicate invert elevation—civil plans should show all subgrade infrastructural requirements.
- **Civil drainage structures**, that is, those designed and detailed by civil engineer in his or her work scope area, shown for reference and coordinated with the civil engineer.
- **Primary subgrade drainage** pipe locations, with the direction of flow indicated. These include potential subdrains in planters, tree pits, and behind walls and other fixed structures. It is important that landscape subdrains be connected to the larger stormwater drainage system and coordinated with the civil engineer.

Erosion and Sedimentation Control

If a Erosion and Sedimentation Control Plan is developed, the elements listed here should be included on that plan. Temporary grading associated with the Erosion and Sedimentation Control Plan should not be shown on the Site Grading and Drainage Plan.

- **Stormwater runoff control devices**, for example, permanent or temporary diversion swales or ditches, retention and detention basins, sediment traps and barriers, sediment basins, silt fences, and straw bale barriers.
- **Inlet protection**, protecting storm drains, catch basins, and other collection devices from silt and sedimentation until the graded site is stabilized, not to be included on the Site Grading and Drainage Plan. If a Erosion and Sedimentation Control Plan is developed, these elements should be included on that plan. These guidelines reinforce the importance of consistent use of Erosion and Sedimentation Control Plans.

  The logic and location of these protective devices should be derived from general construction sequencing. For example, one of first phases of most construction projects includes the protection of existing conditions and resources from the potentially damaging impacts of new construction. Accordingly, inlet protection should be documented in a location that precedes grading operations. The priority location for these devices is the Erosion and Sedimentation Control Plan, followed by the Plant Protection and Removal Plan. (if a Erosion and Sedimentation Control Plan is not included), where existing grades are defined to be protected, and last the Site Grading and Drainage Plan. Note that Erosion and Sedimentation Control Plans are typically completed by civil engineers. While inlet protection should not be shown on the Site Grading Plan, it should be referenced on either the Site Grading and Drainage Plan General Notes or as a plan-based Site Reference Note.

- **Sediment basins or silt traps** to prevent sediment from running off the site during and after construction, not to be included on the Site Grading and Drainage Plan.
- **Streambank, riverbank, or other water body shore protection or stabilization**. Note that a variety of materials and systems are used for these purposes, including rip-rapping, boulders, geotextiles, gabions, and plants or bioengineering. Bioengineering generally refers to the use of vegetation and associated root structures to stabilize slopes. Design of these systems requires specialized expertise, such as that of a streambank stabilization expert. Often, the design and installation of these systems will require permitting from local or state agencies. Watershed data, including proposed land use changes, may be necessary as part of this process.

  After a stabilization system is determined and engineered, documentation may be directed to one or more locations within the plan sets. Plants should be included on Planting Plans. Geotextile and rip-rap systems may be shown on Erosion and Sedimentation Control Plan, if prepared, or the Site Grading and Drainage Plan. In some cases, where revetments such as gabion baskets are used, these systems should be communicated on the Site Materials Plans.

- **Stormwater outlet protection**, protecting outlets from stormwater erosion, including velocity dissipation at pipe outfalls or open channels. Note that outlet protection and all other erosion control devices should be located on the Erosion and Sedimentation Control Plan, if that plan is prepared. If the Erosion and Sedimentation and Control Plan is not prepared, the Site Grading and Drainage Plan should include these elements.

Water Bodies

Water body elevations at both existing and proposed static water bodies, for example, lakes, ponds, wetlands, pools, and fountains. Elevations at existing tidal water bodies should be defined on the original site survey, with both low and high tides indicated. Elevations at large, existing flowing water bodies such as rivers should also be defined on the original site survey, with elevations indicated intermittently along the river's edge at the water level. These elevations represent water levels at the surveyed date and are subject to seasonal and even daily variation.

Elevations for designed streams and channels should be defined at either the centerline or edge, at the ground level, not water level.

Stormwater-Management Devices and Water-Quality Measures

- **Detention and retention basins**, with capacity requirements and volumes provided for civil review at the Construction Documentation phase.
- **Stormwater infiltration and recharge devices** that may clean and store water until it can percolate into the soil. Most of these devices require or at least benefit from a pretreatment system, such as a vegetated landscape area that can filter sediment, leaves, and debris. The study of infiltration devices has been particularly active in recent years, and a growing number of developers and municipalities are experimenting with these systems. Typical systems include:
    - **Sump/Leaky Well:** A leaky well consists of a vertical perforated pipe with a lid at the ground surface and an open bottom. Stormwater enters through an inlet pipe at the top and an overflow pipe [relieves] excess stormwater. The holes in the walls and the open bottom are covered with a granular filter or other nonclogging filter to cleanse stormwater as it percolates into the surrounding soil.

      Leaky wells store stormwater until it can percolate to the surrounding soil. Before entering the device, all stormwater should be filtered by a sediment trap to remove sediment, leaves, and debris. An advantage of the leaky well is that the accessible chamber allows sediment to be readily removed. Consequently, it is more resistant to failure due to clogging.[13]
- **Retention Trench:** A retention trench consists of a trench lined with a nonclogging filter and filled with coarse gravel, and placed under a layer of sand or loam. Stormwater is conveyed to the trench via an inflow pipe after passing through a sediment trap. A perforated distribution pipe allows stormwater to percolate to the gravel. An overflow pipe directs excess flow during heavy rain to the street drainage system.

  The sediment trap prevents clogging of the trench with sediment, leaves and debris, while the nonclogging filter cleanses the stormwater as it percolates from the trench to the surrounding soil. The detailed design for a retention trench can vary provided it includes the basic elements referred to earlier.[14]
- **Infiltration Basin:** An infiltration basin collects and stores stormwater runoff until it infiltrates to the surrounding soil and evaporates to the atmosphere. By removing a portion of stormwater runoff, infiltration basins reduce stormwater peak discharges and volumes to downstream catchments. They also improve the quality of stormwater discharged to the receiving environment.

  An infiltration basin is designed as a depression with grass coverage over a layer of coarse gravel surrounded by a nonclogging filter. A layer of topsoil is usually placed between the gravel layer and the grassed surface. Stormwater entering the basin is filtered to remove sediment, leaves, and debris by sediment traps, vegetated areas or specially designed gutter systems. Stormwater fills the basin and the gravel layer, percolates to the soil and overflows to the street drainage system when the basin fills.

  Infiltration basins are more suitable for larger lots where there is ample space. Their design should be well-integrated with landscape measures.[15]
- **Bioswale:** A bioswale is a linear version of an infiltration basin, but with more emphasis placed on the removal of pollutants with vegetative uptake and microbial soil action. It is often used along streets and parking areas, where vehicle impacts are addressed. The bioswale should be sized and graded by the civil engineer to optimize the collection, storage, and infiltration rates. Check dams may be used to control flow rates and improve pollutant filtration rates.
- **Rain Gardens:** A rain garden is any depressed or recesses landscape area that is used to collect, clean, and recharge or reuse stormwater runoff, diverting water from impervious surfaces. Because these areas are topographically designed, they are shown on Site Grading and Drainage Plans. These areas are most desirable when they are indeed developed as gardens. Native plants are sometimes used in these gardens, as they often require less irrigation water than introduced species. Native plants are not always the best selection for Rain Gardens, as non-natives may perform better in these unique environments.
- **Porous Paving:** Porous paving systems allow water to move through the pavement section into the subgrade and groundwater, as opposed to running across the pavement surface. Porous asphalt and concrete

[13] Duncan, Kim, and Hugh Cross. "Water Smart Practice Note." Lower Hunter and Central Coast Regional Environmental Management Strategy, 2004. www.huntercouncils.com.au/environment/products/downloads/water/Practice_Notes/No5_Infiltration_Devices.pdf.
[14] Duncan, Kim, and Hugh Cross. "Water Smart Practice Note." Lower Hunter and Central Coast Regional Environmental Management Strategy, 2004. www.huntercouncils.com.au/environment/products/downloads/water/Practice_Notes/No5_Infiltration_Devices.pdf..
[15] Duncan, Kim, and Hugh Cross. "Water Smart Practice Note." Lower Hunter and Central Coast Regional Environmental Management Strategy, 2004. www.huntercouncils.com.au/environment/products/downloads/water/Practice_Notes/No5_Infiltration_Devices.pdf.

systems include pore or air space within the mix design that allows infiltration through the pavement medium itself. Other pavement systems such as decomposed granite or crushed gravel allow infiltration between loosely compacted medium. Systems designed with stone or concrete unit pavers, allow infiltration through open or sand joints and setting beds. Parking areas, especially those used for overflow conditions, can be designed with porous paving to be used as a recharge/infiltration basin.

Graphic Requirements

Existing conditions, if desired may be graphically screened a maximum 50 percent of the original unaltered survey, in order to better highlight proposed grading requirements. The landscape architect may also elect to incorporate existing conditions at full value, if that better serves graphic objectives. Note that the survey base should to be adjusted to reflect demolition and tree removal changes to the site, that is, these items should be removed from the base plan.

For the base plan, utilize a greatly simplified illustration of proposed site plan improvements, with steps, walls, and other level changes. Do not include pattern symbols to distinguish materials. Proposed improvements may also be graphically screened in order to better highlight proposed grading requirements.

Grading limit line represented by equally spaced dashed bold line, with "Limit of Grading" note. Limits of grading area may occur within the larger limit of work area. Consider screening this line to distinguish from matchlines that separate sheets.

Line-weight hierarchy, rigorously applied to distinguish grading requirements from existing conditions and other proposed improvements.

Line-weight hierarchy, lightest to heaviest:

1. Screened survey base showing existing conditions, including sub-grade conditions and existing elevations, both contours and spot elevations.
2. Proposed improvements, such as pavements, curbs, steps, walls, and other elements.
3. Graphic patterns and symbols communicating grading requirements, for example, proposed contours and spot elevations.
4. Reference Notes and leader lines.

Contours

Existing contours depicted dashed and screened, as represented in original survey document (require surveyor to provide graphics as requested). Contour elevation number represented on high side of contour, reading to bottom of sheet with north up. Every fifth or 10th existing contour represented with heavier line (sites with more topography may utilize 10th interval).

Proposed contours represented as solid lines per landscape architect's CAD standards. Contour elevation number represented on contour by using "text mask" to conceal contour, reading to bottom of sheet with north up. Every fifth or 10th proposed contour represented with heavier line (sites with more topography may utilize 10th interval). Proposed contour line weight distinguished from line weights used to illustrate proposed improvements.

Proposed contours should be shown at both hardscape and softscape areas, together with key spot elevations as defined under *Specific Requirements* above.

Areas of cut and fill, if included, defined and distinguished with simple tone symbol and Reference Note indicating intent.

Spot Elevations

Existing Spot Elevations to be maintained (no adjustments to existing grades) noted within parentheses next to + defining precise location of elevation, for example, + (89.35).

Proposed spot elevations with prefix per standard abbreviations as noted below. Use "text mask" to hide plan graphic. Include "+" precisely at location of proposed elevation. Avoid the use of leader lines unless absolutely necessary due to plan graphic circumstances. Do not include arrow head at end of leader line.

+ TOC 89.35–Top of Curb (occurs at high point of curb section, most likely at back of curb)

+ BOC 89.35–Bottom of Curb (occurs at flow line/low point of gutter or roadway surface)

+ TW 89.35–Top of Wall (occurs at highest point of wall top or cap, for example, crown, ridge or cross-slope)

+ FS 89.35–Finished Surface (used for paved areas)

+ FG 89.35–Finished Grade (used for landscaped areas)

+ TS–Top of Step (occurs at nose of top tread, or back of top tread)

+ BS–Bottom of Step (occurs at finished surface where pavement meets first riser)

+ TR–Top of Ramp (occurs precisely at crease/change in slope from ramp to flatter area)

+ BR–Bottom of Ramp (occurs precisely at crease/change in slope from ramp to flatter area)

+ TF–Top of Footing

+ BF–Bottom of Footing (if footing elevations are used, it is preferable to establish bottom of footing to ensure frost depth)

+ HP–High Point (used for true high points, that is, where all immediately surrounding grades occur lower)

+ LP–Low Point (true low points should generally not occur without a drain inlet of some sort; false low points are often labeled, but will actually occur with outfall)

The use of a rectangular box around proposed spot elevations may be useful to distinguish proposed elevations from existing, but may not always be graphically practical, for example, where a large number of spot elevations occur in close proximity. Evaluate this option prior to full development of Construction Documents.

Softscape Grading

Swale centerline represented per the landscape architect's CAD standards, including an arrow indicating the flow direction, and a slope percentage indicating minimum or maximum slope.

Slope directional arrows per the landscape architect's CAD standards, and requirements below, with percentage noted to tenths, for example, "1.4 percent," and the note "MIN." (minimum), "MAX." (maximum) or "TYP." (typical).

Hardscape Grading

Grade break line at hardscape areas represented with dashed line and labeled with note parallel to dashed line to read "grade break/change in slope percentage."

Best Practices

Design

Determine the Position and Role of the Project in the Larger Watershed

Every site, regardless of its size, should be studied and designed within the context of the larger watershed. Each site will impact and be impacted by that watershed. Each site plays a cumulative role in the performance of the larger watershed within which it is located.

In examining the site and its context, the landscape architect should (1) determine any regulatory requirements affecting the site design, (2) determine any regional stormwater management practices and the site's role in upholding those requirements, and (3) determine upstream implications for grading, stormwater management, and water quality strategies.

Respect Natural Drainage Patterns

Natural drainage conditions represent a key determinant of a healthy and sustained landscape habitat. The landscape architect should carefully define existing drainage conditions and associated drainage patterns not to be disturbed. Work with existing drainage patterns as much as possible so to maintain hydrological, landscape, and habitat conditions.[16]

Verify that existing drainage patterns, water channels, and water bodies are allowed to continue their predevelopment function.

Baseline Conditions

The rate of stormwater runoff after construction should not exceed preconstruction (predevelopment) rates. In some cases, such as on brownfield and urban sites, lower runoff rates (lower than preconstruction) may be targeted in order to improve existing conditions.

The site survey should be used to summarize the site stormwater runoff and infiltration conditions as a baseline against which to develop and evaluate development proposals. Cover types should be defined on the survey, including impervious and porous surfaces. Proposed development should not result in runoff rates that exceed those on existing site conditions. In cases where existing site conditions are heavily covered with impervious surfaces, it may be desirable to improve the overall infiltration rate of the site with proposed development.

[16] Hopper, Leonard J. Landscape Architectural Graphic Standards. Hoboken, New Jersey: John Wiley and Sons, 2007. P. 61.

Flood Control and Off-Site Impacts

The Site Grading and Drainage Plan should be designed with a stormwater overland release that safeguards inhabited buildings from flood damage potential. The overland release should be designed to address a storm drain system that fails from a specified storm event, most likely a 50- or 100-year event. The overland release will collect water before it reaches the finished floor elevation of buildings, or even as much as 1 foot below those elevations. This device(s) should be established at the Design Development phase for review and costing.

No grading work should occur beyond property line. Existing drainage patterns on adjoining sites should not be impacted by grading or other grading-related improvements on the subject site. That is to say that existing drainage patterns or improvements should not be modified to increase runoff volumes or rates to adjoining sites. No grading or other obstructions should be created on the subject property so to impede flow from adjoining properties.

Porous Pavements

In developing grading and drainage intentions, the landscape architect should consider the impacts of impervious pavements and opportunities to utilize porous pavements such as decomposed granite, gravels, porous concrete and asphalt, and unit paving systems with open joints.

Landscaped ground planes, especially those with multiple plant layers and stories, are less susceptible to fast, high-volume runoff as they are able to absorb and intercept more rainfall. Most site development requires some combination of pavements and landscape areas. In order to maximize the potential for infiltration the Grading and Drainage Plan may be designed so that runoff from impervious surfaces (pavements) is directed to pervious areas (usually landscapes), where it can be slowed and infiltrate. Sites with steep slopes and high percentage of impervious cover are more susceptible to fast, high-volume runoff.

Water Quality

In the United States, the Clean Water Act enacted by Environmental Protection Agency establishes regulations to mitigate both point and nonpoint source pollution. EPA studies have suggested that the majority of water pollution is derived from nonpoint sources. Nonpoint sources include sediment, excess nutrients and associated oxygen depletion, heavy metals, chemicals, pathogens, and even thermal pollution.[17]

Nonpoint water pollution is generally defined as that pollution which comes from diffuse sources and which is "[carried] by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters and ground waters."[18]

While the landscape architect is not usually trained explicitly as an environmental scientist, she can play a leadership role in potentially addressing these issues. Currently this role is underutilized. If the landscape architect is in a position to do so, she can lead initially by establishing an interdisciplinary consultant team well versed in the rapidly evolving knowledge base associated with water-quality protection. This team may include environmentalists, agronomists, habitat experts, and civil engineers.

Preliminary stormwater quality treatment systems should be defined within the DD documents. If structures are included as part of these systems, these elements should be defined on the landscape architect's Site Materials Plans. Otherwise, the civil engineer should define requirements within civil plans and details.

Spacemaking

Grading definition must support the architectural and spatial objectives of the project. Views, movement, and sequence, and spatial relationships are defined as much by grading decisions, as they are by other compositional efforts. Prior to moving into grading Construction Documentation, Design Development decisions must be evaluated with three-dimensional models and other visualization techniques.

Grading plans must be developed together with grading sections to properly study vertical relationships. Grading sections should be drawn at key plan areas. Specific criteria should be developed and evaluated with use of the sections. Maximum slope criteria should be used to make decisions regarding walls, steps, and other devices. After sectional criteria and associated conclusions have been made, these conclusions can be applied to the site plans and Site Grading and Drainage Plans.

Study and document as necessary all typical three-dimensional conditions, for example, planters, ramps and site walls, stairs, and cheek walls. Utilize axonometric or multiple elevation drawings.

[17] Harris, Charles, and Nicholas Dines. "Stormwater Management." *In Time Saver Standards for Landscape Architecture,* pp.330–334. 2nd ed. New York, New York: McGraw-Hill Companies, 1998.

[18] "What Is Nonpoint Source Pollution?" United States Environmental Protection Agency. January 1, 2012. http://water.epa.gov/polwaste/nps/whatis.cfm.

Coordination

Geotechnical

A Geotechnical Soils Report should be prepared for the project. The Soils Report will include recommendations for grading and drainage, amongst other analyses and recommendations. The licensed geotechnical engineer who prepared the Soils Report should review the Site Grading and Drainage Plan and determine if he or she finds it in conformance with the report's recommendations. Any edits suggested by the geotechnical engineer should be incorporated in the CD Site Grading and Drainage Plan.

Site Materials

Coordinate the Site Grading and Drainage Plan with the development of the Site Materials Plan in order to determine pervious surface coverage requirements. That determination should be derived from specific groundwater recharge objectives. Soils information will be important to the determination of runoff and infiltration rates.

Planting

Coordinate the Site Grading and Drainage Plan and associated stormwater management and recharge intent with development of the Planting Plan. Plants can play a significant role in slowing and cleaning water.

Conduct a preliminary "building walk around" with project architect to establish grade relationships with all building entry/exits, foundation conditions, façade finishes, and roof drain locations.

Civil Work

Conduct a preliminary drainage systems review with the project civil engineer to establish relationships with all catch basins, storm drains, subdrains, and so forth.

Overlay the Site Grading and Drainage Plan(s) with utility plan to evaluate utility elevations, both surface and subgrade, and identify any plan locational conflicts.

The use of rip-rap should be carefully evaluated as part of civil runoff and erosion control calculations. Alternatives may be investigated, unless the rip-rap is intended as a project aesthetic.

Conduct a comprehensive grading coordination session with the civil engineer to review proposed grades and interface between site and civil work, for example, between vehicular systems designed by the civil engineer and pedestrian systems designed by the landscape architect.

Final Grading and Drainage Plans may be completed by the civil engineer for on-grade conditions and mechanical or structural engineer for on-structure conditions. Verify with local building departments and state licensure boards whether engineer stamps will be required. If engineering stamps are not required, the landscape architect may complete final Grading and Drainage Plans.

Municipality

Prior to issuing a grading permit, some municipalities may require that the developer or contractor submit an Erosion and Sedimentation Control Plan for review and approval by the city engineer. A stormwater Pollution Prevention Plan (SWPPP), as required by the National Pollutant Discharge Elimination System (NPDES) may also be required. The Site Grading and Drainage Plan, SWPPP and ESC plan should be well-coordinated. Even if these documents are not officially required by the reviewing agency, it is recommended that the landscape architect or civil engineer complete each of these plans in order to responsibly address the issues. These plans should be well developed during Design Development and reviewed for preliminary compliance prior to the development of Construction Documents.

Technical

Building Codes

Check code and agency requirements. Check requirements for contour interval and other requirements. Check maximum slopes at pavements, landing requirements with the interval, maximum level change, and the associated guardrail requirement. Municipal requirements may vary from ADA requirements.

Americans with Disabilities Act of 1990 (ADA)

Landscape architects should become familiar with the latest edition of the U.S. Department of Labor, federal code requirements associated with ADA for exterior site development. This civil rights law prohibits discrimination based on disability. Title II, as administered by the U.S. Department of Justice, provides guidelines for promoting equal opportunity accessibility on all public projects. The U.S. Department of Transportation provides guidelines associated with public projects receiving federal funding and public transportation, for example, highway, railway, and bus transit projects.

Additional codes and guidelines may be applicable, including local building codes which may include adapted accessibility requirements, the Architectural Barriers Act of 1968 for projects receiving federal funding,

and the Fair Housing Act for projects associated with multifamily housing. Landscape architects should consult with their local jurisdiction building department official or state code enforcement officer as necessary to determine which regulation is applicable.

Soils

Site soils' testing is typically completed by a geophysical engineer. The landscape architect should utilize the analysis for both grading design and structural design, including pavement systems. Also, boring data should be used to inform grading design, for example, soil composition and suitability, and depth to bedrock, hardpan conditions, and groundwater. The Grading Plan should be derived, in part, from these conditions. Review the soils report for specific recommendations, for example, minimum slopes away from buildings, minimum and maximum degrees of slope, erosion parameters, and drainage needs in plant pits.

All proposed hardscape and landscape should slope away from buildings, as per specific requirements defined in the soils report. Any drainage that must slope toward building, for example, to a trench drain, should be reviewed by civil and structural engineers.

Consider subsurface drainage in tree pits and in planted areas near structures or paving. Subsurface drainage is used when soil conditions do not allow satisfactory drainage within planting pits or trenches. Poor drainage is especially detrimental to the health of most tree species.

The preservation of existing soils should be considered with Grading Plans, to benefit existing plants, maintain natural runoff and infiltration rates, and minimize costs associated with replacement soils. Proposed planting soils should be considered, in part, for their ability to maintain natural infiltration rates and minimize downstream impacts.

Earthwork Balance

Prior to moving from Design Development to Construction Documentation, determine the volumes of soil to be moved. Establish a strategy to balance cut and fill unless circumstances warrant otherwise. The cost of moving existing soil at the site is about 1/6th that of importing soil and about 1/3rd that of exporting soil, unless the export material may be sold. Soil importing may also be undesirable due to complications that result from mixing different soil types.

Tree Preservation

Grade to protect existing trees. Existing trees absorb carbon dioxide and other pollutants and provide habitat, erosion control, shade, and aesthetic value. Trees add financial value to sites. Even subtle grading around existing trees may severely impact these trees. Avoid grading changes within the drip line of existing trees. Cutting within the drip line, even if only several inches, creates very damaging impacts to surface-absorbing feeder root systems. Filling, when absolutely necessary, can be accommodated to a modest degree with use of selected construction details such as tree wells, compaction-reducing grade beams, and aeration and drainage systems.

Hardscape Drainage

Show the crown or cross-slope for positive drainage on all components, including walks, ramp landings, stair treads, and wall caps (on details). Maintain a 1/4"/LF cross-slope on stair treads and wall caps. Maintain a 1.5 percent to 2 percent cross-slope on sidewalks and ramp landings.

Utilize planar or sheet drainage, at a uniform cross-slope where possible. Use a planar strategy in lieu of use of multiple drain inlets where ground plane pitch varies up and down and is visually and functionally disturbing. Paved areas generally look best when they are designed to be visually free of varied slopes, creases, and irregular warping, and when they are designed to sheet flow in a simple plane to a drain inlet or planting area.

Minimize large sheet flow drainage across frequently used walk areas, especially in climates with freezing conditions. In areas that utilize snowmelt systems, do not allow flow from snow-melted areas to re-freezing conditions at non-snow-melted areas. Ice damning will occur at these transition areas. Snow-melted areas should be drained internally to drains within snowmelted area, and disposed below grade.

Over-structure construction liability issues are significant. The landscape architect should generally not provide documentation for the structure or topping slab below the protected waterproofing system. Grading information for the top of structure should be provided by the engineer, but rigorously coordinated with the landscape architect. Top-of-structure grades should be reviewed to confirm depth of section for proposed improvements, proper slope to subdrains and relationships to surface slopes.

Green Roofs/Roof Top Planting

A variety of green roof design and technical issues should be addressed and documented by the landscape architect, some of which should be communicated on the Site Grading and Drainage Plans. The landscape

architect should consult with other manuals for design and construction best practices. Typical issues and documentation requirements include:

- Depth of section from finish surface to top of structure (Grading Plan and Details)
- Waterproofing and protection systems (details and specifications)
- Surface and subsurface (top of structure) drainage system (Grading Plan, details, and specifications)
- Proposed plants and soil medium (Planting Plan, Soils Plan, details, and specifications)
- Irrigation system (Irrigation Plan, details, and specifications)

Rooftop landscapes require that surface runoff is captured in either landscape area drains or hardscape inlets connected to the building drainage system. Subsoil planter drains should also be connected to the building drainage system. These efforts require a thorough collaboration between the architect, structural engineer, MEP consultant, civil engineer, and irrigation system designer.

Grading at Pedestal Paving Systems

This is a specialized paving system that "floats" above a subslab and is typically a flat, that is, 0 percent slope, surface. Surface water percolates through open joints in the paver system to a subslab drainage system below, sloped over a structure or roof system. This system is waterproofed, with drainage inlets at the subsurface level. The landscape architect should consult with pavement, waterproofing, and drainage manufacturers in detailing and specifying and implementing a pedestal system. For documentation purposes, it is important to understand the following components:

- Depth of system section from finish surface to top of subslab below
- Type of pedestal system and subslab below
- Type and size of pavers and joint size
- Type of waterproofing and extent of roof drainage system, if on building or structure
- Layout of proposed subslab drainage system

The landscape architect should verify that surface runoff can be adequately captured in the subslab drainage basin. The sizing of the subslab drainage system should accommodate a major, for example, 10-year, 100-year, or other, storm event as directed by local jurisdiction guidelines. The landscape architect should work closely with the civil engineer to ensure that the proposed grading and drainage is in compliance with all applicable codes and meets the requirements of the civil engineer's drainage requirements.

Effectiveness of Detention Areas

Note that the cumulative effectiveness of detention and retention basins in the larger watershed is subject to debate. In "The Failure of Detention and the Future of Stormwater Design," Bruce Ferguson made the following argument: [19]

> Uniform on-site detention does not work. It does harm. It should not be practiced. It has no favorable effect on base flows, usually does nothing for water quality and fails to fulfill its single explicit purpose of controlling floods. All over the eastern half of the United States, and in many areas of the West as well, state and local governments require developers to reduce the peak stormwater discharge rate during a defined design storm to its predevelopment level. The intent of this practice, which we can call uniform on-site detention, is to limit downstream flood damage that would otherwise be aggravated by urban impervious surfaces. To comply, a detention reservoir is built on every development site. For two decades or more, the apparent solution to the stormwater problem has been a hydraulic equation to comply with a detention ordinance.
>
> The result of uniform on-site detention is a proliferation of small detention basins distributed randomly over urbanizing watersheds. The basins occur on some tributary systems and not others; they occur on some main channels and not others; they occur in some places where there were never any streams at all. In Atlanta there are more than 10,000 basins now; there are places, where, it is said, you can step from one basin to the next.
>
> Any properly designed, constructed and maintained detention basin, considered in isolation, reduces the peak rate of flow at the point of discharge. But the effect of uniform on-site detention, practiced in a large watershed over a period of years, can be evaluated only where the outflows of randomly located basins accumulate in receiving streams. When evaluated this way, uniform on-site detention is a failure.

[19] Ferguson, Bruce K. "The Failure of Detention and the Future of Stormwater Design." *Landscape Architecture,* December 1, 1991, p. 76-79.

A detention basin does not eliminate runoff, it only delays it. The total volume of discharge from a basin during a storm is the same as the inflow, but the discharge comes out with a later, lower peak and a much longer trailing flow. When the flows from different tributaries join downstream, there is nothing to prevent their volumes from combining to produce peak rates greater than predevelopment peaks, and even greater than the developed watershed would have experienced without the basins.

As an alternative to detention basins, a municipality can collect stormwater impact fees from developers and use them to construct regional reservoirs, designed and operated as public amenities. Selective planning of publicly financed reservoirs led to effective flood control for the Miami River in Ohio 75 years ago.

[Another] way to accomplish these ends is to use infiltration basins as mediators of stormwater flows and quality. Such basins capture stormwater and store it until it can seep into soil voids, returning rainwater to the path it took before development occurred. When water returns to the surface, it is part of the stream's base flow, not the original storm flow. Infiltration, then, uses the soil to reduce floods and sustain base flows in groundwater and streams.[20]

Strategies

Iteration and Quality Control

Grading plans are never completed in final on the first try. More than any other aspect of the landscape architect's work, Grading Plans must be iterated as a trial-and-error process. On some occasions, only minor revisions will need to be made. More commonly, Grading Plans will need to largely be rethought after the initial pass. It is important to cycle through this process during Design Development.

Confirm that contours and spot elevations represent intended 3-D forms with use of sections and three-dimensional models. Study and document as necessary all typical three-dimensional conditions, for example, planters, ramps and site walls, stairs, and cheek walls. Utilize axonometric or multiple elevation drawings.

Be strategic with select use of spot elevations at hardscape areas, for example, identify elevations at primary corners, areas of building interface and drains. Avoid excessive use of spot elevations until DD Plans are complete.

[20] Ferguson, Bruce K. "The Failure of Detention and the Future of Stormwater Design." *Landscape Architecture,* December 1, 1991, p. 76-79.

Conduct an explicit and comprehensive grading coordination session with the architect and civil engineer by "walking around the building" to review proposed grades and relationships to architectural facades, including material relationships, foundation cover and waterproofing requirements. Conduct a similar review with civil engineer at interface between site and civil work, for example, at back of curb area.

Final grading and drainage plans may be completed by civil engineer for on-grade conditions and mechanical or structural engineer for on-structure conditions. Verify with local building departments whether engineer stamps will be required. If engineering stamps are not required, then the landscape architect may complete final grading and drainage plans. State-based professional licensure laws for landscape architects and civil engineers may dictate these requirements.

Metrics

- All grading must meet local codes and performance requirements. Determine these requirements prior to any grading work.
- Grade to conserve water by promoting infiltration and recharge.
- Verify that existing grades are met at the property line and that excess drainage is not diverted across the property line.
- Verify that existing drainage patterns, water channels, and bodies of water are allowed to continue their predevelopment function.
- Determine site-specific minimum and maximum grades in swales, based upon soil percolation rate, precipitation conditions, pedestrian relationships and drain spacing. Intermediate drains along the swale centerline may allow a gentler slope. Consider subsurface drainage (matting) at swale centerlines to expedite absorption. Determine need for rip-rap or other systems to slow runoff and reduce de-sedimentation.
- Establish minimum and maximum allowable slopes on landscape.

Suggested Ranges [21]

Planted fill slopes	2:1 maximum, 3:1 desirable
Planted cut slopes	1½:1 maximum, 2:1 desirable
Turf slopes mown by small mowers	3 ½:1
Turf slopes mown by small sulky type mowers	4:1
Turf slopes mown by tractor drawn gang mowers	5:1
Turf slope minimum	2 percent for positive drainage

[21] Sue, J., and M. Nelischer. "Landscape Grading Design." In *Handbook of Landscape Architectural Construction*. Vol. One. Washington, DC: Landscape Architecture Foundation, 1985.

Maintain pavement slopes between 1 percent minimum and 3 percent maximum. Seek 1.5 percent to 2.0 percent pavement slopes. Determine ideal pavement slope as derived from pavement type and associated roughness, percolation capability, freeze–thaw factors and construction tolerances. Slopes that fall below minimums will not drain well. Slopes that exceed maximums may be awkward for pedestrians. Slopes above 3.5 percent are perceived as ramps but are not officially classified as ramps until they exceed 5 percent.

Suggested Slope Minimums

Cast-in-Place Concrete	1.0 percent minimum
Asphalt	1.5 percent minimum
Concrete Unit Pavers	1.25 percent minimum
Stone Pavers, Smooth Finish	1.5 percent minimum
Stone Pavers, Irregular Finish	1.75 percent minimum

Evaluate these slope recommendations as a team by reviewing as-built field conditions, with measured attention to specific slope percentages. Identify parameters for specific project circumstances.

Roadway and pedestrian circulation design parameters:

Suggested maximum slopes[22]

Primary roads in snow country	7 percent
Short drives	20 percent
Standard roads	17 percent
Standard pedestrian walkways	3.0 percent
Short pedestrian walkways	3.0 percent to 5.0 percent
Handicap ramps	5.0 percent to 8.33 percent

[22] Sue, J., and M. Nelischer. "Landscape Grading Design." In *Handbook of Landscape Architectural Construction*. Vol. One. Washington, DC: Landscape Architecture Foundation, 1985.

Suggested Grading Standards [23]

Type of Use	Desirable Range
Public Streets	1–8%
Private Roadsides.	1–12%
Service Drives	1–10%
Loading/Unloading Areas	1–3%
Parking Areas	1–5%
Walks	1–4%
Grassed Swales	1–50% (2:1)
Terrace and Sitting Areas	1–2%
Grassed Banks	4:1
Planted Banks	2:1
Play fields	2–3%
Game Courts	0.5–1.5%

[23] Strom, Steven, Kurt Nathan, and Jake Woland. *Site Engineering for Landscape Architects*. Hoboken, NJ: John Wiley and Sons, 2010.

Example of a DD Site Grading and Drainage Plan

LEGEND

SHEET REQUIREMENTS

1. Survey Base Sheet
2. Limits of Work (if able to define) or Limit of Project Scope of Work
3. Proposed Site Improvements
4. Preliminary Site Grading and Drainage Reference Notes (for example, purposes only, should be project specific)

SERIES REQUIREMENTS

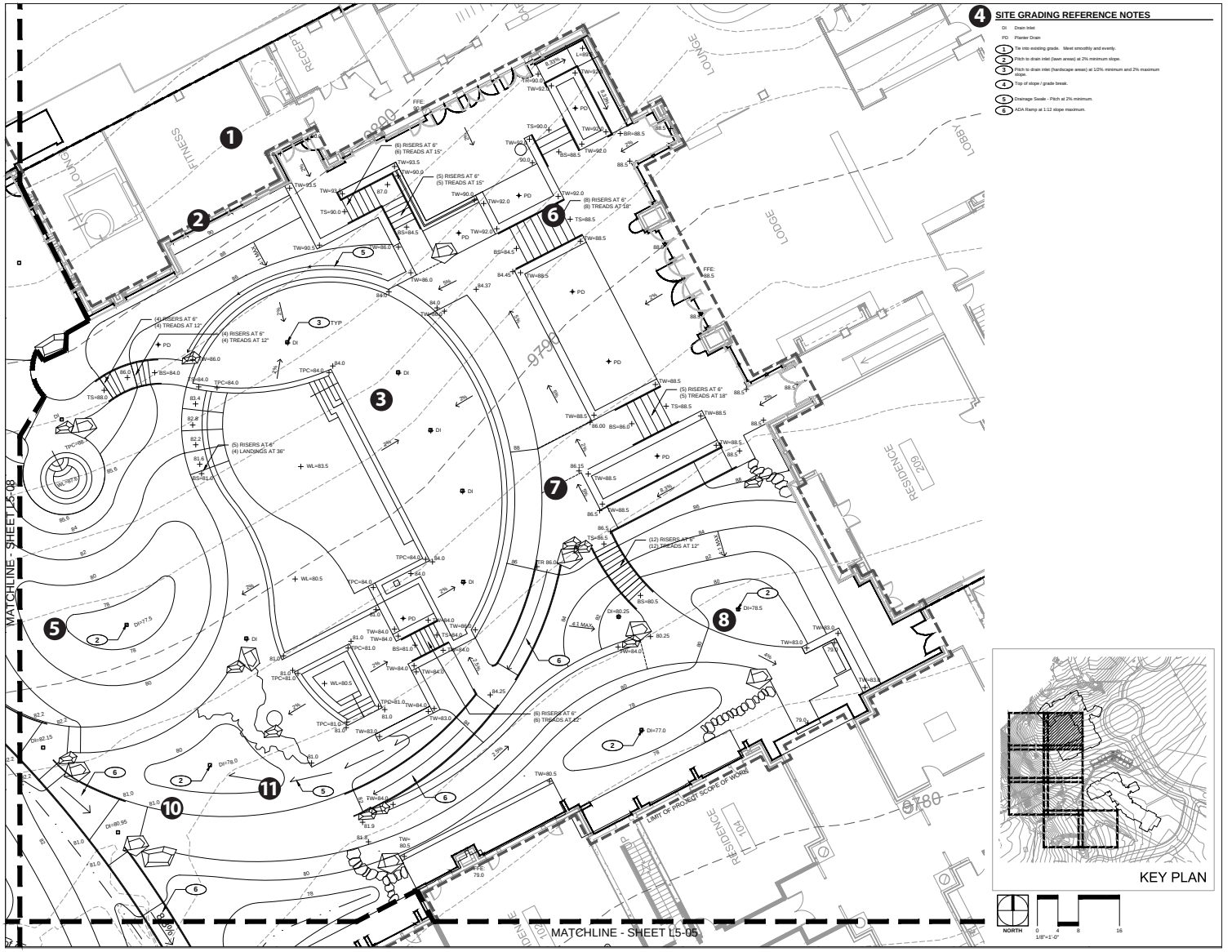
5. Preliminary Contour Grading
6. Primary Spot Elevations
7. Slope Requirements
8. Drainage Structures (Note: Provide Detail Keynote references on Materials Plans)
9. Grade Breaks and Ridges in Softscape Areas

   Grade Breaks/Creases at Hardscape
11. Drainage Swales and Channels

Another item that may be provided, but is not currently depicted, if the project requires it, is:

—Limits of Grading

*Note: This sample depicts only the drawing area for this sheet. For title block requirements refer to preceding Title Block section.



CONSTRUCTION DOCUMENTATION SITE GRADING AND DRAINAGE PLAN

Objective

The CD Site Grading and Drainage Plan comprehensively defines construction requirements for the vertical organization of the site, stormwater management, water-quality measures, and protection of natural resources.

General Requirements

While the DD Site Grading and Drainage Plan carries broad responsibility to define the three-dimensional landscape and the management of stormwater, the CD Grading and Drainage Plan requires a rigorous execution of these ideas. A well-executed Site Grading and Drainage Plan requires extensive analysis, iteration, coordination and quality control. The plan must be developed together with the civil engineer, architect, irrigation designer, and other disciplines with site infrastructure needs.

Primary requirements of the plan are listed:

- Execute all stormwater management objectives, including infiltration and groundwater recharge intentions, and flood control.
- Locate and define elevations for all drainage structures and devices.
- Define all water-quality cleansing devices.
- Define elevations for all soft- and hardscape surfaces, including walls, steps, ramps, and curbs.
- Define ground floor elevations for all buildings and structures.
- Define vertical control for all circulation systems.
- Define all slope stabilization devices.
- Define limits of grading in order to protect existing trees and plants, hydrological resources, and associated landscapes and habitats.

Relationships between Civil and Landscape Site Grading and Drainage Plans

Note that in many cases, the civil engineer will develop a companion Grading Plan, which includes detailed grading and drainage information such as roadway and parking area grading, and drain pipe locations and elevations. Relationships between Grading Plans prepared by the landscape architect and associated Grading Plans prepared by the civil engineer are not always clear, nor well coordinated. In many cases, the two drawings show redundant and conflicting information.

Landscape architects participate in the development of Grading Plans in order to maintain their lead role in the design of the three-dimensional site and accomplish stormwater management and water-quality objectives. Civil engineers require a role in the development of Grading Plans, as they are responsible for horizontal and vertical control of automobile circulation systems and utility infrastructure, including stormwater and drainage systems.

If Grading Plans are to be developed by both the landscape architect and civil engineer in order to serve their individual responsibilities, several recommendations are made to establish clear relationships between these two closely related documents and eliminate redundancies:

- Establish a clean and simple geographical division between the two work areas, for example, the landscape architect may be responsible for all work from the back of curb to the building face and the civil engineer may be responsible for all work inside the back of curb, including roads and parking areas.
- Both the landscape architect and the civil engineer should show all combined surface drainage structures in plan, for example, inlets, area drains, catch basins, trench drains, manholes, and other related structures. The civil engineer should define all surface and subgrade invert elevations for these structures in his or her work area and the landscape architect should define elevations for all drains in his or her work area. The landscape architect shall not duplicate civil elevations, but should reference the Site Grading and Drainage Plan prepared by the civil engineer.
- The landscape architect should show all landscape subdrain pipes, for example, in planters and tree pits, with invert elevations and/or slope direction. Connections to the primary civil stormwater drainage system shall be shown on both the landscape architectural and civil plans.
- If required by the municipality governing the approval of the project, the Site Grading and Drainage Plan may need to be prepared by a licensed civil engineer. If so, the civil engineer's certification stamp will be required on this sheet. In this case, the landscape architect and civil engineer may decide to consolidate all grading information in a single plan. That will require rigorous collaboration and coordination, but will likely lessen potential conflicts that occur between two Grading Plans.

Specific Requirements

Specific requirements are organized to first identify plan requirements, followed by a more detailed itemization of hardscape and softscape grading requirements. Grading requirements for individual components such as pavements and walls are also defined.

Plan

- Final **limits of project scope of work**, as agreed on by the landscape architect, civil engineer, contractor(s) (if applicable) and owner.
- Final **limits of grading**, as coordinated with collaborating disciplines such as the civil engineer and architect.
- Final **Site Grading and Drainage Reference Notes**, describing specific intentions or requirements, for example, "Confirm grade at existing pavement prior to placing proposed concrete."
- Identification of **existing utilities to remain** that are to be kept in service, and/or coordinate such information with the civil engineer. Note that utility information is also included on the Site Demolition Plan and civil infrastructure plans, and is recommended on the Grading Plan to alert contractors to subgrade conditions that may impact grading operations.
- Comprehensive **final contour grading**, with 1-foot contours, at all hardscape and softscape areas as defined in detail below. Note that the civil engineer typically executes the CD grading of vehicular systems, including parking areas. On projects with minimal slope across the project site, 1/4-foot contour intervals may be required.
- Exhaustively defined **spot elevations on ground surfaces** as defined in detail below.
- Exhaustively defined **spot elevations at walls, fences, and railings** as defined in detail below.
- Locations and elevations of all **drainage structures**, including both rim and invert elevations, for drains within the landscape architect's geographical work areas.
- **Subgrade drainage pipe** locations and elevations to serve landscape drainage, with direction of flow, and connections to the civil storm drainage system. Landscape drainage areas include tree and plant pits, drains behind site walls, and other drains in the landscape architect's geographical work areas.

Hardscape Grading Areas

Comprehensive and **final spot elevations** at the following locations: all building door thresholds, all corners of spaces and areas, grade transition or crease areas, tops and bottoms of all stairs at both lateral sides of stair, tops and bottoms of walls, rim elevations of all drain inlets, and key interdisciplinary coordination areas such as tops of curbs and over-structure relationships.

Spot elevations, to one-hundredths in hardscape areas. Thousands and hundreds may be omitted for simplicity, for example, 5280.45 may be noted as 80.45. For metric scale plans define meters to the hundredth's unit, for example, 1456.45. The Site Layout Plan, which defines the horizontal organization of the site development, will also be developed to the hundredth's unit, or in fractions of inches.

Spot elevations at all building entrances, at both sides of entry threshold if sloped across face of building. Exterior finished grade should generally be positioned 1" minimum below interior finished floor elevation, for flood protection. Note that a 1/4" threshold is typically provided at entrances for accessibility compliance. Otherwise the landscape architect should review local conditions to understand water, snow, other environmental conditions that may influence relationships between interior and exterior elevations.

Spot elevations at all high and low points, with HP and LP designations.

Spot elevations at all changes of pitch or gradient. Change of pitch on pavements (crease) indicated with plan symbol to precisely define crease location (dimensioned if necessary), and percentage slope at each of two planar surfaces. Note that a 1/4" threshold is typically provided at entrances for accessibility compliance. Otherwise the landscape architect should review local conditions to understand water, snow, other environmental conditions that may influence relationships between interior and exterior elevations.

Spot elevations at all area corners, including those at paved areas, ramps, parking areas, building corners, and landings. A corner is defined as any area defined by two edges, for example, a ramp or stair landing area would likely include four corners.

Spot elevations at all architectural columns at all column corners, and at other architectural components that intersect with the ground plane.

Top of curb elevations at 50-foot maximum intervals, closely coordinated with civil plans. Overlay civil plans at final quality control review to confirm no discrepancies. Do not show flow line elevations; these elevations are provided by the civil engineer.

Stairs & Ramps

Stairs: Spot elevations at top and bottom stair treads, at both sides of stair span. If grade at bottom riser is sloped, indicate bottom of step elevation at each side of stair span. Do not include spot elevations on each intermediate step, but include a note to indicate number of risers and typical riser height, for example, "5 risers at 6 inches each." Coordinate plan elevations with

stair sections. Spot elevations should not be included on stair sections. Spot elevations should only be included in one location, on the Grading Plan. Stair treads to be sloped at 1/8"/LF or 1/4"/LF, depending upon tread material and climate conditions. Do not indicate tread cross-slope on plans, but include on stair sections/details as a typical note.

Ramps: Spot elevations at top and bottom of ramps, on both sides of ramp width.

Maximum allowable slope percentage shown on ramp, for example, "8.33 Percent Maximum Slope" or "Pitch at 1:12 Maximum."

Landings: Spot elevations at all stair and ramp landings, in all corners. Indicate cross-slope percentage and direction at landing (1.5 percent preferred, 2 percent maximum).

Walls, Fences, and Railings

Comprehensive wall, fence, and railing spot elevations are included, as defined here.

Tops of walls: Spot elevations at all tops of walls and fences. Spot elevations reflect finished surfaces. At flat walls, include spot elevation at each end of wall. For stepped walls, include spot elevation at each end of flat segment, with paired elevations straddling step. Step indicated with line weight matched with wall perimeter. For sloped walls, include spot elevation at each end of sloped segment, with the word "slope" noted between spot elevations. Note that all walls and steps must be fully elevated (drawn in elevation) in order to clarify grading relationships and other design intentions.

At retaining walls, include grades both at back and front of wall. If grade at back of wall is consistent, indicate typical relationship to top of wall in wall section detail. If grade at back of wall varies, indicate elevations in plan at regular interval.

Do not indicate cross-slope at wall caps on plans, but include on wall sections/details as typical note.

Finished grade at bottoms of walls: Spot elevations at finished grade or finished surface at walls, at all end points, changes in wall direction (corners), and along wall length at 30 feet maximum intervals.

Cheekwalls: Spot elevation at intervals along stair or ramp cheekwall to indicate the height above a stair or ramp, and locations where wall slope changes.

Softscape Grading Areas

Spot elevations, to one-hundredths in select landscape areas. Typical locations for spot elevations in landscape conditions are listed. The list is not exhaustive.

- Tops and bottoms of slopes
- Finished grade at walls, at each end and at any change in wall direction
- Rim elevations for landscape drain inlets
- High points
- Low points
- Bottom of swale elevations, at intervals
- Ridge line elevations, at intervals if sloped
- Elevation(s) at tree trunks for trees in close proximity to development to be saved
- Finish grade elevations at landscape, at all building corners, and at a reasonable interval along building façades
- Finish grade at landscape areas that abut hardscape conditions, paired with hardscape elevations to define relationships, that is, whether landscape is flush with hardscape or recessed

Drainage swales and channels, with centerlines, direction of flow and longitudinal slope percentage indicated. Define accurate contour "signature" to reflect the shape and dimension of swale, for example, "U," "V," or a trapezoidal condition. While most all swales should be engineered for capacity and erosion resistance, swales may not need to be designed with an "engineered" cross-section, for example, when a naturalized look is desired. Include any swale lining requirements such as vegetation, geotextile fabric or riprap. See *Streambank, Riverbank, or other Water Body Shore Protection or Stabilization* in preceding text: Grading and Drainage Plans, Design Development, Specific Requirements. Note that detail keynote references, section references, or civil detail references (if the swale is engineered) should be located on the Site Materials Plan. Detail references for grading cross-sections, however, should be located on the Site Grading and Drainage Plan.

Slopes

Degree of landscape slope is generally not used on Construction Documents. Degree of slope is provided at the Design Development phase for informational purposes, to allow the reader convenient access to this information. At the Construction Documentation phase, contours and spot

elevations are used to define slope requirements, with the exception of steep (maximum) slopes, as was defined in the Design Development Grading and Drainage Plan section earlier.

An alternative approach to degree of slope is offered: slope arrows, slope percentages, and slope ratios indicated in DD documents should be maintained and supported by additional spot grades as indicated herein. Slope percentages should be provided on hardscape surfaces to reinforce intent with spot grades, while slope ratios, for example, 4:1, 1:12, and so on should be provided on all ramps and embankments/hillsides to indicate desired intent.

Drainage Infrastructure

Comprehensive **subgrade drainage and pipe locations**, for landscape areas, with direction of flow and minimum slope indicated. These include potential subdrains in planters and tree pits; under sports fields, active lawns, or play areas; and behind walls and other fixed structures. It is important that landscape subdrains are connected to the larger stormwater drainage system and coordinated with the civil engineer.

Erosion and Sedimentation Control

Erosion control or stabilization requirements for steep or other susceptible slopes requiring protection. Depending upon the nature of these requirements documentation should be included on the Site Grading and Drainage Plan, Erosion and Sedimentation Control Plan, Site Materials Plan, or Planting Plan. Refer to *Design Development Requirements.*

Water Bodies

Final **water body elevations** at both existing and proposed static water bodies, for example, lakes, ponds, wetlands, pools, and fountains, and elevations for designed streams and channels. For flowing water bodies, elevations will be comprehensively developed in collaboration with the civil engineer, and documented in close relationship with engineering profiles and cross-sections and elevations at culverts and outfall structures.

Stormwater Management Devices and Water-Quality Measures

- **Detention and retention basins**, with final capacity requirements and volumes provided, as defined collaboratively with the civil engineer.
- **Stormwater infiltration and recharge devices**, with final capacity and performance metrics quantified.

Graphic Requirements

Refer to *DD Graphic Requirements*.

Best Practices

Design

As noted in *DD Grading Best Practices*, preservation of natural drainage patterns presents a host of benefits. Low-impact grading suggests the maintenance of existing topography in order to maintain natural drainage patterns and associated ecologies. As part of that approach, the extent of earthwork and associated cut and fill volumes are minimized. Note that balancing cut and fill volumes does not constitute low-impact grading.

In order to manage this effort, plan areas of cut and fill, including cut and fill volume summaries, should be documented as part of each Grading Plan iteration. Note that some landscape architects may not define cut and fill areas on issued CD documents, but rather maintain this analysis as part of their project records. Cut and fill areas and cut and fill volume summaries should be designated on the CD plans if the landscape architect is required to present that information to the client or reviewing governmental agencies. This documentation may also provide some coordination benefits, highlighting the location and extent of the grading work for interdisciplinary design review.

Coordination

Architecture

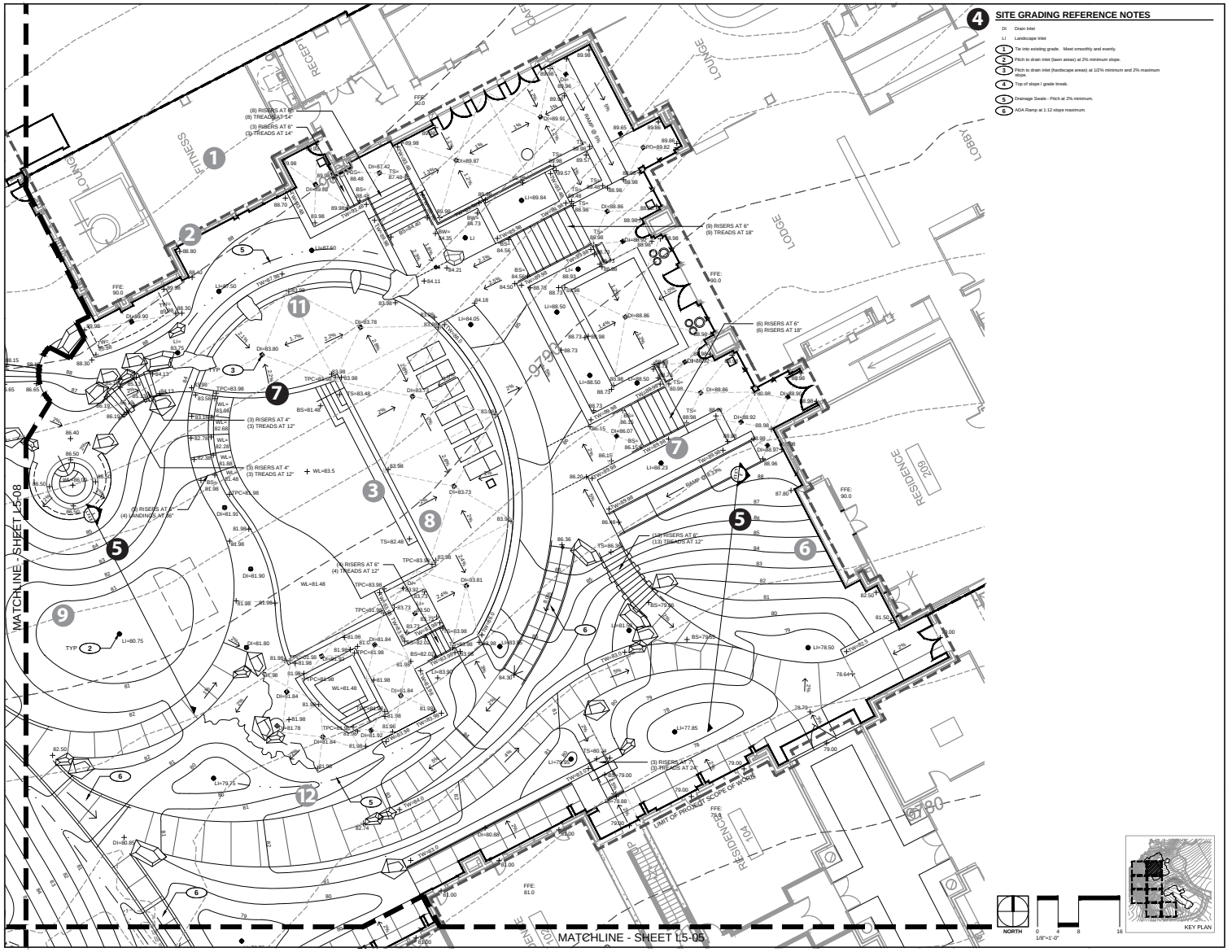
Conduct a final "building walk around" with project architect to confirm detailed grade relationships with all building entry/exits, foundation conditions, façade finishes, and roof drain locations.

Civil Work

Conduct a final drainage systems review with project civil engineer to confirm grading relationships with all drainage structures and civil infrastructure.

In some cases foundation or basement excavation requirements may impact the area requiring grading. For example, the landscape architect may desire to maintain undisturbed natural conditions in close proximity to proposed buildings, but may find it necessary to accommodate foundation or basement excavation work.

Example of a CD Site Grading and Drainage Plan



LEGEND

SHEET REQUIREMENTS

1. Survey Base Sheet
2. Limits of Work (if able to define)
3. Proposed Site Improvements
4. **Site Grading and Drainage Reference Notes (for example purposes only, should be project specific)**
5. Section Callouts

SERIES REQUIREMENTS

6. Comprehensive Contour Grading
7. **Comprehensive Spot Elevations**
8. Slope Requirements
9. Drainage Structures (Note: Provide Detail Keynote references on Materials Plans
10. Grade Breaks and Ridges in Softscape Areas
11. Grade Breaks/Creases at Hardscape
12. Drainage Swales and Channels

Other items that may be provided, but are not currently depicted, if the project requires it, includes:

—Limits of Grading

—Subgrade Drainage Pipe

Note: **Boldface** items represent key distinctions between Construction Documentation documents and Design Development documents.

*Note: This sample only depicts the Drawing Area for this sheet. For Title Block requirements refer to beginning of this section.

DESIGN DEVELOPMENT SITE LIGHTING PLAN

Objective

Define site lighting design intent, including the three-dimensional (horizontal and vertical) fixture locations, fixture types, and target illumination levels/ contrast ratios for all site conditions.

General Requirements

The Design Development Site Lighting Plan is prepared by the landscape architect to establish locational, visual, and technical relationships between site lights and the landscape architecture program, including pavements, jointing, walls, and other site systems.

Site lighting design should be fully conceived in collaboration with a lighting designer, using the lighting program to support the landscape architect's parti or "big idea," public art program and feature elements, safety and wayfinding, night sky protection, and energy efficiency objectives.

Communicate preliminary layout and dimensioning intent, Site Lighting Detail Keynotes and Site Lighting Reference Notes.

Key Distinctions between DD and CD Site Lighting Plans

The landscape architect should be strategic in making content decisions for the Design Development documents. These guidelines suggest individual strategies for each of the DD sheets, subject to the unique role of that sheet in the design and documentation process.

Primary relationships between the DD and CD Site Lighting Plans are summarized here:

- The DD Site Lighting Plan exhaustively defines all site lighting systems, for design evaluation, lighting performance, costing and the determination of infrastructural needs. In that sense, the content of the DD and CD Site Lighting Plans are not significantly different.
- The DD Site Lighting Plan establishes and tests the primary lighting layout viability via cost modeling and lighting calculations developed further during the CD phase.
- The DD Lighting Plan illustrates key dimensions and layout considerations associated with the plan, for example, the typical spacing of lights, or the dimensional relationships between lights and other site or building elements. The CD Plan provides exhaustive layout information to locate every proposed light.
- The DD Lighting Plan provides a set of initial Site Lighting Reference Notes to describe primary layout intentions and requirements. The CD Layout Plan provides an exhaustive set of Site Lighting Reference Notes, comprehensively communicating contractual layout requirements.
- The DD Plan should be used to identify key layout coordination needs between site lighting and other disciplines, that is, potential conflicts and relationships. Key relationships to civil, architectural and other applicable layout systems should be identified, to be fully resolved at the CD phase.

Specific Requirements

Survey base sheet to show all existing conditions to remain, including above-and below-grade structures, existing rock outcroppings and boulders, pavements, plants, topography, utilities, monuments, benchmarks or other reference data, and all legal conditions and restrictions such as property line bearings and distances, recorded easements, zoning setbacks, deed restrictions, adjacent property owners, and zoning districts if relevant to the project layout. Do not modify the base sheet to change or obscure content.

Note the importance of a well-defined existing plant survey, with all existing tree trunk locations, and all existing tree canopies shown to actual drip line, with simple circle, potentially eccentric to reflect actual crown position. Root zone areas should be implied from crown position. The plant survey will help the lighting designer to avoid impacts to existing plants with proposed lighting and electrical systems.

For the lighting component of the survey base sheet, graphic definition of all **existing site lights** that will be maintained and integrated with proposed lighting must be shown. A table that identifies fixture types, manufacturer, catalog number and lamp should be included. This information is critical to the evaluation of illumination levels that incorporate existing and proposed lights.

Preliminary limits of project scope of work, as agreed on by the landscape architect, civil engineer, contractor(s), and owner. Note that the limits of the project scope of work may not coincide with property lines, for example, when areas within the property area have been designated as non-work areas. The DD limits of project scope of work may be revised as they are better informed at the CD phase. If adequate information is not available at the DD phase to intelligently determine the limits of work, the landscape architect may elect to not show these limits at the DD phase.

Sheet matchlines, identifying relationship of subject plan sheet to immediately adjoining plan sheets, with label that reads "Matchline (Refer to Sheet L6-*xx*)." Show a consistent, but minimal, dimension of work outside the matchline, for example, 1" on a full-sized sheet. Overlapping will help to orient the reader to adjoining sheet relationships (see *Graphic Requirements* below).

Enlargement plan references, for areas where detailed lighting layout information is provided at a larger scale.

Section and elevation detail references, for those drawings that include site lighting, for example, wall elevations and stair sections.

Typical Site Detail Keynote References for each light fixture, matching content and format used on the Site Materials Plan. Site Detail Keynote References are intended to indicate the location of the construction detail associated with the fixture.

SITE DETAIL KEYNOTES:

7.0 SITE LIGHTING		DETAIL/ SHEET	RELATED DETAILS	SPEC. SECTIONS
7.1	Street Light	1/L7-06	1 & 3/L7-01	265600 & 033000
7.2	Pedestrian Light	2/L7-06	2 & 3/L7-01	265600 & 033000
7.3	Bollard Light	3/L7-06		265600 & 033000
7.4	Step Light	4/L7-06	1/L7-01	265600
7.5	Uplight	5/L7-06		265600

Sample Site Lighting Detail Keynote List

Preliminary Site Reference Notes to supplement graphic instruction and General Notes. Match reference note format used on the Site Layout Plan. Site Reference Notes provide instructions to the Contractor regarding construction implementation. Site Reference Notes should be used to define layout or other construction requirements associated with light installation.

Examples of *Site Lighting Reference Notes* are provided here (see the generic description of Reference Notes in Chapter 9, Key Documentation Practices). Note that these are only sample notes and do not represent a comprehensive list. Therefore, they should not be used by landscape architects for project applications. The landscape architect should customize Site Lighting Reference Notes to suit individual project needs.

Examples of Site Lighting Reference Notes

1. Center light in line with and between trees.
2. Center light on wall or pavement joint.
3. Space lights equally, as shown.
4. Adjust lamp orientation in field per landscape architect's instruction.
5. Verify 2'-6" clearance between the centerline of light pole and face of curb.

Proposed **Landscape Architectural Improvements Base Plan,** simply illustrating proposed hardscape components such as pavements, walls, and steps with outlines only and a well-developed line-weight hierarchy as described below. Site furniture such as benches and trash receptacles should not be included unless they impact site lighting performance or positioning. Include existing and proposed trees. Shrub masses should be included if they impact lighting design or installation.

Graphic definition of all **non-landscape architectural improvements** that occupy the site. The landscape architect should consider showing and coordinating site elements completed by other disciplines when they may impact site lighting installation or performance. These include architectural elements such as buildings, walls, columns, and overhead elements; street and parking area light poles, utility vaults, boxes, and associated elements; traffic infrastructure; curb cuts, mechanical, telecommunication, and audiovisual infrastructure; site structures; and art features.

Graphic definition of all **proposed site lights**, including pole-mounted, ground-mounted, wall-mounted, suspended, and any other type included on the development site. Note that building-mounted lights may be included on architectural drawings.

SITE LIGHTING LEGEND

- PROPOSED STREET LIGHT
- PROPOSED PEDESTRIAN LIGHT
- PROPOSED BOLLARD LIGHT
- PROPOSED STEP LIGHT
- PROPOSED UPLIGHT

Sample Lighting Graphic

Preliminary layout and dimensioning data to establish typical light locations.

Photometric data and calculations at Design Development are used by the lighting designer to help determine appropriate fixture types, rough fixture spacing, and approximate wattages and lamp types. Therefore, the calculations are limited to typical conditions and areas of special concern. The lighting calculations are expanded at Construction Documents to include computer generated, sitewide point-by-point ISO-footcandle plots if required by client, approving agencies or design team. Note that these are numerical data and there are a variety of metrics used to calculate and represent these points, including illuminance, luminance, luminous efficacy, luminous exposure, and glare ratings. These quantification metrics use different units of measurement, for example, lumens, candelas, and lux. While these topics are beyond the scope of this document, the landscape architect should work with the lighting designer to determine appropriate photometric documentation.

Graphic Requirements

Intent

The Site Lighting Plan graphic is intentionally spare in order to allow lighting symbols and associated annotation to read clearly. Utilize a clean Site Layout Plan as a graphic base for the Site Lighting Plan. That Site Layout Plan base should not include any hatches or pattern symbols as used on the Site Materials Plan. The base should not include any dimensional or keynote information from the Site Layout Plan, but should only include layout information for site lighting.

A graphic hierarchy should be developed to highlight the lighting layout system and direct the reader to key relationships between lighting and site design elements.

General

Proposed hardscape conditions, if desired may be graphically screened to a maximum 50 percent in order to allow the proposed lighting symbols to read vividly. The landscape architect may also elect to incorporate the base plan at full value, if that better serves graphic objectives.

Line-weight hierarchy from lightest to heaviest. The line-weight hierarchy is intended to distinguish three-dimensional components, material changes, and jointing, and allow layout information to read well. The hierarchy should be rigorously applied to distinguish three-dimensional components, material changes, jointing, symbols, and instructional annotation.

The line-weight hierarchy is:

1. Screened survey base showing existing conditions, including subgrade conditions
2. Pavement Jointing where relationships to lights are intended
3. Material systems (edges or changes from one system to another)
4. Level changes, three-dimensional components, changes in plane
5. Layout and dimensioning guidelines, leader lines, extension lines, centerlines
6. Proposed lighting symbols
7. Building and structures

Diagrammatic, oversized (not drawn to scale) symbols are used to represent **proposed lights**. Because actual light sizes are relatively small at site plan scale, they would not likely read well at actual size. A set of distinct diagrammatic symbols should be developed, exaggerated in size to represent each proposed light. The symbols may be developed with graphically corresponding relationships to actual lights, for example, pole-mounted lights might be represented with round symbols, rectangular, wall-mounted lights might be represented with a rectangular symbol.

Utilize a different light symbol for each proposed light product. For example, if two to three different street lights are proposed, utilize a different graphic symbol for each.

Centered Lights: In the majority of applications (but not all), lights will be located to their centers. For example, a pole light will be located to the center point of the base; a round wall-mounted light will be located to its radius point; and a square or rectangular light will be located to the midpoint intersection of both sides. To reinforce centering intentions, light symbols may be developed to include a "cross-hair," target, or other center symbol that can be aligned with a dimension line or Reference Note.

Directional Lights: Directional lights (those with lamps oriented to broadcast light directionally rather than equally in all directions) are shown, with the orientation of the fixture indicated with a graphic symbol. For light poles, a symbol may be used that distinguishes the pole itself from the cantilevered or extended light fixture. Or, a "fixture orientation arrow" may be used to illustrate the direction of the fixture. Directional fixtures are sometimes referred to as "accent" or "adjustable" fixtures.

Refer to the *Site Layout Plan* for the layout and dimensioning guidelines.

Ground-Mounted Lights

Ground-mounted lights are illustrated precisely where the base of the light meets finished grade. While the light symbol may be diagrammatic and exaggerated in size to read properly, the shape of the symbol should correspond to the actual shape of the light base, for example, round or square. Any intended ground plane relationships, such as pavement jointing, should be graphically defined and reference noted.

Wall-Mounted Lights

Wall-mounted lights, positioned at intended face of application, graphically projected from wall surface for graphic emphasis. While the light symbol may be diagrammatic and exaggerated in size to read properly, the location of the symbol should be precise, that is, the center of the light should be positioned accurately. Any intended relationships, for example, with wall jointing and railings, should be graphically defined and Reference Noted.

Suspended Lights

Suspended, hanging, or above-grade lights shown with a full-tone dashed line. Include dashed delineation of structure from which light is suspended, for example, site architecture, building architecture, or other elements.

Best Practices

Design

Intent

The landscape architect should work with the lighting designer to determine where, how much and even if lighting is necessary to accomplish broader design intent. The lighting design should indeed support spatial and experiential intent. The lighting design team can "choreograph" the experience of moving through or otherwise using the site, as guided or facilitated by lighting. For example, areas of lighting emphasis may be defined, in order to attract users, guide circulation, or emphasize places of special interest.

As part of the Design Development lighting design, a Statement of Lighting Design Intent should be developed and included with DD presentations and potentially within specifications. The statement should include a brief overview of design intent, functional requirements, illumination levels, and how luminaire selection addresses these objectives. Include any municipal requirements for luminaires and illumination levels.

Projected Illumination Levels

Site lighting is best understood three-dimensionally with actual projected illumination levels. A variety of software tools exist to model illumination levels, from those provided by lighting manufacturers to show basic light levels, to more sophisticated industry software that may show light levels, energy use, and alternative lamp sources.

It is important to determine the role of the light source and color/temperature in accomplishing lighting rendition intent. For example, the landscape architect may determine if plants, people or hardscape materials should be emphasized.

Sustainable design and Illumination

Excess site lighting wastes energy, creates light pollution, compromises "dark sky" conditions, and may contribute to visual acuity problems associated with glare. It is possible to minimize illumination levels while still achieving program goals with the appropriate selection and placement of light fixtures. In determining the "correct" illumination levels, the designer seeks to accomplish design, functional, and safety objectives without excess or light trespass on to neighboring sites. Maximum, rather than minimum lighting levels should be targeted. In "dark sky" sensitive areas, fixture types should generally be selected to direct light downward, rather than into the night sky. Refer to light level guidelines established by the Illumination Engineering Society of North America (IESNA), in the *IESNA Lighting Handbook*.

An energy audit may be used to evaluate the overall energy efficiency of existing or proposed developments. Energy audit software is available to determine and evaluate energy consumption, cost, carbon dioxide emissions, and even the remote energy source in powering lights, for example, nonrenewable sources such as coal or renewable sources such as wind. LEED includes credits for light pollution reduction and optimizing energy performance.

Coordination

General Information Sheet

The elements below should be located on the General Information Sheet and must be developed and coordinated with the Site Lighting Plan.

Lighting General Notes

Lighting General Notes are used to clarify intent and requirements that are not clear on plan.

Lighting Symbols Legend

Refer to the General Information Sheet for the symbols legend requirements. If a specialized lighting symbols legend is determined to be necessary, it may be developed as a Luminaire Schedule, as defined next.

Luminaire Schedule

The luminaire schedule is a table or chart that defines requirements for each light and may summarize the light fixtures used on the project. A luminaire is the entire lighting unit, including the lamp and all the necessary parts and wiring. The luminaire schedule may be included on the landscape architect's Site Lighting Plan, but it must be well coordinated with the Site Electrical Plan and specifications, as there are potential redundancies between these elements.

Note that the data itemized in the following list are largely specification information. As reported throughout these guidelines, specification information should not be included on drawings. The luminaire schedule may be an acceptable exception to this rule. Alternatively, the landscape architect may utilize a generic luminaire schedule, describing each luminaire generically, for example, Pedestrian Light, Type One, Pedestrian Light, Type 2, and Step Light. Each of these references should then be listed and further defined in lighting specifications.

The landscape architect's Site Detail Keynote system should also be used to identify each luminaire. Each of these keynote references should then be listed verbatim and further defined in lighting specifications.

LUMINAIRE SCHEDULE—TYPICAL DATA

- Plan identification symbol or abbreviation.
- Generic fixture description including mounting methodology (pole-mounted, bollard, ground-mounted); key features (equip with glare shield, louvered face plate, or diffusing lens); and important materials (stainless steel or bronze housing).
- Fixture indentification. Include the manufacturer's product name or catalog number.
- Mounting environment, such as: "tree mounted", or "recessed into wall". Include fixture mounting height above grade if not included in construction details, or lighting layout drawing notes.
- Lamp type (include the bulb type, wattage , kelvin temperature, Color Rendering Index, and if possible lumen output). For example, "20W LED, 3000°K, 85CRI (1500 lumens)."
- Quantity, that is, total number of luminaires for each type shown on the plan.

Lighting Designer

The landscape architect should always work with a professional lighting designer and electrical engineer. Landscape architects are not trained to design site lighting independently. Collaboration between the landscape architect and lighting designer usually yields the best outcome, where the landscape architect expresses design intent and the lighting designer expands and executes that intent. Often the landscape architect will establish the broader site design objectives within which the lighting design objectives are framed.

Architectural Relationships

If the site is developed together with buildings, and if key interior–exterior relationships are desired, establish an integrated lighting illumination model to study and resolve these relationships. Note, however that interior lighting should generally not be relied upon to illuminate or contribute to illumination levels of exterior spaces.

Tree and Plant Protection

Site lighting design and layout should be organized to avoid construction impacts on existing plants and trees. These impacts may be overlooked if the lighting designer is not well aware of existing plant positions, and the associated crown and root mass. In order to avoid these impacts, the Site Lighting Plan should be conceived as an overlay to the site survey with existing plants.

Specific impacts to existing plants should be avoided:

- Physical conflicts between lights and trees or plants
- Light positions which require maintenance activities that may damage plants
- Electrical conduit trenching impacts to tree or plant roots
- Light foundation impacts on tree or plant roots
- Site grading and soil compaction associated with light construction and associated impacts on tree or plant roots

Municipal Requirements

Review municipal codes for required illumination levels, source type, and product standards.

Technical

Position and locate lights to centers, rather than to edges or to faces. If specified lighting products change (are revised), the Site Lighting Plan layout will likely still be valid.

Strategies

Lighting Design Analysis and Light Selection[24]

Establish minimum and maximum illumination levels to meet project objectives, but pay particular attention to limiting maximum thresholds. Evaluate alternative lighting products, mounting locations, and illumination levels with photometric lighting analyses. Photometric analyses are conducted via software programs that incorporate the input of proposed spatial conditions and specified light locations. The output is in the form of ISO-footcandle plots that can show light levels in both a designated horizontal or vertical plane.

Sophisticated lighting analysis software allows the designer to input CAD data to describe the space, or the designer can use the CAD tools available within the software to construct and approximate the spatial conditions. After constructing or inputting the spatial data, the light fixture location and orientation is defined. Then, proprietary photometric data for each fixture are included, obtained from the product manufacturer. The lighting analysis software allows a number of different analyses, including surface illumination modeling, light level and contrast ratio compliance reporting, light trespass assessment, and glare analysis. Many of these lighting tools allow photo realistic night time renderings to be extracted from the input.

[24] Benya, James R. "Lumen Crunching for Dummies." *Electrical Construction and Maintenance*. May 1, 2007. http://ecmweb.com/content/lumen-crunching-dummies.

Example of DD Site Lighting

LEGEND

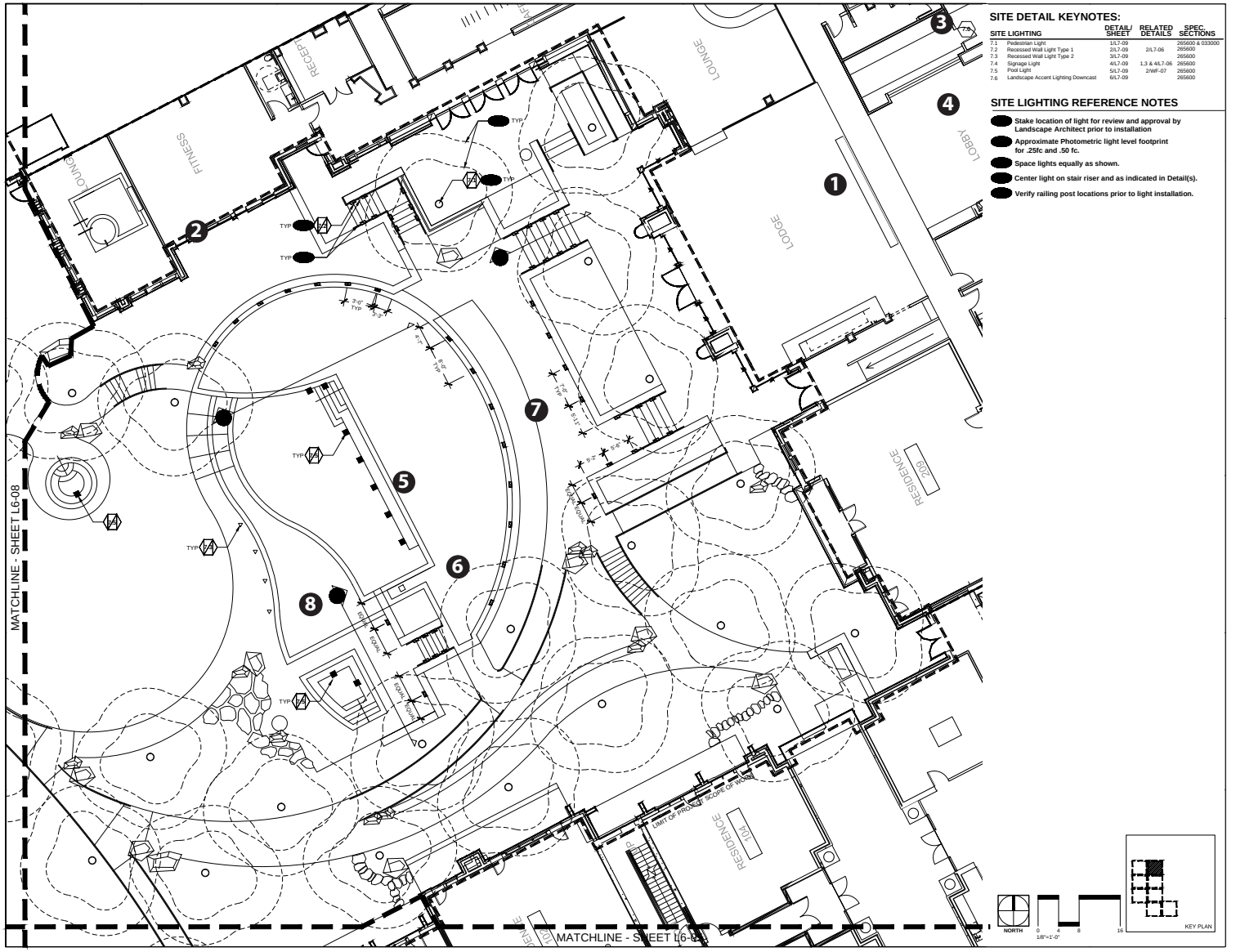
SHEET REQUIREMENTS

1. Survey Base Sheet
2. Limits of Work (if able to define) or Limits of Project Scope of Work
3. Site Detail Keynote References
4. Preliminary Site Lighting Reference Notes (if necessary, for example purposes only, should be project specific)Section Callouts
5. Proposed Site Improvements

SERIES REQUIREMENTS

6. Proposed Site Lighting
7. Preliminary Layout and Dimensioning Data
8. Section/Elevation Detail References

*Note: This sample depicts only the drawing area for this sheet. For title block requirements refer to preceding Title Block section.



CONSTRUCTION DOCUMENTATION SITE LIGHTING PLAN

Objective

Refine the three-dimensional (horizontal and vertical) placement of fixtures and specify all lighting equipment required to fulfill the lighting program. Provide specific installation instructions as required for the contractor to successfully install the complete lighting system.

General Requirements

The CD Site Lighting Plan is prepared by the landscape architect to define contractual locations for site light fixtures, including relationships between site light fixtures and the landscape architecture program, such as pavements, jointing, walls, planting plan, and other site systems.

The electrical engineer will prepare a Site Electrical Plan that defines circuitry and power requirements, including feeders, transformers, switches, duct banks, conduits, stub-outs, and other electrical elements requiring his professional stamp. The lighting designer will prepare the site lighting layout, final fixture schedule, and associated mounting notes for inclusion onto the electrical engineer's plans or, if the lighting related information is sufficiently complex, as a separate lighting focused document. The lighting/electrical documents are by necessity a highly collaborative effort between the landscape architect, lighting designer, and electrical engineer. For example, while the electrical engineer is responsible for showing the project's circuitry, the lighting designer must provide him with information about what fixtures are to be switched or dimmed together (usually delivered to the electrical engineer in the form of a "circuiting intent plan"). Likewise, while the lighting designer may provide the controls specification, he relies on the electrical engineer to design the interface between the site's power distribution system and the control system.[25]

Identifying appropriate locations for remote ballasts, drivers, and transformers is another example of critical collaboration between these three professionals. As a specifier, the lighting designer chooses whether a fixture will utilize a remote power-transforming device and is aware of what accessory equipment is available from the manufacturer to facilitate its intended use. However, the electrical engineer is best qualified to identify the maximum distance the device can be located away from the fixture based on wire size and his power distribution strategy. Upon consideration of the lighting designer and electrical engineer's input, the landscape architect must determine the most discrete location within the site plan that these remote devices can be placed and properly camouflaged by plantings or built elements.[26]

The landscape architect is ultimately responsible for positioning and integrating lighting elements with the larger site design as well as ensuring that fixtures, site furnishing and planting design are mutually supportive and coordinated.[27]

Utilize comprehensive layout data, Site Detail Keynotes and Site Reference Notes as defined on the Site Layout Plan and Site Materials Plan.

Specific Requirements

As noted on the DD Site Lighting Plan, the primary distinctions between the DD and CD Site Lighting Plan relate to the extent of layout instructions and the precision by which illumination levels are evaluated and conformed. Most other specific requirements for the CD Site Lighting Plan do not differ significantly from those for the DD plan. CD level improvements are noted here:

- Comprehensive **Site Detail Keynote references** for each light fixture, matching content and format used on the Site Materials Plan. Detail Keynote references are intended to indicate the location of the construction detail associated with the light fixture.
- Comprehensive **Site Reference Notes**, to supplement graphic instruction and General Notes. Match the Site Reference Note format used on the Site Layout Plan. Site Reference Notes provide instructions to the contractor regarding construction implementation. Site Reference Notes should be used to define layout or other construction requirements associated with light fixture installation.
- Comprehensive **Layout and dimensioning data** to locate all lights.

Graphic Requirements

Graphic requirements are the same in the Construction Documentation phases as in the Design Development phase.

Best Practices

Strategies

Lighting Codes and Beyond

A growing number of municipalities have developed guidelines for exterior and site lighting design. These guidelines may be based in principles of energy conservation, night sky protection, or the reduction of excessive light

[25] Patrick Quigley, Patrick B. Quigley and Associates, Architectural Lighting Consultants.

[26] Patrick Quigley, Patrick B. Quigley and Associates, Architectural Lighting Consultants.

[27] Patrick Quigley, Patrick B. Quigley and Associates, Architectural Lighting Consultants.

levels, as exemplified by the Joint IDA/IESNA Model Lighting Ordinance or the U.S.G.B.C.'s "LEED Sustainable Sites" criteria. Other cities focus on safety, while still others may use lighting codes to enhance their marketability or civic identity by calling for façade lighting or illumination of monuments and public art. It is important to understand the unique elements of local codes, to embrace what they say about the community's value system and to integrate this interpretation into the project's program and its nighttime ambiance. The landscape architect is responsible for meeting lighting codes but just as importantly he is responsible for the mood, usefulness, and aesthetic expression of the project at night.[28]

Photometric Plans

Traditional city "plan check" values may be represented by codes or design criteria with more focus on achieving minimum light levels and contrast ratios at stairs, ramps, curb lines, or sidewalks, or along streets, intersections, and roadways. In this case, photometric plans are required to show that a safe environment is provided for pedestrians and/or vehicles in order for law enforcement to monitor a setting at night. On projects where this orientation toward safety is a primary concern, yet no required light levels are provided, adhere to the standards of practice in the latest edition of the Illuminating Engineering Societies (IES) *Lighting Handbook*.

In order to review and evaluate lighting design proposals from private developers, many cities now require that photometric plans be submitted to illustrate proposed lighting levels. For example, the city of Scottsdale, Arizona, maintains an especially robust set of exterior and site lighting design guidelines and submittal requirements. It is recommended that such practices are followed for all projects, regardless of location, in order to quantify and measure the projected performance of the lighting proposal.[29]

For each project, a minimum of two photometric studies should be prepared, a horizontal illuminance plan (ISO-footcandle plot) measuring illuminance levels at grade and a vertical illuminance plan measuring "light trespass" around the perimeter of the site.

- The horizontal illuminance plan should be sitewide, including 10 feet beyond the project property line, with point by point footcandle levels recorded on a maximum 10 foot by 10 foot grid. The footcandle values at each point on the plan must include the light from all fixtures that contribute to that point.
- The vertical illuminance plan, or "light trespass plan," shows point by point footcandle levels in a vertical plane, at the property line, around the entire project. The calculation points should be at a maximum of 10 feet along the property line by 5 feet on center in the vertical plance to a height of at least 10 feet.

The illuminance/photometric plan(s) shall include key information on every light fixture used to calculate the footcandle readings shown. A depiction of the fixture, its catalog number, including accessories, complete lamp information (light source type, watts, beam spread, lumens, degrees kelvin, and catalog number), the identification of the photometric file used for the calculations and its source. This information shall be provided in a summary table and shall match the specification information shown on the project's cut sheets, electrical site plans, and fixture schedule. Light loss factors used in the calculations will be identified for each fixture and shown on the plan. Each light fixture's mounting height and aiming orientation should also be noted.[30]

The illuminance/photometric plan(s) must identify the initial maximum, minimum, and average illuminance levels within the calculated areas and then include these in a table of "contrast ratios". Governing agencies typically require not only the project's average illuminance, but also the average vs the lowest calculated value, the average vs the highest calculated value, as well as the highest vs lowest values—all be expressed as ratios within the table.

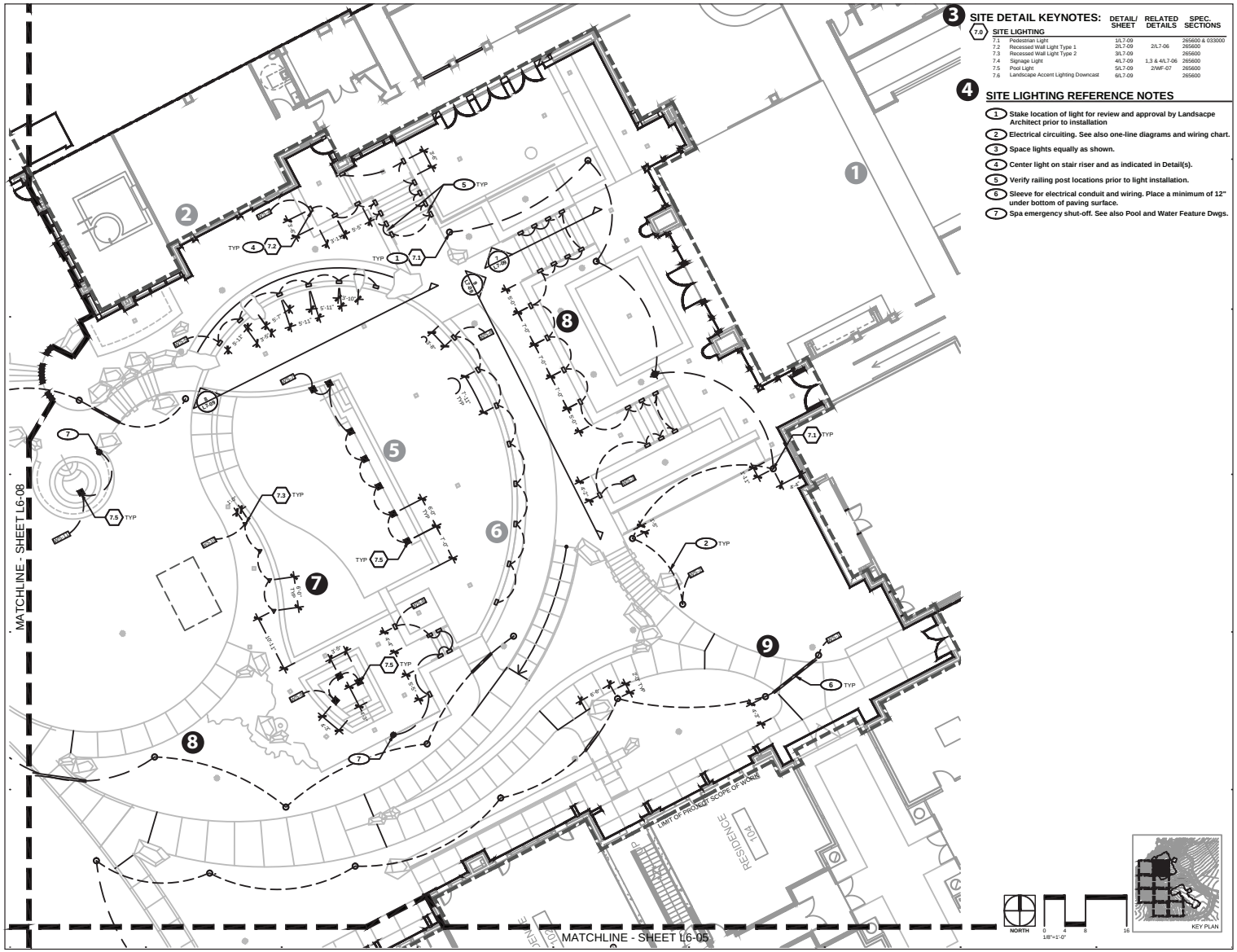
Beyond meeting code requirements, assessing the project's contrast ratios can provide important information to the Landscape Architect. For example, a pedestrian walking along a path that has a 3:1 contrast ratio between its average light level and the lowest calculated point will see obstacles and other path users more easily than if the same path has a 15:1 contrast ratio. A 3:1 ratio suggests overlapping pools of light along the walkway, while a 15:1 ratio indicates pools of brightness, interrupted by patches of deep shadow or darkness. On the opposite side of this issue, the Design Team should be alarmed if a contrast ratio of 3:1 is seen in a sculpture garden, where a ratio of 10:1 or more may be desirable in highlighting an art object.

Remember that simply meeting numerical light level requirements that satisfy a city's plan check process—does not mean a competent lit environment has been designed!

[28] Patrick Quigley, Patrick B. Quigley and Associates, Architectural Lighting Consultants.
[29] "Exterior and Site Lighting Design Guidelines—Photometrics." ScottsdaleAZ.Gov. www.scottsdaleaz.gov/design/guidelines/lighting.asp.

[30] Patrick Quigley, Patrick B. Quigley and Associates, Architectural Lighting Consultants.

Example of a CD Site Lighting



LEGEND

SERIES REQUIREMENTS

1. Survey Base Sheet
2. Limits of Work (if able to define) or Limits of Project Scope of Work
3. **Site Detail Keynote References**
4. **Site Lighting Reference Notes (for example purposes only, should be project specific)**
5. Proposed Site Improvements

SERIES REQUIREMENTS

6. Proposed Site Lighting
7. **Final Layout and Dimensioning Data**
8. **Proposed Electrical Conduit Routing (Diagrammatic)**
9. **Proposed Conduit Sleeves beneath Pavements**

Note: **Boldface** items represent key distinctions between Construction Documentation documents and Design Development documents.

*Note: This sample depicts only the drawing area for this sheet. For title block requirements refer to preceding Title Block section.

SITE DETAILS: DESIGN DEVELOPMENT COMPOSITE REFERENCE SECTIONS

Objective

With strategic sectional depiction, explore and define key spatial intent, visual qualities, design components, and technical systems, including relationships between these elements. Frame this depiction as a composite reference for each of the primary spaces or areas.

General Requirements

Composite Reference Sections are defined by two primary attributes:

- The *composite* or combined depiction between interdisciplinary systems and components, and
- The use of these drawings as *reference* documents, whereby specific details are referenced within the section.

Composite Reference Sections can be used both as an illustrative tool for design review and presentation, and as a technical medium for interdisciplinary coordination.

The landscape architect can play a lead role in illustrating interdisciplinary design systems and technical components, including those in landscape architecture, architecture, civil and structural engineering, water features, and lighting. It is unlikely that these important drawings will be produced by collaborating disciplines.

Key Distinctions between DD and CD Composite Reference Sections

The landscape architect should be strategic in making content decisions for the Design Development documents. These guidelines suggest individual strategies for each of the DD sheets, subject to the unique role of that sheet in the design and documentation process.

Primary relationships between the DD and CD Composite Reference Sections are summarized:

1. The DD Composite Reference Sections depict "design" details, whereas the CD Composite Reference Sections define contractual details and systems.
2. Graphically, the DD Composite Reference Sections utilize a blend of illustrative and technical characteristics, with scale references such as people and other entourage detail to display and evaluate design intent. As Contract Documents, the CD Composite Reference Sections are graphically composed to clearly communicate requirements, rather than accentuate design intent. The CD sections may maintain a rich and potentially diverse set of symbols and patterns to readily identify and distinguish components.
3. The DD Composite Reference Sections utilize a selected set of Site Detail Keynotes to identify key details, while the CD Sections should utilize a comprehensive set of Site Detail Keynotes to identify all details shown on the drawing.
4. The DD Composite Reference Sections may utilize a selected set of dimensions to identify key spaces and components, while the CD sections should not utilize any dimensions. Construction Document layout and dimensioning should be shown solely on the Site Layout Plan.

Specific Requirements

Scale and spatial illustration, visual qualities, and character of spaces:

- Illustrate intended activities and uses, with associated program.
- Define component shapes, sizes, and proportionate relationships.
- Include materials, furnishings, and lighting components (coordinated with lighting consultant).
- Suggest material patterns and textures.

Current proposed **component program** for costing, to complement and reinforce Site Materials Plan information, for example, pavements, walls, drainage, and specialty features/elements

Infrastructure strategy, including any unique relationships between utilities and finish components

Primary **technical systems**, components, and relationships:

- Identify interdisciplinary coordination issues.
- Include above- and below-grade components.
- Approach these drawings as preliminary Construction Documents.

Preliminary design details and detail assemblies, incorporated and composed with relationships to adjoining detail and assemblies. That context is used to inform the further development of individual details at a larger scale.

Site Detail Keynote references for all systems and components, complementing the Site Detail Keynotes used on the Site Materials Plans.

Key dimensions, identifying sizes of primary spaces and elements. This information is provided for reference only and is not intended to be used for actual construction.

Existing and proposed soil zones, illustrated to define approximate extent and relationships to adjoining systems. The soil type definition should include the following classifications:

- Undisturbed soil
- Compacted sub-soil
- Planting soil(s), distinguished by type if applicable

Grading and drainage strategies, defined and evaluated:

- Identify surface and subsurface drainage infrastructure.
- Verify depth of structure for over-structure applications.
- Define drainage penetration locations at structure.
- Establish/clarify landform intent.
- Define minimum and maximum slopes.
- Determine whether grading is achieving spatial and architectural objectives.

Code requirements, illustrated to review and confirm satisfactory application:

- Level changes
- Landings
- Railings
- Maximum slopes
- ADA issues
- Structural issues

Graphic Requirements

Composite sections work well together with the Site Materials Plans, and they should be developed with similar graphic strategies, that is, with the comprehensive use of pattern symbols and Site Detail Keynotes to identify and distinguish systems and components.

Section-elevation depiction, to illustrate elements at the section cut line and those elements in elevation beyond. Elevation elements beyond should be illustrated with lighter line weights, as noted below.

Architectural scale, required to illustrate detailed components: 1/4" = 1'-0" is ideal, but may not be practical due to section length and sheet size constraints. 3/16" = 1'-0" next best, or 1/8" = 1'-0".

Line-weight hierarchy from lightest to heaviest:

1. Background information, for example, components in elevation beyond
2. Symbols and jointing within a material system
3. Material changes
4. Dimensions and keynote leader lines
5. Level changes, three-dimensional components, changes in plane
6. Scale elements, including people, automobiles, furniture, and other human-scale references

Specified furniture, lighting, and other proprietary components, incorporated by "pasting" in these components from manufacturers' sources. It is important that "real" depictions of proposed components be used in order to evaluate scale, form, and material qualities.

Best Practices

Design

Utilize Composite Reference Sections as a primary design tool by selecting the most instructive and useful section cuts in the project. Section selections are important decisions; a neglected section may mean unresolved or poorly documented design.

Utilize Composite Reference Sections to define and illustrate functional systems or performance-based intentions. That may include hydrological processes, maintenance provisions or micro-climatic intentions.

Coordination

ARCHITECTURAL COORDINATION

- Evaluate scale and spatial relationships between landscape and architecture.
- Evaluate material relationships between landscape and architecture.
- Study and resolve physical relationships between the site and building construction, including detailed building connections.

STRUCTURAL COORDINATION

- Determine size, location, and configuration of structural components.
- Identify connections between site systems.
- Identify subgrade relationships between site work and subgrade architecture or other structures.

CIVIL ENGINEERING

- Identify and coordinate relationships between civil and landscape grading.
- Determine relationships between civil Infrastructure and landscape architectural systems.

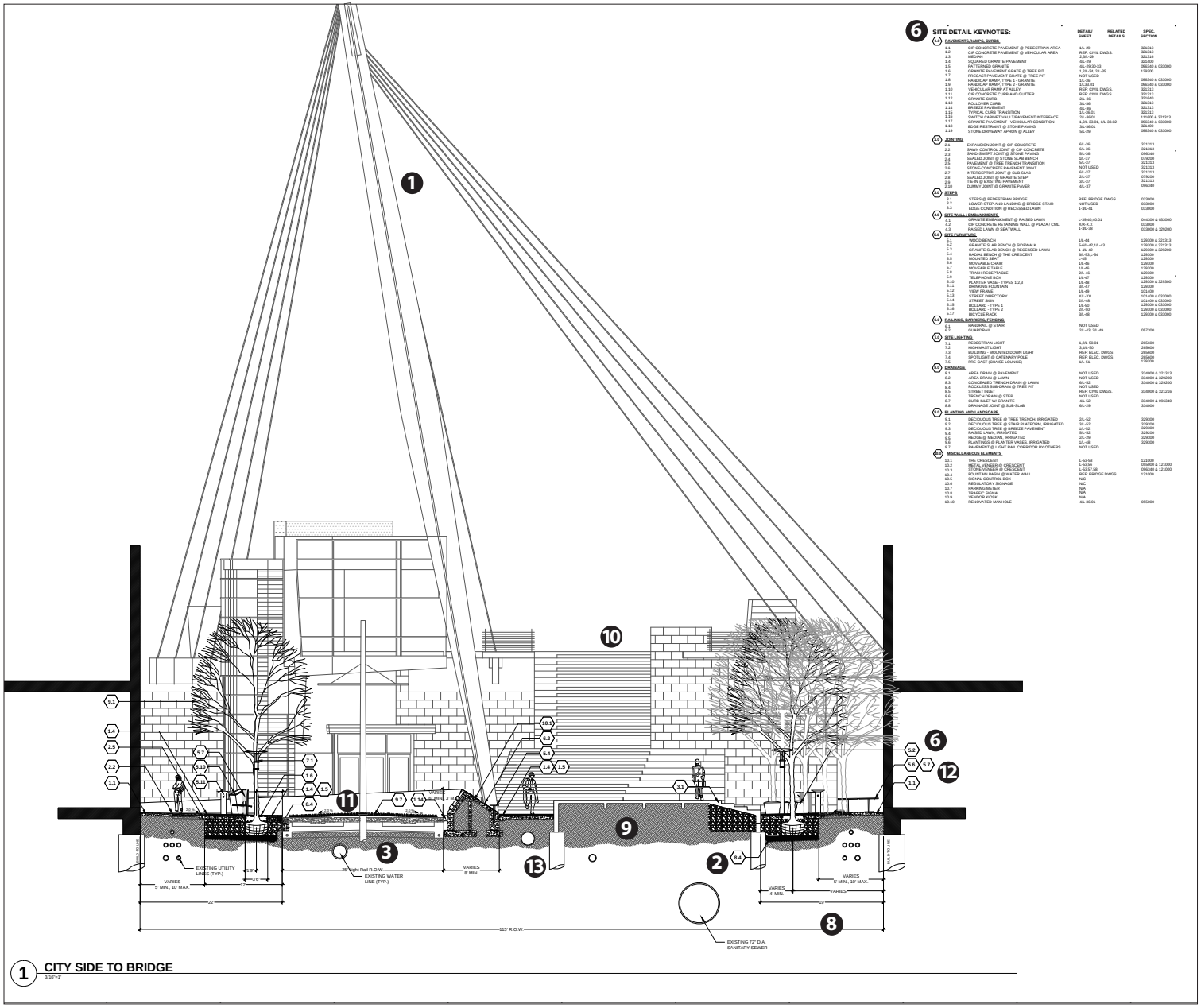
Technical

- Draw all subgrade requirements, with dimensional accuracy.
- Accurately draft proposed grading conditions, in order to be able to evaluate and coordinate these conditions.
- Draw all wall elevations to show, jointing, patterns, and material connections.
- Integrate digital architectural drawings, to established scaled building relationships. Include both sectional drawings and elevations, as part of the sectional graphic background.

Strategies

While a generally comprehensive distribution of sections may be desirable, the landscape architect should be strategic in determining where to cut sections on the plan. Section selection should be aimed at learning the most from these drawings, as these DD sections are exploratory in nature. Sections should generally address the most representative spatial conditions, the most complex technical and interdisciplinary relationships and any challenging or unresolved conditions that require study.

Example of DD Composite Reference Sections



6 SITE DETAIL KEYNOTES:

		DETAIL/ SHEET	RELATED DETAILS	SPEC. SECTION
6.0 PAVEMENTS/RAMPS, CURBS				
1.1	CIP CONCRETE PAVEMENT @ PEDESTRIAN AREA	1/L-29		321313
1.2	CIP CONCRETE PAVEMENT @ VEHICULAR AREA	REF. CIVIL DWGS.		321313
1.3	MEDIAN	7.1/L-29		321216
1.4	SQUARE IN GRANITE PAVEMENT	4/L-29		081640
1.5	ROUNDED GRANITE	4/L-29,30-03		081640 & 033000
1.6	GRANITE PAVEMENT GRATE @ TREE PIT	1.2/L-03, 2/L-05		129300
1.7	PRECAST PAVEMENT GRATE @ TREE PIT	NOT USED		
1.8	HANDICAP RAMP, TYPE 1 - GRANITE	15/L-29		086340 & 033000
1.9	HANDICAP RAMP, TYPE 2 - GRANITE	14,31-01		086340 & 033000
1.10	CIP CONCRETE CURB AND ALLEY	REF. CIVIL DWGS.		321313
1.11	CIP CONCRETE CURB AND GUTTER	REF. CIVIL DWGS.		321313
1.12	GRANITE CURB	26/-36		321640
1.13	ROLLOVER CURB	30/-36		321313
1.14	BREEZE PAVEMENT	4/L-36		321313
1.15	TYPICAL CURB TRANSITION	15/-36,01		321313
1.16	SWITCH CURB TRANSITION PAVEMENT INTERFACE	20/L-01,02		111000 & 321313
1.17	GRANITE PAVEMENT - VEHICULAR CONDITION	1/L-03,05, 1/L-33-02		086340 & 033000
1.18	EDGE RESTRAINT @ STONE PAVING	3/L-04,01		321400
1.19	STONE DRIVEWAY APRON @ ALLEY	5/L-29		086340 & 033000
6.0 JOINTING				
2.1	EXPANSION JOINT @ CIP CONCRETE	6/L-36		321313
2.2	SAWN CONTROL JOINT @ CIP CONCRETE	6/L-36		321313
2.3	SAND-SWEPT JOINT @ STONE PAVING	5/L-36		086340
2.4	SEALED JOINT @ STONE SLAB BENCH	1/L-27		079200
2.5	PAVEMENT @ TREE TRENCH TRANSITION	5/L-27		321313
2.6	STONE-CONCRETE PAVEMENT JOINT	6/L-27, NOT USED		321313
2.7	INTERCEPTOR JOINT @ SUB-SLAB	4/L-37		321313
2.8	TIE-IN @ EXISTING PAVEMENT	2/L-37		079200
2.9	TIE-IN @ EXISTING PAVEMENT	2/L-27		321313
2.10	DUMMY JOINT @ GRANITE PAVER	4/L-37		086340
6.0 STEPS				
3.1	STEPS @ PEDESTRIAN BRIDGE	REF BRIDGE DWGS		033000
3.2	LOWER STEP AND LANDING @ BRIDGE STAIR	NOT USED		033000
3.3	EDGE CONDITION @ RECESSED LAWN	1-3/L-41		033000
6.0 SITE WALL / EMBANKMENTS				
4.1	GRANITE EMBANKMENT @ RAISED LAWN	L-39,40,40-01		044000 & 033000
4.2	CIP CONCRETE RETAINING WALL @ PLAZA / CML	X/X-X, X		033000
4.3	RAISED LAWN @ SEATWALL	1-3/L-38		033000 & 326200
6.0 SITE FURNITURE				
5.1	WOOD BENCH	1/L-41		129300 & 321313
5.2	GRANITE SLAB BENCH @ SIDEWALK	1-4/L-42,1/L-43		129300 & 321313
5.3	GRANITE SLAB BENCH @ RECESSED LAWN	1-4/L-43		129300 & 326200
5.4	RADIAL BENCH @ THE CRESCENT	6/L-S11-64		129300
5.5	MOUNTED SEAT	L-45		129300
5.6	MOVEABLE CHAIR	1/L-48		129300
5.7	MOVEABLE TABLE	1/L-48		129300
5.8	TRASH RECEPTACLE	2/L-49		129300
5.9	BIKE RACK - TYPE 1	1/L-49		129300
5.10	PLANTER VASE - TYPES 1,2,3	1/L-48		129300 & 329300
5.11	DRINKING FOUNTAIN	3/L-47		129300
5.12	VIEW FRAME	1/L-49		101400
5.13	STREET DIRECTORY	X/L-XX		101400 & 033000
5.14	BOLLARD - TYPE 1	1/L-50		129300 & 033000
5.15	BOLLARD - TYPE 1	1/L-50		129300 & 033000
5.16	BOLLARD - TYPE 2	2/L-50		129300 & 033000
5.17	BICYCLE RACK	3/L-48		129300 & 033000
6.0 RAILINGS, BARRIERS, FENCING				
6.1	HANDRAIL @ STAIR	NOT USED		
6.2	GUARDRAIL	2/L-43, 2/L-49		057300
6.0 SITE LIGHTING				
7.1	PEDESTRIAN LIGHT	1,2/L-50-01		265600
7.2	HIGH MAST LIGHT	3/L-50		265600
7.3	BUILDING - MOUNTED DOWN LIGHT	REF ELEC. DWGS		265600
7.4	SPOTLIGHT @ CATENARY POLE	REF ELEC. DWGS		265600
7.5	PRE-CAST (CHANSE LOUNGE)	1/L-50		129300
6.0 DRAINAGE				
8.1	AREA DRAIN @ PAVEMENT	NOT USED		334000 & 321313
8.2	AREA DRAIN @ LAWN	NOT USED		334000 & 326200
8.3	CONCEALED TRENCH DRAIN @ LAWN	6/L-52		334000 & 326200
8.4	ROCKLESS SUB-DRAIN @ TREE PIT	NOT USED		
8.5	STREET INLET	REF. CIVIL DWGS.		334000 & 321216
8.6	TRENCH DRAIN @ STEP	NOT USED		
8.7	CURB INLET IN GRANITE	4/L-52		334000 & 086340
8.8	DAMPER FLAP @ SUB-SLAB	6/L-29		334000
6.0 PLANTING AND LANDSCAPE				
9.1	DECIDUOUS TREE @ TREE TRENCH, IRRIGATED	2/L-52		329300
9.2	DECIDUOUS TREE @ STAR PLATFORM, IRRIGATED	3/L-52		329300
9.3	DECIDUOUS TREE @ BREEZE PAVEMENT	1/L-52		329300
9.4	SHRUBS @ MEDIAN, IRRIGATED	2/L-29		329300
9.5	HEDGE @ MEDIAN, IRRIGATED	2/L-29		329300
9.6	PLANTINGS @ PLANTER VASES, IRRIGATED	1/L-48		329300
9.7	PAVEMENT @ LIGHT RAIL CORRIDOR BY OTHERS	NOT USED		
6.0 / 7 MISCELLANEOUS ELEMENTS				
10.1	THE CRESCENT	L-53-58		121000
10.2	METAL VENEER @ CRESCENT	L-53,56		050000 & 121000
10.3	STONE VENEER @ CRESCENT	L-53,57,58		086340 & 121000
10.4	FOUNTAIN BASIN @ WATER WALL	REF BRIDGE DWGS.		131000
10.5	PEDESTRIAN BRIDGE	NIC		
10.6	REGULATORY SIGNAGE	NIC		
10.7	PARKING METER	N/A		
10.8	TRAFFIC SIGNAL	N/A		
10.9	VENDOR KIOSK	N/A		
10.10	RENOVATED MANHOLE	4/L-36.01		055000

LEGEND

1. Final Component Program
2. Preliminary Design Details and Assemblies
3. Infrastructure Requirements
4. Grading and Drainage Requirements
5. Code Requirements (if necessary)
6. Detail Keynote References
7. Reference Notes (if necessary)
8. Key Dimensions
9. **Existing and Proposed Soil Zones**
10. **Section-Elevation Depiction**
11. Primary Technical Systems
12. ARCHITECTURAL COORDINATION
13. STRUCTURAL COORDINATION

CONSTRUCTION DOCUMENTATION COMPOSITE REFERENCE SECTIONS

Objective

To aid the contractor in understanding otherwise undefined relationships, illustrate key interdisciplinary site design systems and technical components, including landscape architecture, architecture, civil, structural, and lighting.

General Requirements

While Design Development Composite Reference Sections play an important role in design decision making, they can also be maintained and further developed as construction document references. As these sections often incorporate a number of individual details, the transition from Design Development to Construction Documentation requires that the sections be updated to reflect and coincide with final detail development.

The transition further requires that any supporting information shown for reference be confirmed and finalized in order to avoid misrepresentation and inaccuracies.

These guidelines promote the useful role of Composite Sections as part of the Construction Documentation phase. The sections facilitate the contractor and design team in understanding relationships between components and systems.

During Construction Documentation, Composite Reference Sections should be used as a technical medium for interdisciplinary coordination. The composite reference between interdisciplinary systems and components is the fundamental feature of these drawings. Architects and engineers use these types of drawings routinely and by necessity as part of their Construction Documents.

The landscape architect is well positioned to assemble and depict multidisciplinary systems that would not otherwise be studied and illustrated by others through the Construction Documentation process.

Specific Requirements

Final component program, illustrated and identified for costing, to complement and reinforce plan information.

Final construction details and detail assemblies, including relationships to adjoining details and assemblies. Adjacencies and transitions between details accurately represented.

Infrastructure requirements, including any unique relationships between utilities and finish components.

Existing and proposed soil zones, illustrated to accurately define extent and relationships to adjoining systems.

Grading and drainage requirements, defined accurately and reference noted. Include surface and subsurface drainage components, minimum and maximum slopes, grade breaks or creases, and so forth.

Code requirements, illustrated and reference noted to define satisfactory execution:

- Level changes
- Landings
- Railings
- Maximum slopes
- ADA issues
- Structural issues

Site Detail Keynote references for all systems and components, complementing the Detail Keynotes used on the Site Materials Plans.

Site Reference Notes describing key construction requirements, complementing the Reference Notes used on the Site Layout Plans.

Graphic Requirements

Contract Documents: As noted above, the CD Composite Reference Sections are graphically composed to clearly communicate contractual requirements, rather than accentuate design intent.

Scale references: Do not include people, automobiles, and other scale references. These elements are used for Design Development sections in order to evaluate scale relationships.

Layout information: Do not include layout or detail dimensions, as CD layout dimensions are included solely on the Site Layout Plan and detail dimensions are required on site details. Site detail dimensions are distinguished from site layout dimensions, as site layout dimensions are used to position elements and site detail dimensions are used to define dimensions within each element or system.

Best Practices

Best practices described at the DD phase should also be applied at the CD phase.

Interdrawing Coordination and Parametric Modeling

The Challenge

While Design Development Composite Reference Sections play an important role in design decision making, they should also be maintained and further developed as a Construction Documentation reference. As these sections often incorporate a number of individual components, the transition from Design Development to Construction Documentation requires that the sections be updated to reflect and coincide with the plan layout and final detail development. This requires diligence and can be challenging.

There is some debate about the role and appropriateness of Composite Reference Sections as part of the landscape architectural Construction Documents. The argument against including the sections in the Construction Documents suggests that the sections may not precisely match drawings and details included elsewhere in the set. This argument is derived from the notion that coordination between plan, sectional drawings, and detail drawings is a laborious manual exercise, with much susceptibility to errors and inconsistencies.

That issue has historically been a challenge for the architectural design industry at large. Complex relationships between various drawing types have resulted in the need to share and coordinate a massive number of drawings between disciplines working in the same space. Imperfections in the process result in errors, omissions, and associated change orders, which may add significant costs to projects.

Parametrics

In the early 1980s, CAD-based software programs were introduced to the mechanical design industry that established automated relationships between drafted systems and components within a building. This area was known as "parametrics" or "parametric building modeling." For mechanical systems designers, the modeling system was used to study the implications of building changes on the performance of mechanical systems, and vice versa. Working with "embedded relationships," design or performance criteria could be applied to the model and alternative schemes could be readily evaluated."[31]

Parametric modeling was slower to develop in architectural design. Difficulties in isolating cause and effect relationships in buildings, more easily accomplished with mechanical systems, has been the primary challenge. A more pragmatic solution utilizes "partially constrained" relationships, only those that the architect selects. In the late 1990s, "building information modeling" software known as AutoDesk Revit was released to allow architects to model buildings with partially constrained criteria. "Autodesk® Revit® Architecture software [now] helps [the architect] explore early design concepts and forms, and more accurately maintain [his] vision through design, documentation and construction. Make a change, and it's automatically updated across the project. [The architect can] use the essential building information modeling (BIM) data that Autodesk Revit Architecture software provides to support sustainable design, clash detection, construction planning and fabrication."[32]

Parametrics are now revolutionizing the architectural design process. As architects enter drawing data in one form, such as a plan, an information database is fed with information that automatically establishes other types of associated drawings, schedules, and even specifications. For example, as plans are built for individual floors in a building, a composite section is being created within the database and can be presented at any time. And as changes are made on one drawing, the entire database, including other drawings are updated. For example, if a wall is moved in plan, it will be moved in section also. This system is immensely valuable in coordinating relationships between drawings and disciplines.

Role in Landscape Architectural Documentation

In order for the system to be most effective, proponents of using the parametric modeling approach for project design and documentation suggest the need for its complete use by all disciplines on the entire design project. The work of landscape architects is inherently multidisciplinary and could benefit from automated design, documentation, and coordination systems. The benefits will be especially useful for landscape architecture work that occurs in close proximity to work by other disciplines, such as over-structure work, urban plazas, and streetscapes.

For landscape architects, an integrated and automated set of relationships between plans, sections, and details reinforces the need for composite drawings such as reference sections. Composite Reference Sections are analogous to building sections developed by architects and similar sections developed by engineers. Architects and engineers use these types of

[31] "Products." Autodesk. www.autodesk.com/.

[32] "Products." Autodesk. www.autodesk.com/.

drawings routinely and by necessity. Without these drawings, a complete depiction of building and site systems is difficult to achieve.

It is suggested that landscape architects initially use parametric modeling systems to coordinate and automate relationships between in-house and interdisciplinary drawings. For example, as any changes in the details are made individually, these changes would be reflected in sections via automated processes. Adjustments to plan locations of elements would also be reflected in sections, and as the landscape architect works together with architects, engineers, and others, drawing updates can be used to coordinate the interface between systems.

Longer-term use of parametric modeling system by the landscape architect might be used to evaluate site performance against established metrics. While these opportunities are largely unexplored by landscape architects, they hold much potential, for example, evaluating site micro-climates derived from alternative design configurations and determining water infiltration rates derived from different pavement systems and configurations.

DESIGN DEVELOPMENT SITE DETAILS

Objective

Design Development Site Details resolve and display all material, form and finish decisions associated with three-dimensional design. DD details should function as "design details," where all issues associated with design, rather than implementation, have been determined.

General Requirements

Intent

DD Site Details should manifest the project mission and vision, demonstrating design principles, intended character, quality, and performance. In this sense, details are everything to the success of the project and should be evaluated relative to project goals and metrics prior to advancing into Construction Documentation. The landscape architect should identify any unresolved Design Development form or technical issues. A site plan is only as good as it is three-dimensionally resolved and well-conceived site plans can fail variously with poor detailing. The development of site details generally requires more extensive knowledge of building practices than some other landscape architectural Construction Documents, with the potential exception of specifications. Consequently, DD details require extensive study, iteration, review, and coordination.

DD details place special emphasis on interdisciplinary relationships. The landscape architect should take initiative in developing and coordinating the interface between site systems and building, civil, structural, environmental, and other systems. All site-building relationships should be comprehensively depicted, for example, site walls to building façades, pavement to door thresholds, and drainage intentions at buildings.

Extent—Determining what Details to Develop

Comprehensiveness

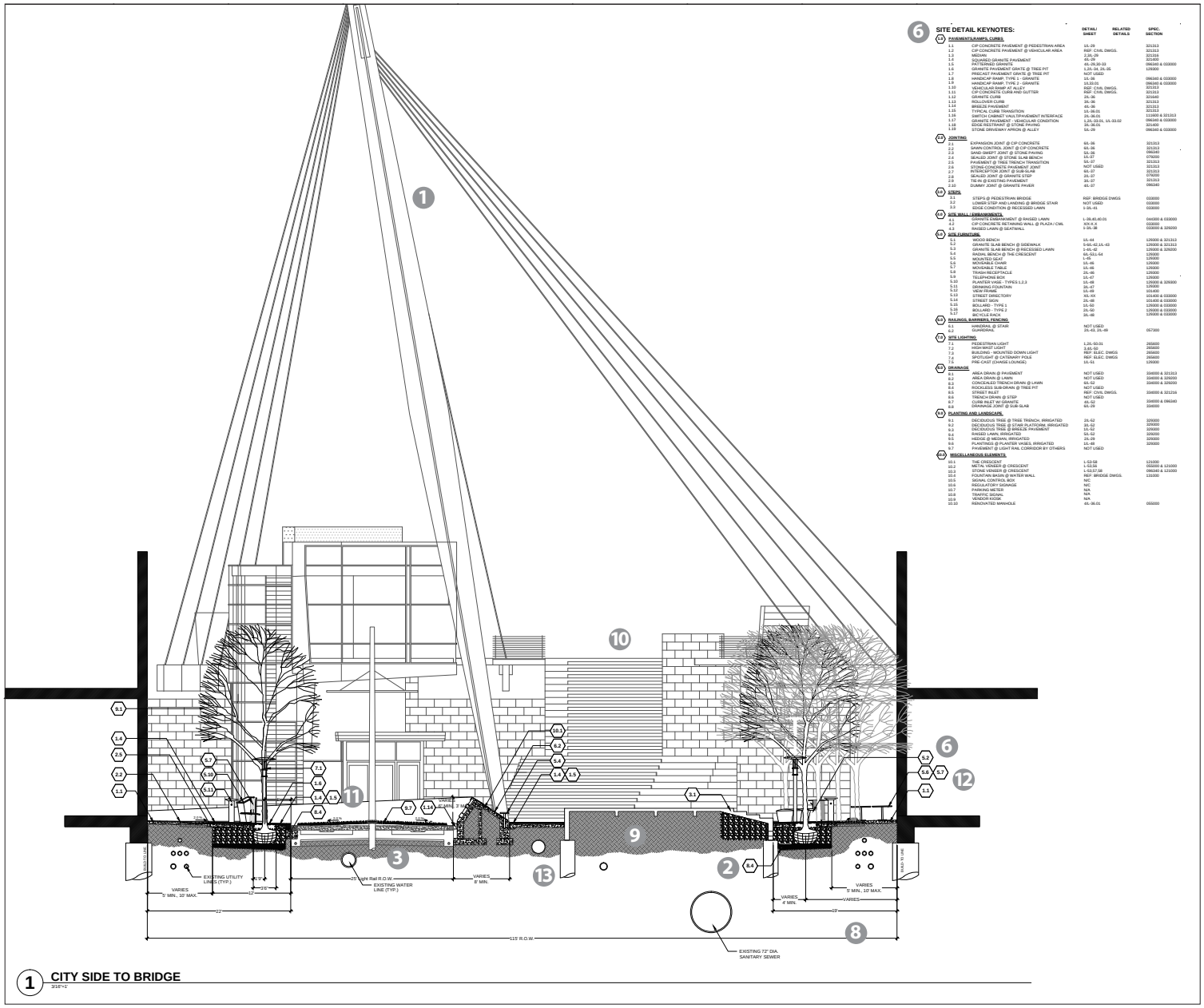
What details to provide in the DD and CD documents is a basic and important consideration. Some landscape architects elect to provide fewer details, preferring to address any unresolved issues in the field or through the shop drawing process. In some cases, that determination is derived from design fee constraints.

Others believe that a comprehensive and complete set of details results in most accurate and economical contractor bids, highest built quality, and best client service. This group abides by the premise that only those details provided in the Construction Documents are legitimately part of the owner–contractor contract. Complete and accurate pricing cannot be accomplished without a comprehensive set of details. It is recommended that the landscape architect assign a detail, or set of details for every condition under the landscape architect's work scope.

More specifically, a comprehensive detail selection should address the following conditions:

- Every proposed site component, assembly or system
- Critical or unique design features that require more extensive review
- All locations where two materials, components or systems adjoin, for example, pavement-light interface
- All locations where a grade change occurs
- All locations where a change in plane occurs, for example, pavement meets a wall, column or step
- All conditions requiring structural design
- Any untypical conditions requiring clarification, such as where a typically subgrade paving edge is exposed
- Views of each component from each unique side, for example, custom furniture, planters, and walls

Example of CD Composite Reference Sections



LEGEND

1. Final Component Program
2. Final Construction Details and Assemblies
3. Infrastructure Requirements
4. Grading and Drainage Requirements
5. Code Requirements (if necessary)
6. Detail Keynote References
7. Reference Notes (if necessary)
8. Key Dimensions
9. **Existing and Proposed Soil Zones**
10. **Section-Elevation Depiction**
11. Primary Technical Systems
12. ARCHITECTURAL COORDINATION
13. STRUCTURAL COORDINATION

Note: **Boldface** items represent key distinctions between Construction Documentation documents and Design Development documents.

There are NO significant distinctions between DD and CD Drawings. However, all people, cars, and illustrative furnishings not specified in the project should be removed.

Choose detail section cut locations where the most number of components come together. For example, on a deck, show the post, beam, joist, decking, and railing components.

Provide details for all project components under contract, regardless of custom, standard or proprietary nature. Prefabricated components should be shown to illustrate position, relationships to other components, and mounting requirements.

Typical and Unique Conditions

Resolve and document all typical and nontypical three-dimensional conditions, for example, planters, ramps, and site walls, stairs, and cheek walls. Utilize axonometric or multiple elevation drawings to complement plans and sections.

Elevations

Provide elevation of all walls, fences, planters, fountains, and other vertical conditions, and include subgrade conditions, finish grade, and top and bottom of footings.

Sections

Maintain and further develop selected Design Development Composite Sections in order to illustrate relationships between adjoining systems and components. Details within these sections will need to be updated as they are advanced.

Assemblies and Jointing

A landscape architectural detail most usually depicts an assembly of materials or components connected to one another. One of the most fundamental, important, and challenging detail elements is the jointing relationships between different materials. The joint is defined as the meeting or interface between any two materials or components. In landscape architecture, joints are especially important because they incorporate structural considerations; accommodate movement, differential expansion, and contraction; and present undesirable exposure for weather intrusion.

It is important that the landscape architectural Construction Documents include the full range of joint types likely to occur on the project. An itemized set of joint details should be included within the Site Details Keynotes list. Joint details should not be specifically defined within other associated details, but rather itemized and detailed separately, for emphasis and clarity. Joint details commonly occur in paving and wall systems, including expansion joints, control joints, and isolation joints. Additional joint details should be included to depict other areas of interface, for example, between walls and pavements, metals and pavements or walls, and site furniture and pavements.

Key Distinctions between DD and CD Site Details

The landscape architect should be strategic in making content decisions for the Design Development documents. These guidelines suggest individual strategies for each of the DD sheets, subject to the unique role of that sheet in the design and documentation process.

Primary relationships between the DD and CD Site Details are summarized here:

- DD Site Details establish and graphically highlight form, scale, materials, and preliminary technical relationships between adjoining components and systems. Design Development details should make these characteristics especially evident, for example, with the use of three-dimensional drawings, composite interdisciplinary drawings and use of scale elements. CD Site Details are strictly developed without graphic embellishment, illustrated with the least amount of graphic information to communicate contractual requirements.
- DD Site Details are organized as a comprehensive set of in-progress Construction Details, for further development as "implementation details" during the Construction Documentation phase. A DD detail should be developed for all materials, components, systems, and conditions included on the project, that is, the DD detail set should be comparable with the CD detail set in terms of extent and number of details.
- DD Site Details are not intended to be "implementation details" as they do not provide the necessary technical, dimensional, or instructional information to construct the project.
- DD Site Details are used together with plans to conduct preliminary, feasibility level coordination with all associated disciplines, for example, architecture, civil, structural, electrical, irrigation, and mechanical, if necessary. Feasibility-level coordination is primarily oriented toward concluding that details can "work," that is, formally, technically, per building codes and within the allocated construction budget. CD Site Details are used to conduct advanced and comprehensive technical coordination, ensuring that the documents include no errors or omissions.
- DD Site Details fully utilize the Site Detail Keynote system to highlight relationships to other systems and details. More extensive use of Keynotes over written notes is preferable at this point. CD Site Details apply the Site Detail Keynote system in similar fashion.

Specific Requirements

Detail Content

Subject Elements

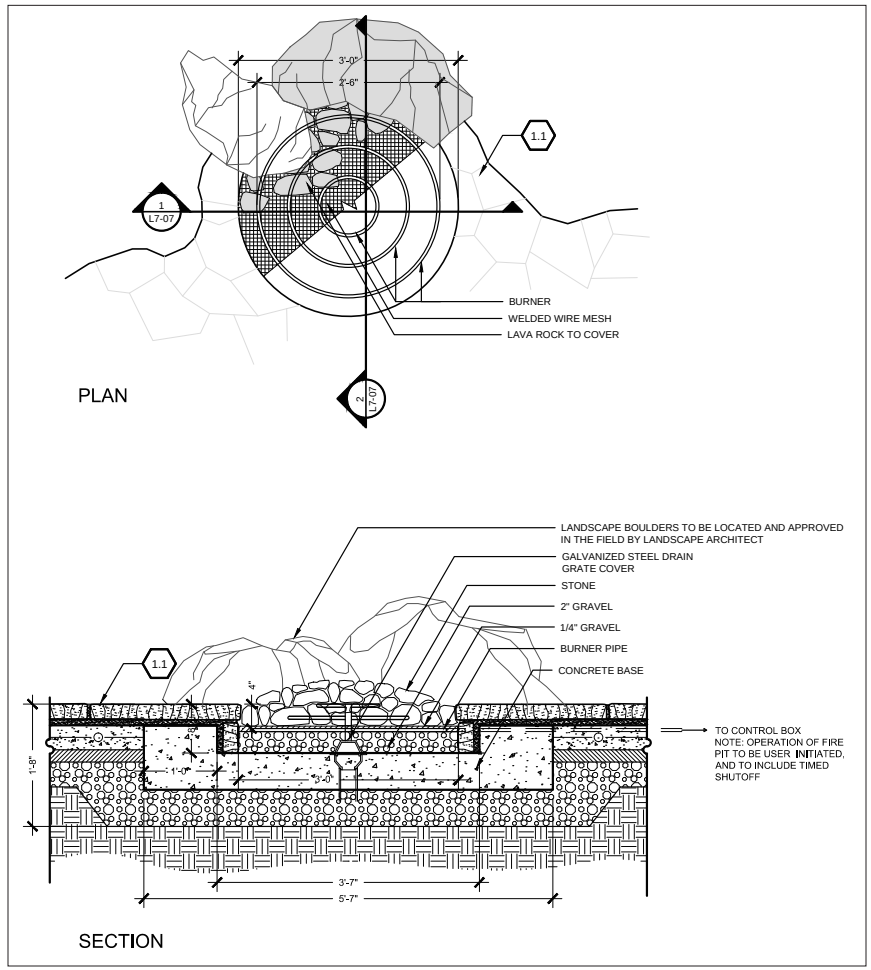
The landscape architectural DD Site Detail shall include the elements listed here, strictly focused on the subject detail. The subject detail is that element named in the detail title. Subject Details are further described in Chapter 3, Operational Principles.

- Graphic shape, size, position, and relationships between elements within the detail, shown precisely and to scale
- Primary or key dimensions to indicate shape, size, position, and relationships between components within the detail assembly
- Generic description of material and finish requirements
- Preliminary structural and setting systems
- Jointing requirements detailed or Site Detail Keynote references to jointing details
- Keynoted relationships to adjoining systems and components. Connection information is defined generically for review and final definition at Construction Documentation. For example, define pavement relationship at top of stair—is it keyed, doweled, or ledged?

Adjoining Systems

While the detail should focus on the subject component or system, the detail should also illustrate adjoining systems, for reference. In some cases, adjoining work may be shown simplified, for example, where a wall detail illustrates a relationship to adjoining paving, the paving section may be shown without reinforcement or jointing.

- **Transitions:** It is important to define and illustrate all potential transitions from the subject detail to adjoining systems. Often, these conditions will vary but are not documented. For example, a pavement system may adjoin a variety of other pavement systems, or it may adjoin varied landscape conditions.
- **Subgrade Conditions:** All details must show full-depth subgrade requirements, including base course or other subgrade preparation, to an undisturbed condition.
- **Work by Others:** Do not draft work by others which is outside the landscape architect's contract. Liability and inaccuracies may occur. If such work needs to be shown for reference, "cut and paste" associated detail files from the applicable consultant, or draft a simple outline of the project component.



Sample DD-Level Detail Graphic

- **Section Cut Line:** Detail sections should represent only elements that physically occur within the specific section cut line, rather than incorporating elements that would occur if the section cut line were jogged. "True" sections present less opportunity for confusion or misrepresentation.
- **Reference Point:** Elevations and sectional details should be constructed from a known vertical reference point. A reference point is a point whose vertical elevation has been defined on the Site Grading and Drainage Plan. Reference points are often reflected as finished grade elevations.

Soils

Existing and proposed soil zones, illustrated to define approximate extent and relationships to adjoining systems. Soil type definition should include the following classifications:

1. Undisturbed soil
2. Compacted sub-soil
3. Planting soil(s), distinguished by type if applicable

Scale Relationships between Details

Where a collection of related details are assembled, choose scales between details that relate to one another, for example, ½" to 1", 1" to 2", 3/8" to 3/4", 1½" to 3". Do not mix scale types, that is, architectural, engineering, and metric scales.

Structural Requirements

At the DD level reinforcement may not be graphically shown, but if reinforcement is intended to be used, it should be noted. Include a note, for example, "Reinforced cast-in-place concrete foundation." Review DD details with structural engineer to determine reinforcement needs. Refer to *CD Site Detail Requirements* for reinforcement definition.

Graphic Requirements

General

DD details represent a transition between "design" and "implementation" documentation. As such, they should be organized graphically as in-progress construction details, utilizing CD-level graphics such as line weights and symbol hatches. The design role of DD details allows the limited use of illustrative graphics that can be removed or simplified as the details transition to Construction Documents. Spare outline-oriented details may also be used at the DD phase, supplemented with scale elements and amenities such as people and furnishings to help define and evaluate the complete design environment. This type of drawing is readily developed as a construction detail. The only role of graphics in the CD detail should be to define and distinguish the limits of materials.

Sheet Composition

Sheet *Layout and Detail Module*, organized per the landscape architect's CAD standards. Each detail should be positioned within its own orthogonal territory, un-infringed by other detail graphics. That territory may be defined by a simple outline, blocking out the detail space, or that territory may be imaginary, implied by the limits of the detail graphic and associated title. When details "invade" the territory of other details, the legibility of the sheet is compromised.

Details organized on sheets to follow the master Site Detail Keynote order given below. Organize details numerically from left to right, top to bottom, unless organized otherwise by the prime consultant.

Details and component groupings ordered as recommended here. A more detailed description of Keynote Systems is presented Chapter 9, Key Documentation Practices.

- Pavements, Ramps, and Curbs
- Jointing
- Stairs/Steps
- Site Walls
- Site Furniture
- Site Metals (including railings, barriers, and fencing)
- Site Lighting
- Drainage and Waterproofing
- Planting and Landscape (including erosion control)
- Miscellaneous Elements (including signage and art)
- Plant Protection

Multiple corresponding details grouped, that is, those that relate to a specialized component or plan enlargement area grouped together on the same page. For example, an art component that requires unique foundation components, walls, and special paving may utilize a grouping of these details in a dedicated portion of a detail sheet.

All details organized to fit within an 8 ½" x 11" format, unless unavoidably oversized. The format will allow for easy paper space organization on the detail sheets, easy hardcopy filing and intranet accessibility.

Left edge of detail graphic aligned with left edge of detail title (detail number in circle), even if dimensions or notes are included in the detail graphic.

Detail Title

Descriptive but concise detail title, with emphasis placed on the detail material or component. Do not include prescriptive information. For example, use "Precast Wall Cap," not "6"-Thick Precast Wall Cap, Acid-Etched." In some cases, such as with paving systems, setting systems may be used to distinguish detail titles, for example, "Stone Paving, Sand-Set" versus "Stone Paving, Mortar-Set."

Finish Requirements, generally not used to distinguish systems by title, for example, "Cast-in-Place Concrete" may be used to identify variously finished concrete pavements. Hatch symbols should be used on plans to distinguish various concrete finishes. The principle promotes the identification of specific materials by solely one reference, so that if a modification is necessary, only one reference will need to be changed.

One component, multiple details: Where multiple details are used to convey a single component or system, distinguish detail titles by either drawing type or emphasis of drawing, for example, "Crescent Wall—Elevation," "Crescent Wall—Section," and "Crescent Wall—End Detail."

Detail title reference number in a circle, with a number, sized per landscape architect's CAD standards. Extend a horizontal "title bar" from the middle of the circle, aligned with the rightmost edge of the detail graphic content and/or notes.

Site Detail Keynote reference number on the far-right-justified end of detail title line, in hexagon, floating above the title line, with sizes and offsets per the landscape architect's CAD standards. It is important to remember that these details all describe one component or system and should be reflected accordingly in the Site Detail Keynote List. Each type of detail should not be represented by a separate (unique) Site Detail Keynote reference.

Scale reference, written in feet and inches, left-justified to and immediately below detail title, to read as follows, with capital letters: "ORIGINAL SCALE: 3/4" = 1'-0".

Detail Graphics

Landscape architect's CAD standards should be studied and fully utilized by the landscape architect.

Detail scale selection is not an arbitrary decision and should be informed by a number of factors. The ideal detail scale should allow clear and legible depiction of all primary components, but may not necessarily show in explicit detail the smallest components such as hardware, which may be shown diagrammatically. The detail should be scaled to allow all geometries to read, including geometric transitions, for example, radius tangent points.

Do not choose scale larger than necessary, that is, if next smaller scale can readily portray components. 1/4" = 1'-0" is recommended as a minimum scale, unless the detail is very simple. For intricate details, 1" = 1'-0" or 1½" = 1'-0" may be considered, with 1" = 1'-0" the preferred scale.

Line-weight hierarchy requirements, from heaviest to lightest:

1. Outline principle edges for subject component in detail.
2. Changes of plane, such as stair tread in plan view.
3. Material changes that do not occur along aforementioned lines.
4. Dimension and extension or leader lines.
5. Hidden lines or objects beyond.
6. Pattern symbols.

Distinctive hatch patterns should be used on section details to designate each component of the detail that occurs along the section cut. For elements shown beyond or in elevation only, show outline of those elements only, without hatch patterns.

Use a clean, orthogonal **bounding box** on plan details, to define plan limits.

Use **Cut lines** to graphically terminate or "cut" an end to the detail, generally occurring on each side of the detail section drawing. Cut lines should occur on right and left sides of detail, but not on top or bottom. All cut lines should be oriented vertically, rather than angled.

Use **standard line types and hatches** as defined within the landscape architect's CAD standards, used to represent materials.

Detail Dimensions

Organize **dimensions above, to left and below detail** per landscape architect's CAD standards. Dimensions should not conflict with detail notes or keynote leader lines, and should not be positioned over a detail graphic.

Use **graphic dimensions on the detail**, rather than narrative dimensions in notes. Use narrative dimensions in notes when referring to the complete size of a component that cannot be dimensioned in full on the detail. For example: "1" x 1'-0" x 9'-0" tubular metal beam."

Dimensions noted in architectural scale (feet and inches), for example, 1'-6", not 18". Where the measurement is less than 1 foot, note the dimension in inches only, for example, 8", not 0' – 8". Do not use fractions less than 1/16" for site details—site work component construction tolerances are limited to this threshold. Show fractions with a diagonal slash, for example, 3/4". Engineering dimensions (feet and tenths) are generally not used for detail work.

Use actual instead of nominal dimensions, except for masonry applications such as stone paving. Nominal masonry dimensioning will allow flexibility with sizing joints. Masonry shop drawings must be completed with actual dimensions.

Annotation Requirements—Graphic

Capitalize all notes and detail titles. Use font type for all notes per landscape architect's CAD standards.

Do not use abbreviations in detail titles. It is acceptable to use abbreviations in detail notes only if the abbreviations match standard abbreviations list included in document set.

Position text notes and Site Detail Keynotes primarily on the right side of the drawing, left-justified in a text block, 1/4" minimum from the graphic edge of the detail, per the landscape architect's automated CAD standards. Avoid long leader lines as they are difficult to follow.

Use fully horizontal leader lines as much as possible. If angled leaders are necessary, choose a single angle established in the landscape architect's CAD standards, with all leaders parallel after break from horizontal.

Leader lines should never cross one another. It is customary, however for note leader lines to cross dimension lines. In this application, break or discontinue the leader line as it crosses the dimension line. The landscape architect's CAD standards should automate this process.

Leader lines should be centered on text, stopping 1/8" short of text, per the landscape architect's automated CAD standards.

Organize **blocks of General Notes,** if necessary, without leaders in the lower-right corner of the detail drawing. If space is not available, locate the notes in the upper-left corner. These notes apply to conditions that cannot be specifically located on the detail. For example, the note "Stain all wood members" or "Paint all field welds to match" would be appropriate.

Annotation Requirements—Content

Notes **are focused on the size, shape, and relationships** of materials and components. Do not describe material characteristics or assembly instructions on details. This information is required in the Project Specification Manual.

Generic labeling is used to identify materials. Do not use the manufacturer's name or product number. Do not use the proper material name. For example, use label "stone" not "Lake Placid Blue Granite by Cold Spring Granite." Precise materials should be described in specifications.

Detail References

Where references to other details are necessary, utilize one of two methods:

A typical Site Detail Keynote symbol with leader line, where the leader arrowhead location clearly designates the component.

A typical Site Detail Keynote symbol with a leader line to circle designating area detailed more fully elsewhere. The circle technique should be used where emphasis is necessary, or when enlargement detail has been provided.

Site Detail Keynotes (hexagonal references) should be used as much as possible to note all conditions detailed elsewhere, rather than written notes.

Notes

Note **material finishes** on details. Do not use symbols alone to communicate finishes. Where various finishes are proposed for a material, note: "Finish varies—See Plan." For example, cast-in-place concrete may be installed both as a broom and a sandblast finish.

Organize notes top down by hierarchy or logical sequence where practical, for example, note "Precast Cap" above "Mortar Setting Bed" for precast cap, or, note "Cast-in-Place Concrete Wall" above "Board-Form Finish."

Use the **most concise description** for each note, without sacrificing content. For example, instead of "Carefully brush specified application of linseed-based preservative to all cut surfaces prior to actual installation, with the approval of the landscape architect, during proper temperature conditions," use "Pre-installation preservative at all cut surfaces." Additional examples of concise description include "All wood members shall be stained," and "All fasteners shall be countersunk and capped/plugged."

Focus notes only on subject detail in title, that is, avoid descriptions of adjacent details shown for reference only. Do not describe materials that have been detailed elsewhere.

Do not repeat notes from detail to detail. Where detail systems appear in more than one place, reference the base or primary detail for information. Select the primary detail and completely note its components. For similar details, note only variations from the base or typical condition. Reference the base detail as a note on the detail variation.

Use consistent references when referring to other details and project components, for example, "sealed expansion joint" must be referred to consistently in the drawings, details, and specifications. Or, for example, the words "garage," "structure," and "deck" should not be used interchangeably. Cross-check terms on details with terms on plans, legend, and specifications.

Minimize the use of abbreviations in notes for ease of reading. Any necessary abbreviations should match the standard abbreviation list made available under the landscape architect's CAD standards pull-down menu.

The "See Specification" phrase is not to be used. This is implicit in the construction industry.

The "As Necessary" phrase is not to be used. The note is vague and does not communicate useful or legally binding information.

No references should be made to specific specification sections. These relationships are implicit, and the contractor is expected to understand the organization and content of the projects specifications. For example, it is not necessary to include a note to follow the note "Compacted Subgrade" that reads "Refer to Earthwork Specifications."

Do not use "No Scale" or "Not To Scale" detail references. Details should always be drawn to scale.

Do not use "@" to Substitute for "at."

Best Practices

Design

Exterior Orientation

It goes without saying that landscape architectural details must be well suited to the exterior environment. A number of principles guide that responsibility, some of which vary regionally, others of which suggest more universal applicability.

Durability: Weathering, freeze–thaw, sun and moisture, physical loading conditions, vandalism, earth movement, and wear establish challenging life-cycle conditions for landscape architectural construction. As a result, exterior construction should be detailed with stout, weather-resistant, flexible, and tolerant characteristics. Exterior details vary considerably from interior details—most interior environments would not endure in an exterior environment.

Scale and Proportion: Exterior components are often scaled larger than associated interior components due to visual proportioning to the outdoor landscape. In addition, the anthropometrics of exterior use suggest a more robust interface between man and the exterior environment. Exterior pedestrian strides can be lengthier than interior strides, suggesting that exterior steps be broader than interior steps. Personal territories can be larger too, such as seating space per person in public spaces. Function spaces such as those for outdoor play and dining also tend to be more expansive, possibly due to the perceptual freedom of exterior movement.

Natural Context: Natural conditions associated with the exterior environment such as sun, light, and humidity levels effect the perception and regional applicability of landscape architectural materials and details. Light-colored, heat-reflecting pavement materials used in Phoenix may be undesirable in Chicago or Minneapolis, where heat absorption and expedited snow melt may be desirable. Steel site furniture in the desert southwest can scald an unknowing user. Clear and dramatic light in the New Mexican high desert inspires artists and architects to use saturated color palettes against stunning sky vistas.

Civic Resolve: Public spaces require a level of detail commitment that suggests stability and pride in public institutions and democratic ideals. Historically, civic buildings have been built with a sense of permanence. A consistent level of quality between the public building and the public exterior space upholds these principles most effectively. Well-built public spaces symbolize the immutable values of the governments that they represent.

Economy of Form: Exterior detail forms should be simple in order to address exterior construction economies and life-cycle objectives. Complex details are rarely necessary and can usually be simplified to improve expression and associated cost. For example, complicated cast-in-place concrete formwork can rarely be justified. Spare and economical details may be assembled so that "undistinguished detail elements [may be] made remarkable through their particular combination and repetition."[33]

Serving the Design Mission: Details should support the mission of the project as a unified and rigorously iterated expression. Paradoxically, details are not really details (where a detail is defined as a minor part of something else), but details are rather the entire project. Details are everything. Ludwig Mies van der Rohe famously suggested that "God is in the details," promoting their almighty importance and the challenging need to align them with project ideals. A variation on the quote, "The devil is in the details" warns of the dangerous implications of poorly developed details. A project can indeed go wrong in the execution of detail.

Consequently, design principles should manifest themselves in the details. Relationships between individual parts and the whole must be understood. Detail development should occur as a holistic project effort, rather than a separate activity near the end of the design process. Detail decisions should be tied to project objectives. Each built landscape should be distinguishable by a set of attributes that are represented in the details. If, for example, a garden courtyard at an Alzheimer assisted living facility is organized to "stimulate the physical and mental well-being of its residents," each detail

[33] "Kirkwood, Niall. "Landscape and Detail." In *The Art of Landscape Detail: Fundamentals, Practices, and Case Studies*. Hoboken, NJ: John Wiley and Sons, 1999.

may play a role in serving that mission. Or, if it is most important that a project protect water resources, a variety of detailed systems may play a role, including paving, drainage, and planting.

Suitability

Detail materials also should be chosen with an understanding of their inherent properties and suitability for intended applications. Material capabilities and limitations should be studied and understood during Design Development decision making. Essential structural attributes, for example, span capabilities of wood species and pavement-loading capabilities should be identified. Weathering attributes for material candidates should be examined. Various stone, wood and metals may perform well in one region and poorly in another, poorly enough to fail.

Sustainability

Environmental impacts and sustainability measures should be major considerations when selecting project materials and devising details. In the *LEED for New Construction Standards* V2.2, the United States Green Building Council (USGBC) refers to this project checklist area as Materials and Resources. Credits are given for material reuse, recycled content, regional and rapidly renewable materials, and use of certified wood. Construction waste management is another important component of the LEED checklist.

Life Cycle

Another perspective on sustainable material selection addresses the "life cycle" of the manufactured material or product, also known as the "cradle to grave" material analysis. Here, materials can be evaluated by addressing environmental impacts comprehensively across time. In the manual *Building Better Buildings: A Blueprint for Better Buildings*, the State of California focuses, in part, on the role and selection of sustainable materials. The following is an overview of a process for evaluating the environmental impacts of candidate material:

- **Resource Acquisition:** This includes addressing the environmental impacts of extracting the resources to manufacture the product.
- **Manufacturing:** This includes evaluating the environmental impacts of the manufacturing process.
- **Transporting:** This includes considering the impacts of transporting the material to the manufacturing or assembly location, as well as transporting the material to the site.
- **Installation:** This includes the impact that the installation of the product will have on the installer as well as the project occupants.
- **Impact on Building Occupants:** This includes an evaluation of the potential impact the product might have on occupants during its use.
- **Performance:** This includes consideration of product durability, as well as product maintenance requirements.

Various standards and associated tools for evaluating the sustainable characteristics of building materials are available, including those listed here.[34]

- **National Institute of Standards and Technology Building for Economic and Environmental Sustainability (BEES):** BEES measures the environmental performance of building products by using the environmental life-cycle assessment approach specified in ISO 14000 standards.
- ***AIA Environmental Resource Guide*:** This guide presents detailed life-cycle information about a number of building products.
- LEED Materials Credits: The material credit requirements in the LEED Green Building Rating System address some of the key criteria for product selection.

Additional standards are published by ASTM International, originally founded as the American Society of Testing and Materials. The organization currently publishes more than 12,000 technical standards for materials, including many used in architectural and landscape architectural design.

ANSI, the American National Standards Institute, also develops and promulgates a large variety of standards, some of which serve the construction industry. ANSI's mission is focused on U.S. business and U.S. quality of life.

Material Selection

Once structural, weathering and sustainability determinations have been made, a short list of candidate materials may be assembled for aesthetic consideration. Materials and associated finish options should be inventoried as they address project objectives. Finishes in landscape architectural materials include a wide range of choices, some of which provide varying

[34] "California Sustainable Design Training: Sustainable Materials." www.ciwmb.ca.gov/Greenbuilding/Training/StateManual/Materials.doc.

performance considerations. Cast-in-place concrete can be broomed, troweled, sand-blasted, acid-etched, or rubbed, and each of these finishes presents different life-cycle considerations. Stone can be polished, honed, water-jetted, hammered, flamed, or sawn. Each of these finishes results in vividly different appearance and performance implications. In addition, the life-cycle implications of finishing processes vary significantly, as itemized earlier.

There is growing recognition of the importance of responsible material and detailing decisions in the design and construction industries, as they relate to both the health of the project and to the broader environment. Site work is especially culpable due to the scale of the work and the immediacy of the impacts to public systems. The importance of material selection in landscape architectural detailing suggests the need for formal and accountable decision-making processes. A metrics-based process should be established to inventory and evaluate alternative material, product, and detail considerations. A matrix or similar graphic device should be used to visually compare materials, details, and performance criteria. Criteria should be derived from the broad performance metrics established for the project. More detailed criteria should be dedicated to durability, weathering, life cycle, and aesthetic considerations. Too often, materials are selected and detailed based solely upon subjective and emotional judgments.

Coordination

The most effective details are those that are developed and coordinated with a host of participants, including material suppliers, product representatives, project maintenance personnel, construction contractors, and interdisciplinary design team consultants.

The landscape architect should develop project plans, details, and specifications in tandem, with careful coordination between the three, so that the specifications describe in greater "specificity" the general information contained within the details. It is imperative that the Site Detail Keynote List (proposed project systems and components), specifications, and details are aligned with one another to avoid errors and omissions and potential implications to the cost-estimating process.

Drawing-Specification Relationships

Carefully coordinate detail content and terminology to be consistent with specifications. Specification development should take place by carefully reviewing all project plans and details and developing a CSI-based outline of project materials and systems. All quality-control reviews must be conducted with plans, details, and specifications simultaneously.

Architectural Coordination

"Walk around" the building with the architect to determine all site work-building interface conditions. Sketch these details with the architect. Determine detailing responsibilities and how to represent work by others.

Engineering Requirements

Coordinate and resolve structural requirements for site details. Review the details with structural engineers prior to initiating Construction Documents, for example, walls, steps, pavements, light bases, and railings. For example, detail all railings to support loading requirements, rather than merely stating that they must support a lateral load per building code. Conduct structural review of all component shapes and connections, with confirmation of approximate sizes of structural elements. Conduct a comprehensive work session with the engineer to prepare him to conduct a detailed "redline" review of the current details, making recommendations for structural improvements. Reinforcement and final sizes should be determined at Construction Documentation.

Coordinate and resolve civil requirements for site details. Review details with civil engineers prior to initiating Construction Documents, for example, drainage details, piping conditions, curb and ramp details, utility components, and relationships between pedestrian and vehicular (civil) systems.

Fabricators

Determine and confirm the constructability of proposed detailing systems. Work with fabricators and contractors during the design and documentation process to determine construction parameters and limitations. Determine stock material availability, shaping and finishing limitations, and cost implications. For example, metal bent in two directions will likely need to be cast, and will require a mold cast and associated lead time.

Technical

Modeling Software

Utilize three-dimensional drafting media and software to study, illustrate, and resolve Design Development details from multiple perspectives.

Automated Drawing-Specification Interface

Proprietary software is available to electronically link plans and details to project specifications.

For example, "E-SPECS for CAD integrates . . . drawings and specifications directly from CAD®, instantly updating . . . specifications as [drawings are developed.] E-SPECS for CAD recognize standard CAD elements or complex drawing objects in Architectural Desktop®. As [the designer] enter[s] text, Keynotes, blocks, hatches, or other drawing elements, . . . specifications stay in sync, in real time. Insert a wall, door, window, or any other building object into . . . drawing and instantly update [the] project manual with the appropriate specifications.[35]

Any changes [made] to the drawings will automatically be incorporated into the [technical] specifications. [One] can manage all the interface definitions, including setting up new projects and establishing section links directly from CAD®.[36]

And with the click of [a] mouse, [the designer] can access all the other functionality that e-SPECS provides to update [specifications] sections on-the-fly, post project notes,[and] review section markups."[37]

Strategies

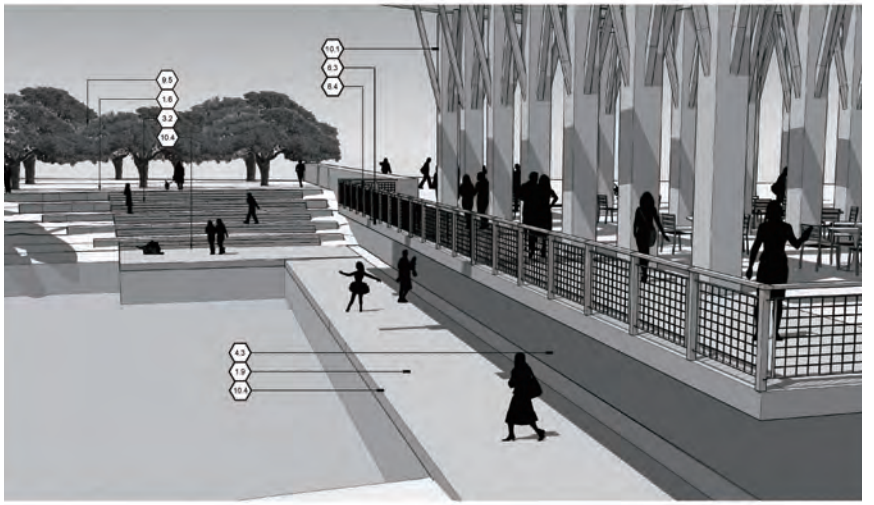
Process

Iterating the Details

Develop or "layer" a cumulative level of detail in the site details as the plan and design proposal matures. Utilize design reviews, quality-control reviews, interdisciplinary coordination, and value engineering sessions to inform the development of details. Do not attempt to finalize or provide full documentation, for example, exhaustive dimensioning, specific reinforcement or full annotation until the Design Development program and cost confirmation has been completed.

Establish strong relationships between the DD Site Details and Composite Reference Sections. Utilize these complementary drawings to inform one another. For example, use the sections to inform scale and form relationships between individual details.

[35] " E-SPECS for AutoCAD. http://e-specs.com/products/e-specs-for-autocad/.
[36] " E-SPECS for AutoCAD. http://e-specs.com/products/e-specs-for-autocad/.
[37] " E-SPECS for AutoCAD. http://e-specs.com/products/e-specs-for-autocad/.



Sample Three-Dimensional Graphic Illustration with Associated Keynote References

Research and Innovation

Among the various design and fabrication disciplines, the building construction industry has been relatively slow to make widespread advances in the quality of building products and details. Concrete mix design, steel and wood framing systems, insulation, and window products are similar to those used a century ago. Furthermore, the fabrication of many of these construction products is materially wasteful, energy-intensive, and harmful to the environment. It is said that the energy used to manufacture construction materials exceeds the energy used for all other types of manufacture, agriculture, and transportation combined.

In landscape architecture and site development, twenty-first-century systems and details remain very similar to those produced in the twentieth and even nineteenth centuries. Pavements, stairs, walls, railings, and planting systems have not advanced significantly. The durability and life cycle of many constructed systems seems to be in decline and may be linked to short-term investment horizons for many developers and clients.

Some sustainability advances, however, have been made. A growing percentage of site furniture is currently being fabricated with recycled content. In addition, some innovation has occurred with water quality and stormwater management, with bio- and phyto-remediation

systems to clean water, and pervious pavements that facilitate the recharge of groundwater supplies. And substitute wood products have been developed that may help to reduce the rate of deforestation and mitigate greenhouse gas emissions. These products are both durable and recyclable, although complete life-cycle analyses have not been reviewed for this publication.

Academic research and design practice investigations are not readily shared between the two realms, as they are in industries such as medicine and life sciences. Landscape architects have poorly endeavored to improve upon construction systems, and focused emphasis has not been placed on landscape construction technologies and details in academic programs. The horticultural industry, for example, has learned much about "how to plant a tree," but many landscape architects' Planting Details remain essentially unchanged. In practice, "successful" landscape architects are "promoted" to responsibilities that free them from detailing responsibilities. Site detailing processes must be more significantly rooted in advancement and innovation, rather than repetition. Landscape architects need not conduct empirical research themselves, but can look to a range of allied disciplines for analysis and recommendations.

Site construction detailing practice is well positioned to draw from associated sciences and technologies. Scientists study materials and systems that we use as landscape architects. For example, the American Concrete Institute (ACI) has made conclusions relative to the use of expansion joints in cast-in-place concrete applications, but this information is not currently well utilized by landscape architects. The Marble Institute of America, representing the use of all types on architectural stone, is "committed to supporting sustainable initiatives and innovations at all levels of the production of stone products."[38] The MIA and Stone Council are developing best practices in the industry to provide architects and landscape architects with guidance in implementing environmentally preferable operations.

The American Society for Testing and Materials (ASTM) maintains a phenomenal and world renowned collection of technical resources for approximately 140 industries, including building and site construction. The ASTM digital library represents a research clearinghouse, with thousands of peer-reviewed symposia papers. The engineering collection contains about 30,000 papers, accessible with a good search engine and retrieval process. Few topics are neglected or are too obscure, ranging from "Dimension Stone Use in Building Construction" to "Constructing and Controlling Compaction of Earth Fills." Many of these papers address the latest concepts and technologies for very specific topics.

The ASTM knowledge base is not readily accessed by landscape architects, maybe due to the overwhelming breadth and complexity of the profession, together with project fee and time constraints. It has been suggested that landscape architecture firms establish nonproject venues to pursue the development of improved practices and technologies. Those venues might include foundations, academic partnerships, or even research departments whose services are incorporated as part of the consultant's services.

Resolution

Details must be thoroughly studied and well resolved, with a rigorous level of precision. Precision relates to the degree of definition, not the exactness of the installation. Components and systems must be fully understood and represented, not left to field interpretation. Poorly resolved details leave necessary requirements undefined.

Well-resolved details can be accomplished with a number of specific techniques highlighted below.

Three-Dimensional Study

Interdisciplinary Cross-Checking

Constructability Reviews

Design Phase Mock-Ups

As-Built Records

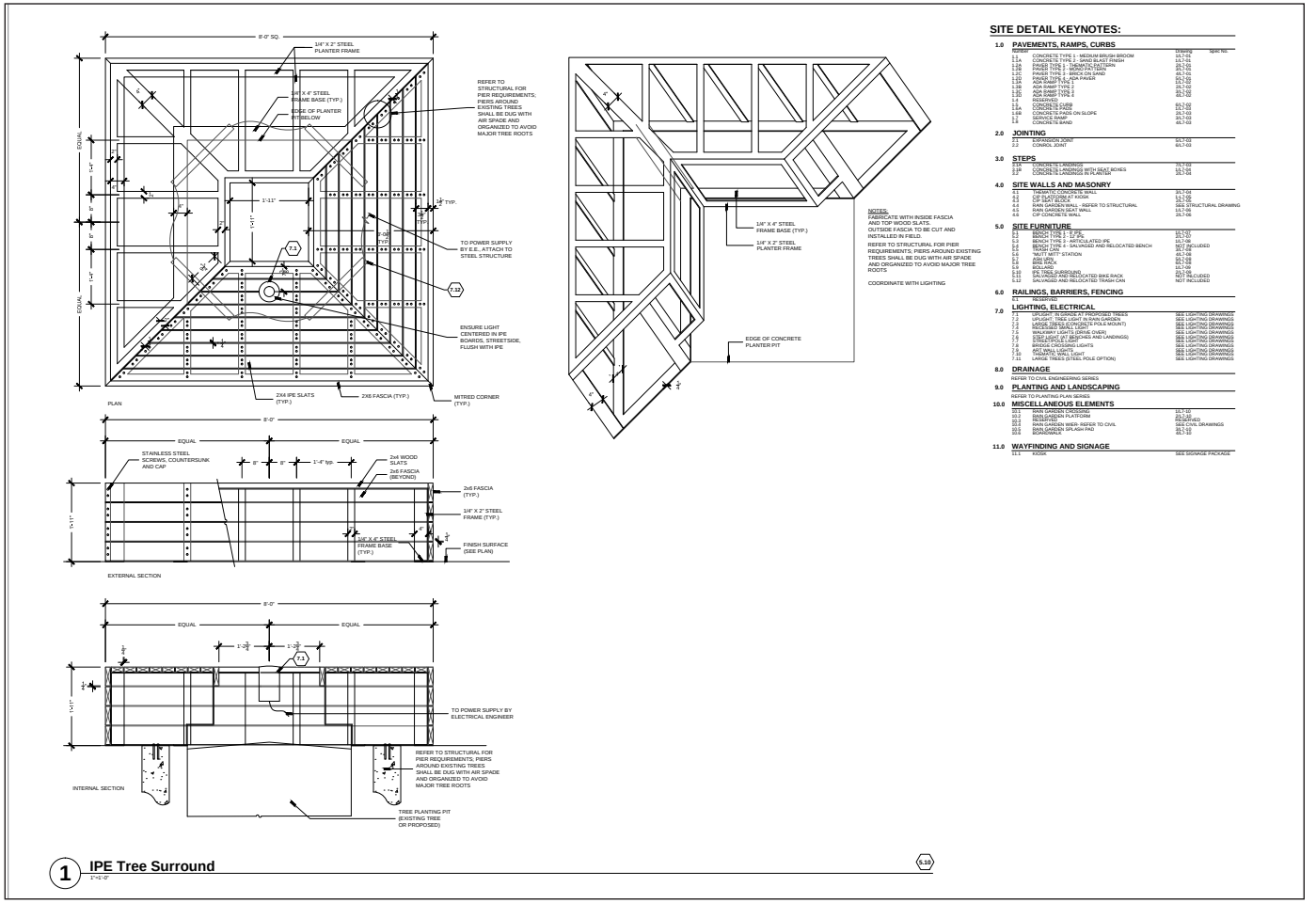
Three-Dimensional Study

Details should be drafted three-dimensionally and reviewed from every perspective. Plan and section drawings alone neglect key considerations. All unique site conditions should be studied as they influence the primary detail. If select details are drawn full-scale, proportion, human fit, and key intricacies can be understood. Large-scale study models can provide a very useful form development tool. Few projects can be well executed without the use of three-dimensional study and documentation tools. Determine the most critical three-dimensional aspects of the project and determine a method for improved depiction, for example, isometric, perspective, plan-section, or exploded views.

[38] Marble Institute of America. www.marble-institute.com/industryresources/stonegreenbuilding.cfm.

Using 3D Graphics in Construction Documents

This is a Sample Construction Drawing for a custom bench planter utilizing a three-dimensional graphic to convey design intent. In-progress and finished photographic documentation are provided to depict the final product outcome.



Interdisciplinary Cross-Checking

The landscape architect's perspective should be complemented by that of collaborating disciplines. The project architect, civil engineer, structural engineer, or project artist should review the landscape architectural details as part of a comprehensive quality-control review process. The review will likely determine inaccuracies, inconsistencies or incomplete information.

Constructability Reviews

A contractor should review design and construction details for constructability. Constructability relates to the degree that the documents provide adequate information to properly bid and build the project, that is, the completeness of the documents. The contractor may be contracted as a member of the design team or may offer pro bono services in order to position himself to bid on the work or negotiate a contract with the owner.

Design Phase Mock-Ups

The ultimate test for level of resolution in construction details may be reflected in an actual construction exercise. If fees allow, a preconstruction mock-up can provide all the evidence that the designer needs to complete the design detailing process at a high level of resolution. The design phase mock-up should be integrated with the design services contract by enlisting the services of a subcontractor capable of the specialized construction required within the mock-up.

As-Built Records

Maintain project shop drawings on file for future project use. These drawings precisely illustrate how components are built, as represented by the industry specialists. Theoretically, these details should be well resolved. These drawings are usually more advanced and potentially include improvements to the construction details established by the landscape architect.

Evidence

As designers and constructors, we know and trust only what we see and experience ourselves, in our locale, tested and proven. Project-based experimentation should not be utilized to a great extent, unless the client is interested in a demonstration project or performance analysis. Landscape architects should be extremely careful when using new or "imported" systems. "Imported" systems refer to those construction practices utilized elsewhere in the world, but unproven in the project locale. For example, a paving system used in the American Southwest could deteriorate rapidly in the Mountain West, where freeze–thaw cycles present damaging impacts to exterior construction.

In some cases, where life cycle expectations for the project are extremely high, a survey of similar systems subject to similar conditions should be undertaken. In addition, a performance mock-up may be utilized. In this case, a partial mock-up of a questionable system may be tested prior to actual use on the project. Ideally, the system can be tested over the course of two seasons, under relevant site circumstances. For example, a vehicular paving system may be installed in a location subject to construction traffic.

Use of Standard Details

Standard details are those details previously developed by the landscape architect that are kept on file for use in similar project applications. When adapting standard details to new project applications, the landscape architect must scrutinize each detail for applicability to all project circumstances. In addition, the landscape architect should not assume that the standard detail is complete or well-developed. Standard details are often positioned in archived files without full or rigorous quality-control reviews. The standard detail should only be used as a point of departure for further development during the Design Development and Construction Documentation process.

The landscape architect should begin the detailing exercise by comprehensively defining all details associated with the project. Do that by "walking around" the site plan and graphically itemizing all materials, components, systems, and conditions on the Site Detail Keynote List. Preliminary "Sketch Details" for each material system identified should be prepared. Upon completion the landscape architect may search the firm's standard detail database to determine applicable details for futher development. Most all pavements, walls, and other fundamental systems can be developed from a standard detail. Space should be allowed for additional details to be added to the detail sheets. See also illustration in Chapter 7, Design Development: Design Solutions for Graphic Depiction of Mock-up and Storyboard Process.

Each component or system should use one standard detail which may be comprised of plans, sections, elevations, and/or axonometric drawings, to further describe and depict the component or system. Related details should also be included where necessary to describe connections or transitions to various conditions or adjacent components and systems.

When using standard details from a government agency such as a parks department, changes should not be made to details other than

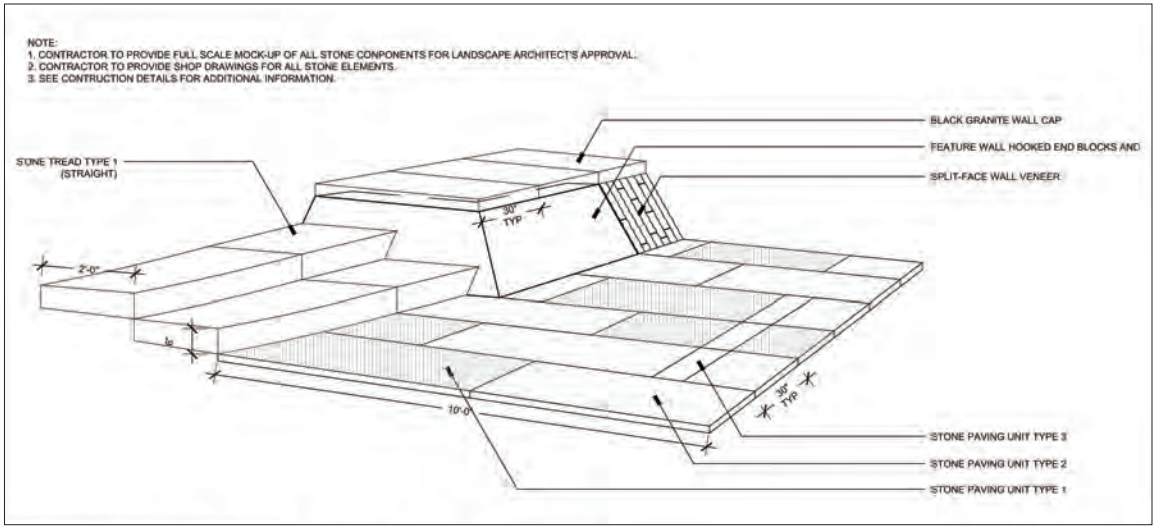
incorporating dimensional information to fit the component or system to project circumstances. Original detail authorship and ownership should be carefully recorded as a general note within the individual detail block. Proprietary liability should not rest with the landscape architect, unless details by others are manipulated. In some cases, standard public agency details should not be provided by the landscape architect but rather identified in the General Notes as directed by the agency.

Avoid redundancy, that is, repetition of the same information on similar details. Instead, develop a base detail with common or standard information. Develop additional details that vary from the base detail, but only note variations from the standard. For example, many stair details will utilize the same basic systems, but will vary only in number of steps and landings, handrails, cheekwall, and potentially lighting conditions. Highlight only these variations in the details; do not repeat tread shape, finish, or reinforcement information.

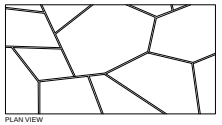
Catalog cut sheets or proprietary details should not be used within Contract Documents. These details may contain references to work not included within the contract. In addition, they are often not drawn to scale, and may change if an alternate product is chosen during the design, bid or construction process. If a proprietary product is to be used, it may be illustrated with a generic outline. Installation intent should be communicated within the detail.

Incorporating Construction Drawing Mock-Up Details for Quality Control

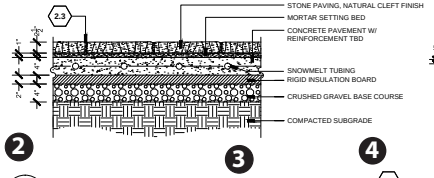
This is a sample construction drawing mock-up detail that was provided on the General Information Sheet of the drawing set to convey the design intent for the illustrated systems. The photograph depicts the final built outcome and highlights the importance of including such mock-ups to reinforce quality and workmanship expectations for specific elements on the project.



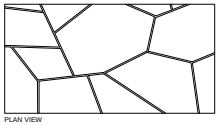
Example of DD Site Details—Paving



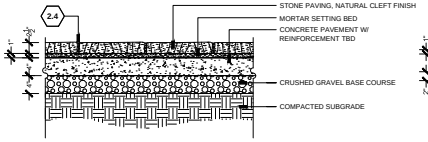
PLAN VIEW
NOTES:
1. PROVIDE MOCK-UP
2. MAX. LENGTH OF SIDE 24", MIN. LENGTH OF SIDE 6"
3. NO CONTINUOUS JOINTS OVER 4' IN LENGTH IN ANY DIRECTION



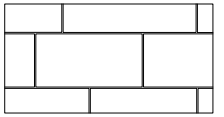
1 Stone Paving Type 1 (1.1)
1"=1'-0"



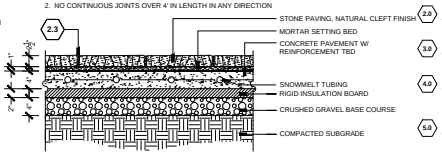
PLAN VIEW
NOTES:
1. PROVIDE MOCK-UP
2. MAX. LENGTH OF SIDE 24", MIN. LENGTH OF SIDE 6"
3. NO CONTINUOUS JOINTS OVER 4' IN LENGTH IN ANY DIRECTION



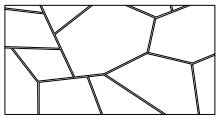
2 Stone Paving Type 2 (1.2)
1"=1'-0"



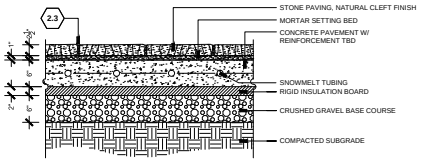
PLAN VIEW
NOTES:
1. PROVIDE MOCK-UP
2. NO CONTINUOUS JOINTS OVER 4' IN LENGTH IN ANY DIRECTION



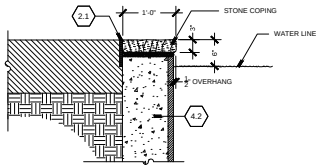
3 Stone Paving Type 3 (1.3)
1"=1'-0"



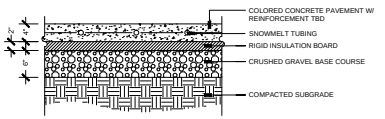
PLAN VIEW
NOTES:
1. PROVIDE MOCK-UP
2. MAX. LENGTH OF SIDE 24", MIN. LENGTH OF SIDE 6"
3. NO CONTINUOUS JOINTS OVER 4' IN LENGTH IN ANY DIRECTION



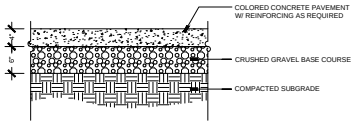
4 Stone Paving Type 4 (1.4)
1"=1'-0"



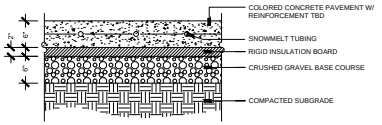
5 Stone Coping (1.5)
1"=1'-0"



6 Concrete Type 1 (1.6)
1"=1'-0"

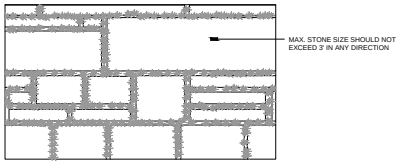


7 Concrete Type 2 (1.7)
1"=1'-0"

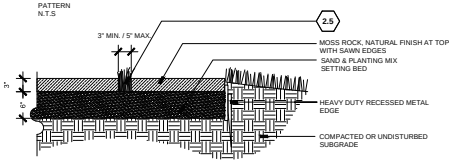


8 Concrete Type 3 (1.8)
1"=1'-0"

NOTES:
1. PROVIDE MOCK-UP
2. SUBMIT PAVER SAMPLE



PATTERN
N.T.S



9 Stepping Stone Type 1 (1.9)
1"=1'-0"

1 SITE DETAIL KEYNOTES:

		DETAIL/ SHEET	RELATED DETAILS	SPEC SECTION
1.0	**PAVEMENTS, RAMPS, CURBS**			
1.1	Stone Paving Type 1 (irregular stone on snowmelt concrete substab)	1/L7-02	1/L7-10	096380 & 033000
1.2	Stone Paving Type 2 (irregular stone on concrete substab)	2/L7-02	1 & 2/L7-10	096380 & 033000
1.3	Stone Paving Type 3 (rectilinear stone on snowmelt concrete substab)	3/L7-02	3/L7-10	096380 & 033000
1.4	Stone Paving Type 4 (irregular stone on snowmelt concrete substab for vehicular use)	4/L7-02	4/L7-10	096380 & 033000
1.5	Stone Coping	5/L7-02		096380
1.6	Concrete Type 1 (colored and snowmelted)	6/L7-02		321313
1.7	Concrete Type 2 (gray and non-snowmelted)	7/L7-02	4 & 5/L7-10	321313
1.8	Concrete Type 3 (colored and snowmelted for vehicular use)	8/L7-02		321313
1.9	Stepping Stone Type 1 (Pathway)	9/L7-02		096380
1.10	Stepping Stone Type 2 (Irregular)	1/L7-03		096380
1.11	Stone Banding	2/L7-03	1,2,3 & 4/L7-10	096380
1.12	Concrete Pavers	3/L7-03		321400
2.0	**JOINTING**			
2.1	Expansion Joint	4/L7-03		321313
2.2	Control Joint	5/L7-03		321313
3.0	**STEPS**			
3.1	Stairs Type 1 (stone slabs on snowmelt conc fig)	6/L7-03		096380 & 033000
3.2	Stairs Type 2 (snowmelt concrete & conc footing)	7/L7-03		096380 & 033000
4.0	**SITE WALLS/ EMBANKMENTS**			
4.1	Stone Veneer Wall	1/L7-04	1/L7-10	048600 & 033000
4.2	Stone Veneer Retaining Wall Type 1	2/L7-04	2 & 3/L7-10	048600 & 033000
4.3	Stone Veneer Retaining Wall Type 2	3/L7-04	5/L7-10	048600 & 033000
4.4	Dry Stacked Stone Retaining Wall	4/L7-04		323223.10
5.0	**SITE FURNITURE**			
5.1	Bench	1/L7-05		129300
5.2	Table/Lounge Chair	2/L7-05		129300
5.3	Trash Receptacle	3/L7-05		129300
5.4	Planter Pot Type 1	4/L7-05		129300 & 329300
5.5	Planter Pot Type 2	5/L7-05		129300 & 329300
6.0	**RAILINGS, BARRIERS, FENCING**			
6.1	Split Rail Fence	1/L7-06		061063
6.2	Handrail	2/L7-06		057300
6.3	Guardrail	3/L7-06		057300
6.4	Bollards	4/L7-06		129300
7.0	**SITE LIGHTING**			
	Refer to Lighting and Electrical Series Drawings			
8.0	**DRAINAGE**			
8.1	Landscape Area Drain	1/L7-08		334600
8.2	Hardscape Area Drain	2/L7-08	2,4 & 5/L7-10	334600
8.3	Trench Drain	3/L7-08		334600
9.0	**PLANTING AND LANDSCAPE**			
	Refer to Tree and Shrub Planting Series Drawings			
10.0	**MISCELLANEOUS SITE FEATURES**		Refer to Water Design Drawings	
10.1	Infinity Edge Pool and Reflection Basin	1 & 2/WF-06		130001
10.2	Custom-Shaped Spa	3/WF-06		130001
10.3	Circular Exterior Spa	4/WF-06		130001
10.4	Serenity Oval Spa	5/WF-06		130001
10.5	Rectilinear Aspen Spa	6/WF-06		130001
10.6	Woodland Oval Spa	7/WF-06		130001
10.7	Gas Fireplace	4/L7-08		048600, 033000, 048100 & 055000
10.8	Gas Firepit Type 1	5/L7-08		048600, 033000, 048100 & 055000
10.9	Gas Firepit Type 2	1/L7-09		048600, 033000, 048100 & 055000
10.10	BBQ	2/L7-09		047200
10.11	Landscape Boulder	3/L7-09		044300.10
10.12	Sculpture Type 1	4/L7-09	1/L7-11	121400
10.13	Sculpture Type 2	5/L7-09	2/L7-11	121400

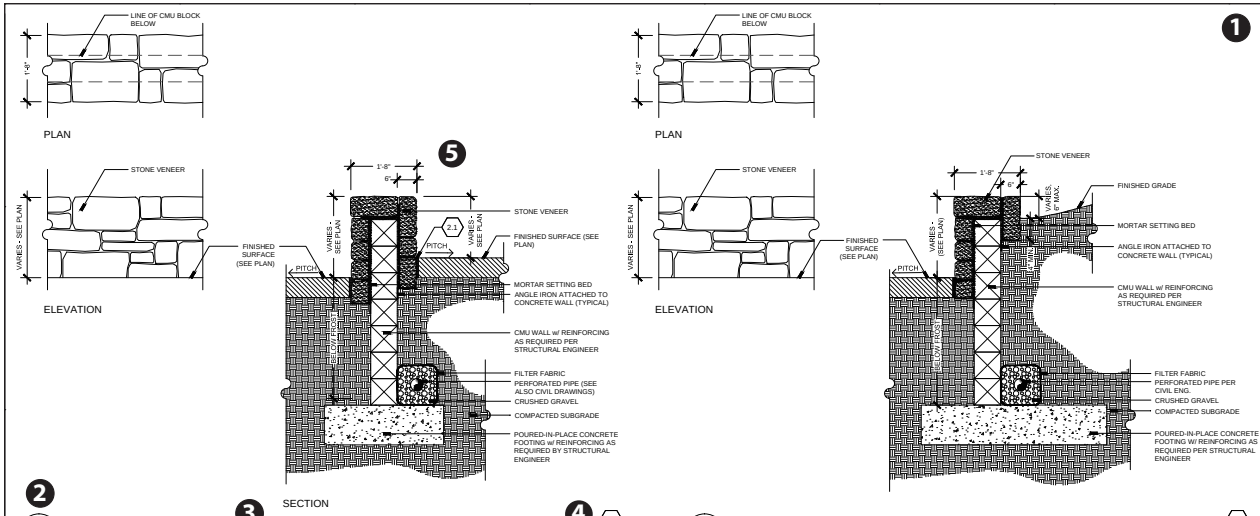
LEGEND

1. Site Detail Keynote List
2. Detail Number
3. Detail Title
4. Site Detail Keynote Reference
5. Preliminary Site Detail

Example of DD Site Details—Walls

LEGEND

1. Site Detail Keynote List
2. Detail Number
3. Detail Title
4. Site Detail Keynote Reference
5. Preliminary Site Detail

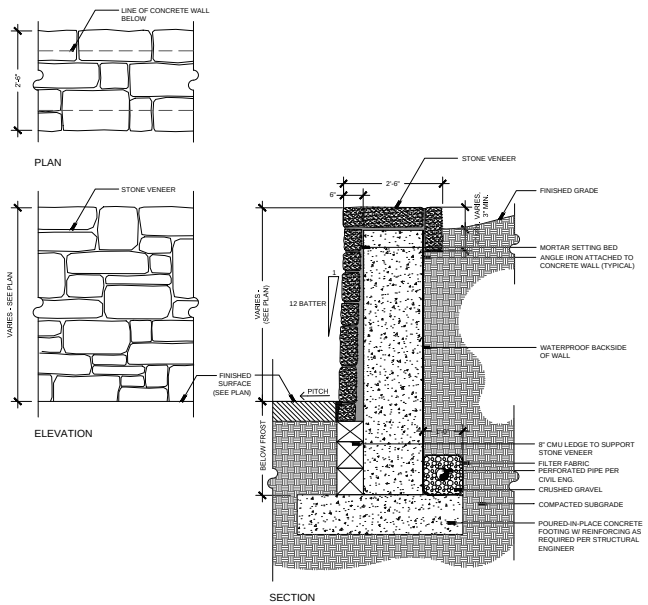


1 Stone Veneer Wall
3/4"=1'-0"

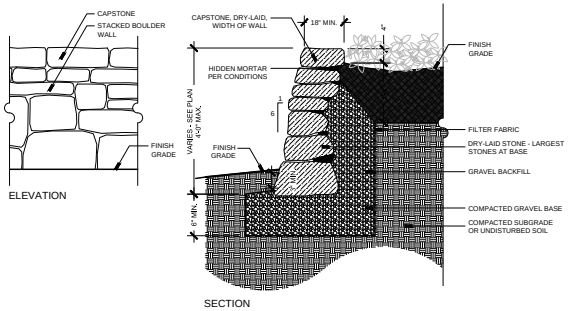
2 Stone Veneer Retaining Wall Type 1
3/4"=1'-0"

1 **SITE DETAIL KEYNOTES:**

		DETAIL/ SHEET	RELATED DETAILS	SPEC SECTION
1.0	**PAVEMENTS, RAMPS, CURBS**			
1.1	Stone Paving Type 1 (irregular stone on snowmelt concrete substab)	1L7-02	1L7-10	096380 & 033000
1.2	Stone Paving Type 2 (irregular stone on concrete substab)	2L7-02	1 & 2L7-10	096380 & 033000
1.3	Stone Paving Type 3 (rectilinear stone on snowmelt concrete substab)	3L7-02	3L7-10	096380 & 033000
1.4	Stone Paving Type 4 (irregular stone on snowmelt concrete substab for vehicular use)	4L7-02	4L7-10	096380 & 033000
1.5	Stone Coping	5L7-02		096380
1.6	Concrete Type 1 (colored and snowmelted)	6L7-02		321313
1.7	Concrete Type 2 (gray and non-snowmelted)	7L7-02	4 & 5L7-10	321313
1.8	Concrete Type 3 (colored and snowmelted for vehicular use)	8L7-02		321313
1.9	Stepping Stone Type 1 (Pathway)	9L7-02		096380
1.10	Stepping Stone Type 2 (Irregular)	1L7-03		096380
1.11	Stone Banding	2L7-03	1,2,3 & 4L7-10	096380
1.12	Concrete Pavers	3L7-03		321400
2.0	**JOINTING**			
2.1	Expansion Joint	4L7-03		321313
2.2	Control Joint	5L7-03		321313
3.0	**STEPS**			
3.1	Stairs Type 1 (stone slabs on snowmelt conc fig)	6L7-03		096380 & 033000
3.2	Stairs Type 2 (snowmelt concrete & conc footing)	7L7-03		096380 & 033000
4.0	**SITE WALLS/ EMBANKMENTS**			
4.1	Stone Veneer Wall	1L7-04	1L7-10	048600 & 033000
4.2	Stone Veneer Retaining Wall Type 1	2L7-04	2 & 3L7-10	048600 & 033000
4.3	Stone Veneer Retaining Wall Type 2	3L7-04	5L7-10	048600 & 033000
4.4	Dry Stacked Stone Retaining Wall	4L7-04		323225.10
5.0	**SITE FURNITURE**			
5.1	Bench	1L7-05		129300
5.2	Pool Lounge Chair	2L7-05		129300
5.3	Trash Receptacle	3L7-05		129300
5.4	Planter Pot Type 1	4L7-05		129300 & 329300
5.5	Planter Pot Type 2	5L7-05		129300 & 329300
6.0	**RAILINGS, BARRIERS, FENCING**			
6.1	Split Rail Fence	1L7-06		061053
6.2	Handrail	2L7-06		057300
6.3	Guardrail	3L7-06		057300
6.4	Bollards	4L7-06		129300
7.0	**SITE LIGHTING**			
	Refer to Lighting and Electrical Series Drawings			
8.0	**DRAINAGE**			
8.1	Landscape Area Drain	1L7-08		334600
8.2	Hardscape Area Drain	2L7-08	2,4 & 5L7-10	334600
8.3	Trench Drain	3L7-08		334600
9.0	**PLANTING AND LANDSCAPE**			
	Refer to Tree and Shrub Planting Series Drawings			
10.0	**MISCELLANEOUS SITE FEATURES**			Refer to Water Design Drawings
10.1	Infinity Edge Pool and Reflection Basin	1 & 2WIF-06		130001
10.2	Custom-Shaped Spa	3WIF-06		130001
10.3	Circular Exterior Spa	4WIF-06		130001
10.4	Serenity Oval Spa	5WIF-06		130001
10.5	Rectilinear Aspen Spa	6WIF-06		130001
10.6	Woodland Oval Spa	7WIF-06		130001
10.7	Gas Fireplace	4L7-08		048600, 033000, 048100 & 055000
10.8	Gas Firepit Type 1	5L7-08		048600, 033000, 048100 & 055000
10.9	Gas Firepit Type 2	1L7-09		048600, 033000, 048100 & 055000
10.10	BBQ	2L7-09		047300
10.11	Landscape Boulder	3L7-09		044300.10
10.12	Sculpture Type 1	4L7-09	1L7-11	121400
10.13	Sculpture Type 2	5L7-09	2L7-11	121400

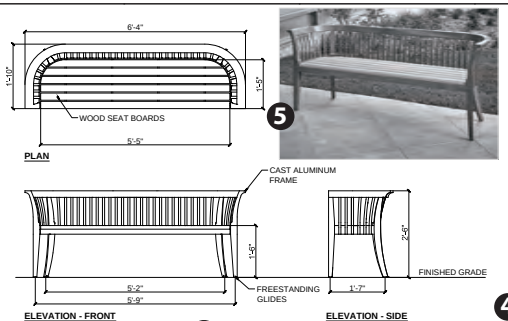


3 Stone Veneer Retaining Wall 2
3/4"=1'-0"



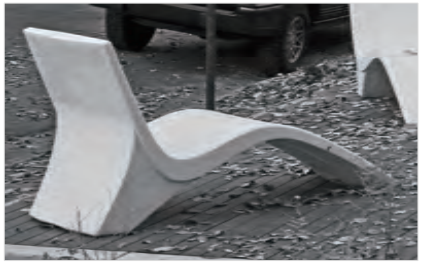
4 Dry Stacked Stone Retaining Wall
3/4"=1'-0"

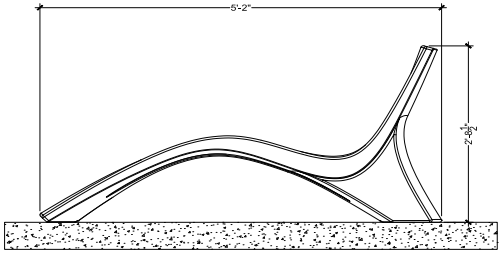
Example of DD Site Details—Site Furnishings



1 BENCH - TYPE 1

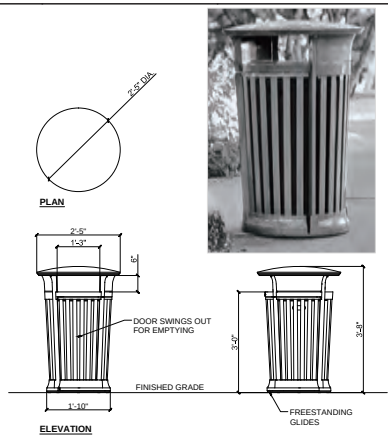
NOT TO SCALE





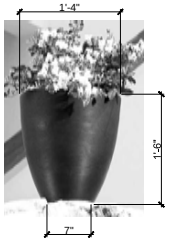
2 POOL LOUNGE CHAIR

NOT TO SCALE



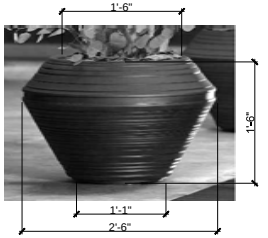
3 TRASH RECEPTACLE

NOT TO SCALE



4 PLANTER POT - TYPE 1

NOT TO SCALE



5 PLANTER POT - TYPE 2

NOT TO SCALE

1 SITE DETAIL KEYNOTES:

		DETAIL/ SHEET	RELATED DETAILS	SPEC SECTION
1.0	**PAVEMENTS, RAMPS, CURBS**			
1.1	Stone Paving Type 1 (irregular stone on snowmelt concrete subslab)	1/L7-02	1/L7-10	096380 & 033000
1.2	Stone Paving Type 2 (irregular stone on concrete subslab)	2/L7-02	1 & 2/L7-10	096380 & 033000
1.3	Stone Paving Type 3 (rectilinear stone on snowmelt concrete subslab)	3/L7-02	3/L7-10	096380 & 033000
1.4	Stone Paving Type 4 (irregular stone on snowmelt concrete subslab for vehicular use)	4/L7-02	4/L7-10	096380 & 033000
1.5	Stone Coping	5/L7-02		096380
1.6	Concrete Type 1 (colored and snowmelted)	6/L7-02		321313
1.7	Concrete Type 2 (gray and non-snowmelted)	7/L7-02	4 & 5/L7-10	321313
1.8	Concrete Type 3 (colored and snowmelted for vehicular use)	8/L7-02		321313
1.9	Stepping Stone Type 1 (Pathway)	9/L7-02		096380
1.10	Stepping Stone Type 2 (Irregular)	1/L7-03		096380
1.11	Stone Banding	2/L7-03	1,2,3 & 4/L7-10	096380
1.12	Concrete Pavers	3/L7-03		321400
2.0	**JOINTING**			
2.1	Expansion Joint	4/L7-03		321313
2.2	Control Joint	5/L7-03		321313
3.0	**STEPS**			
3.1	Stairs Type 1 (stone slabs on snowmelt conc ftg)	6/L7-03		096380 & 033000
3.2	Stairs Type 2 (snowmelt concrete & conc footing)	7/L7-03		096380 & 033000
4.0	**SITE WALLS/ EMBANKMENTS**			
4.1	Stone Veneer Wall	1/L7-04	1/L7-10	048600 & 033000
4.2	Stone Veneer Retaining Wall Type 1	2/L7-04	2 & 3/L7-10	048600 & 033000
4.3	Stone Veneer Retaining Wall Type 2	3/L7-04	5/L7-10	048600 & 033000
4.4	Dry Stacked Stone Retaining Wall	4/L7-04		323223.10
5.0	**SITE FURNITURE**			
5.1	Bench	1/L7-05		129300
5.2	Pool Lounge Chair	2/L7-05		129300
5.3	Trash Receptacle	3/L7-05		129300
5.4	Planter Pot Type 1	4/L7-05		129300 & 329300
5.5	Planter Pot Type 2	5/L7-05		129300 & 329300
6.0	**RAILINGS, BARRIERS, FENCING**			
6.1	Split Rail Fence	1/L7-06		061063
6.2	Handrail	2/L7-06		057300
6.3	Guardrail	3/L7-06		057300
6.4	Bollards	4/L7-06		129300
7.0	**SITE LIGHTING**			
	Refer to Lighting and Electrical Series Drawings			
8.0	**DRAINAGE**			
8.1	Landscape Area Drain	1/L7-08		334600
8.2	Hardscape Area Drain	2/L7-08	2,4 & 5/L7-10	334600
8.3	Trench Drain	3/L7-08		334600
9.0	**PLANTING AND LANDSCAPE**			
	Refer to Tree and Shrub Planting Series Drawings			
10.0	**MISCELLANEOUS SITE FEATURES**			Refer to Water Design Drawings
10.1	Infinity Edge Pool and Reflection Basin	1 & 2/WF-06		130001
10.2	Custom-Shaped Spa	3/WF-06		130001
10.3	Circular Exterior Spa	4/WF-06		130001
10.4	Serenity Oval Spa	5/WF-06		130001
10.5	Rectilinear Aspen Spa	6/WF-06		130001
10.6	Woodland Oval Spa	7/WF-06		130001
10.7	Gas Fireplace	4/L7-08		048600, 033000, 048100 & 055000
10.8	Gas Firepit Type 1	5/L7-08		048600, 033000, 048100 & 055000
10.9	Gas Firepit Type 2	1/L7-09		048600, 033000, 048100 & 055000
10.10	BBQ	2/L7-09		047200
10.11	Landscape Boulder	3/L7-09		044300.10
10.12	Sculpture Type 1	4/L7-09	1/L7-11	121400
10.13	Sculpture Type 2	5/L7-09	2/L7-11	121400

LEGEND

1. Site Detail Keynote List
2. Detail Number
3. Detail Title
4. Site Detail Keynote Reference
5. Preliminary Site Detail

CONSTRUCTION DOCUMENTATION SITE DETAILS

Objective

Construction Documentation Site Details communicate the three-dimensional requirements for constructing the site work, as a discrete and itemized set of detailed technical drawings. Requirements for form, size, and generic materials are included.

General Requirements

Intent

CD Site Details are developed exclusively as "implementation details," contrasted with "design details" developed during the Design Development phase. Therefore, they establish a legal definition of project construction requirements, binding the landscape architect to conformity with accepted standards for constructability and workmanship, assuming the contractor constructs the details as documented. If the contractor does not construct the project as the details illustrate, legal responsibility for failure or other liability shifts to the contractor. Consequently, the landscape architect must explicitly define how the site should be constructed with details. Construction details should not vary in their interpretation by different parties.

Construction details precisely illustrate sizes, shapes, and relationships between construction systems and components. Materials, joining methods, and dimensions of components are described. Material properties or proprietary information should not be included on drawings.

Together with plans, details are used to establish construction cost estimates and bids. Details must clearly differentiate the extent of material systems in order to conduct quantity takeoffs.

Specific Requirements

Detail Content

Subject Elements

The landscape architectural CD Site Detail shall include the elements listed below, strictly focused on the subject detail. The subject detail is that element named in the detail title.

- Graphic shape, size, position, and relationships between components within the detail assembly shown precisely and to scale
- Fully dimensioned shape, size, position, and relationships between components within the detail assembly
- Generic description of material and finish requirements
- Structural requirements and setting systems
- Jointing requirements detailed or Detail Keynote references to jointing details
- Keynoted relationships to adjoining details
- Transition or Connection Details

Structural Requirements

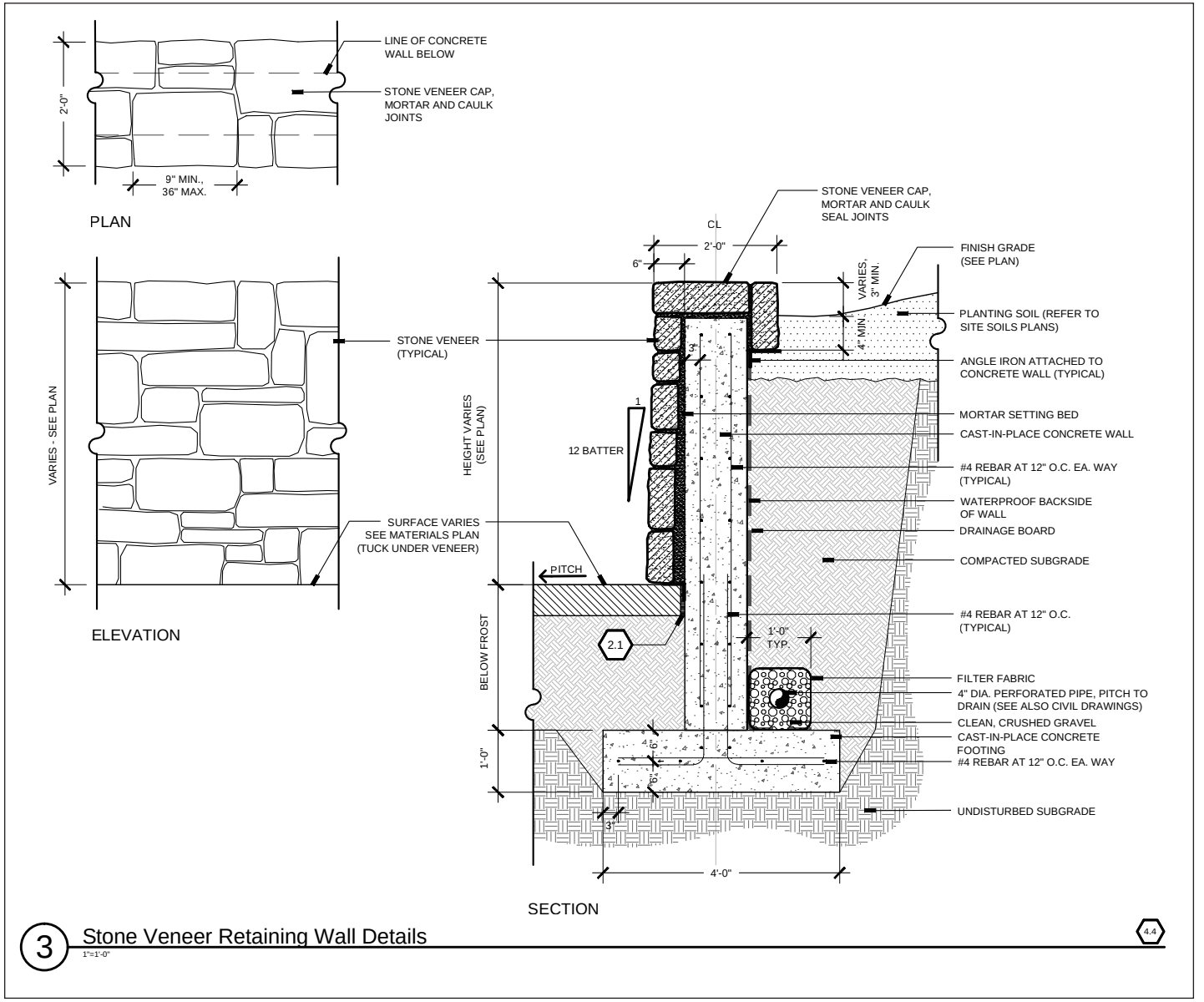
Utilize one of two strategies for depiction of structural reinforcement, as per the landscape architect's contractual relationship with the client and/or structural engineer:

- **Strategy 1:** If the landscape architect is contracted by the client to define reinforcement requirements, incorporate explicit recommendations from the engineer by accurately defining rebar size and spacing, and accurately representing the rebar graphic. For example, show accurate clearances, shapes, and horizontal spacing. Ensure the engineer's review and approval prior to issuing.
- **Strategy 2:** If the landscape architect is not contracted by the client to define and document reinforcement requirements, do not show or label the rebar. Include a note, for example, "Reinforced cast-in-place concrete foundation. Refer to Structural details for information." Do not replicate the engineer's drawings for reference.

For paving details, always explicitly show and annotate reinforcement and other structural requirements. Coordinate with engineer. For example, a cast-in-place concrete slab detail might include graphic delineation of reinforcement per the landscape architect's CAD standards, with an associated note that reads "# 4 Rebar at 12"
O.C. each way."

Otherwise, a note should be provided either directing the reviewer to the engineer's drawings or indicating that reinforcing shall be as required by an engineer. The latter approach, however, is not recommended.

Sample CD-level Detail Graphic



Graphic Requirements

Graphic requirements described at the DD phase should also be applied at the CD phase.

Best Practices

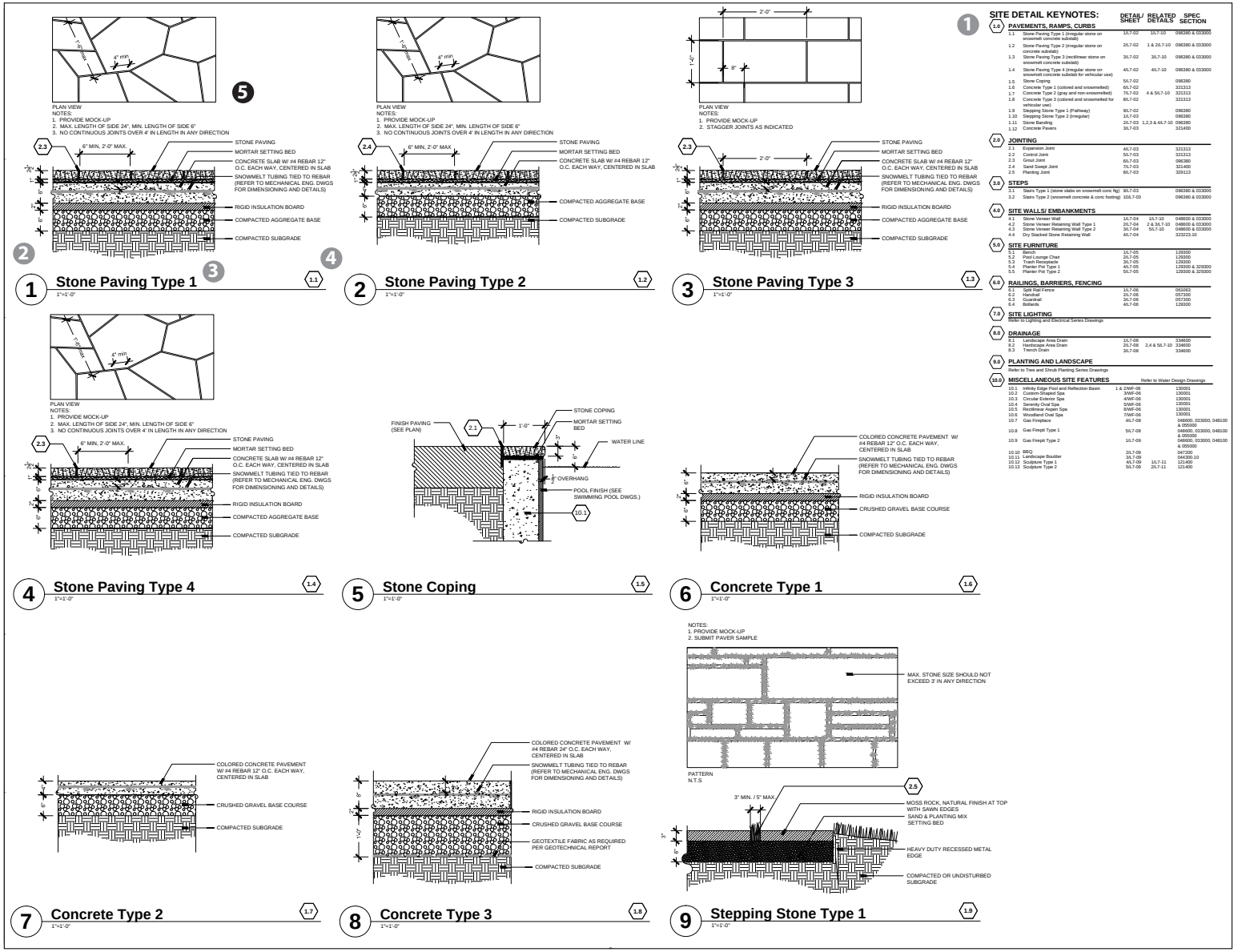
Best practices described at the DD phase should also be applied at the CD phase.

Example of CD Site Details—Paving

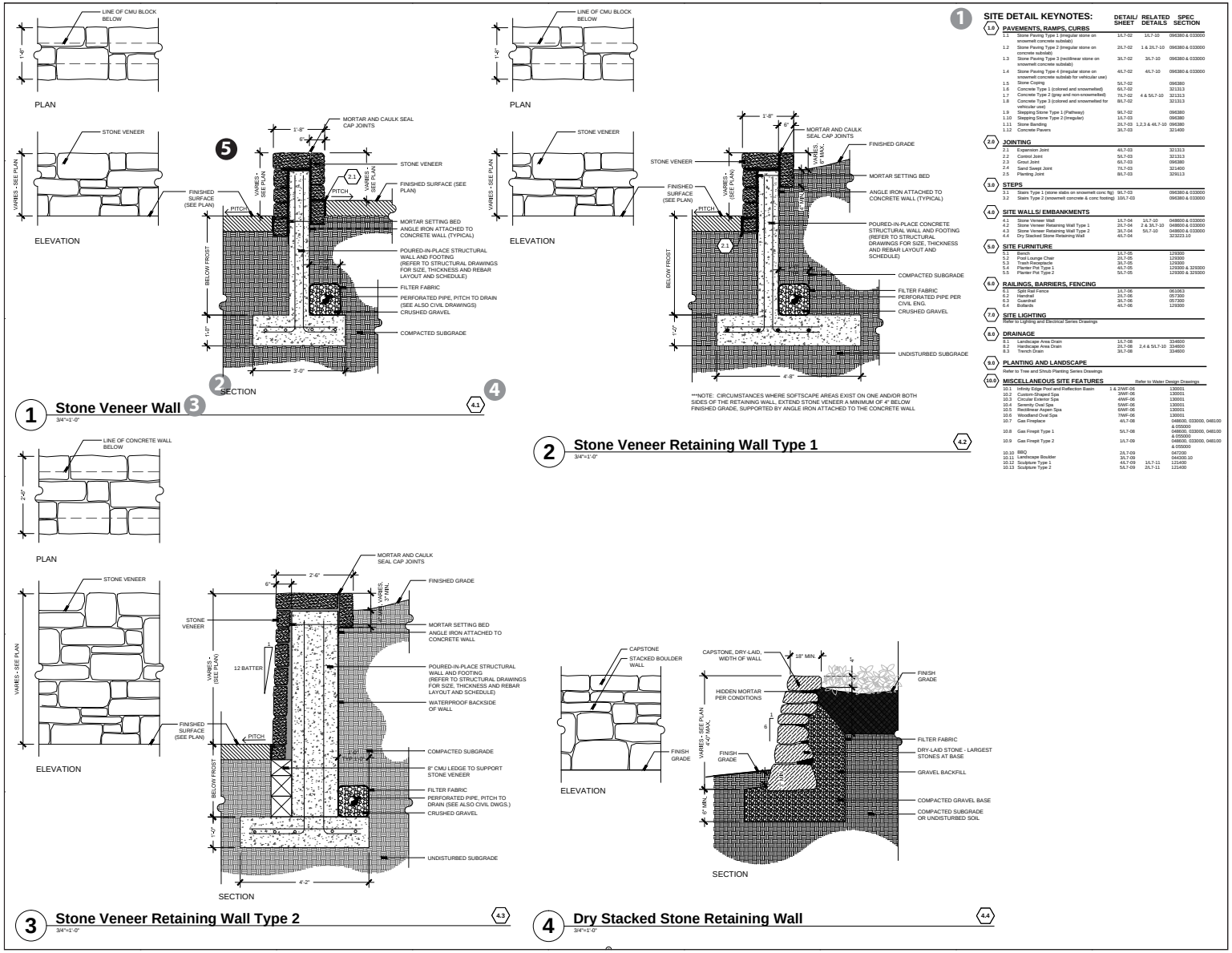
LEGEND

1. Site Detail Keynote List
2. Detail Number
3. Detail Title
4. Site Detail Keynote Reference
5. **Site Detail (includes final engineering)**

Note: **Boldface** items represent key distinctions between Construction Documentation documents and Design Development documents.



Example of CD Site Details—Walls



SITE DETAIL KEYNOTES:

		DETAIL/ SHEET	RELATED DETAILS	SPEC SECTION
1.0	**PAVEMENTS, RAMPS, CURBS**			
1.1	Stone Paving Type 1 (irregular stone on snowmelt concrete substrate)	1L7-02	1L7-10	096380 & 033000
1.2	Stone Paving Type 2 (irregular stone on concrete substrate)	2L7-02	1 & 2L7-10	096380 & 033000
1.3	Stone Paving Type 3 (rectilinear stone on snowmelt concrete substrate)	3L7-02	3L7-10	096380 & 033000
1.4	Stone Paving Type 4 (irregular stone on snowmelt concrete substrate for vehicular use)	4L7-02	4L7-10	096380 & 033000
1.5	Stone Coping	5L7-02		096380
1.6	Concrete Type 1 (colored and snowmelted)	6L7-02		321313
1.7	Concrete Type 2 (gray and non-snowmelted)	7L7-02	4 & 5L7-10	321313
1.8	Concrete Type 3 (colored and snowmelted for vehicular use)	8L7-02		321313
1.9	Stepping Stone Type 1 (Pathway)	9L7-02		096380
1.10	Stepping Stone Type 2 (Irregular)	1L7-03		096380
1.11	Stone Banding	2L7-03	1,2,3 & 4L7-10	096380
1.12	Concrete Pavers	3L7-03		321400
2.0	**JOINTING**			
2.1	Expansion Joint	4L7-03		321313
2.2	Control Joint	5L7-03		321313
2.3	Grout Joint	6L7-03		096380
2.4	Sand Swept Joint	7L7-03		321400
2.5	Planting Joint	8L7-03		329113
3.0	**STEPS**			
3.1	Stairs Type 1 (stone slabs on snowmelt conc fig)	9L7-03		096380 & 033000
3.2	Stairs Type 2 (snowmelt concrete & conc footing)	10L7-03		096380 & 033000
4.0	**SITE WALLS/ EMBANKMENTS**			
4.1	Stone Veneer Wall	1L7-04	1L7-10	048600 & 033000
4.2	Stone Veneer Retaining Wall Type 1	2L7-04	2 & 3L7-10	048600 & 033000
4.3	Stone Veneer Retaining Wall Type 2	3L7-04	5L7-10	048600 & 033000
4.4	Dry Stacked Stone Retaining Wall	4L7-04		323223.10
5.0	**SITE FURNITURE**			
5.1	Bench	1L7-05		129300
5.2	Pool Lounge Chair	2L7-05		129300
5.3	Trash Receptacle	3L7-05		129300
5.4	Planter Pot Type 1	4L7-05		129300 & 329300
5.5	Planter Pot Type 2	5L7-05		129300 & 329300
6.0	**RAILINGS, BARRIERS, FENCING**			
6.1	Split Rail Fence	1L7-06		061063
6.2	Handrail	2L7-06		057300
6.3	Guardrail	3L7-06		057300
6.4	Bollards	4L7-06		129300
7.0	**SITE LIGHTING**			
	Refer to Lighting and Electrical Series Drawings			
8.0	**DRAINAGE**			
8.1	Landscape Area Drain	1L7-08		334600
8.2	Hardscape Area Drain	2L7-08	2,4 & 5L7-10	334600
8.3	Trench Drain	3L7-08		334600
9.0	**PLANTING AND LANDSCAPE**			
	Refer to Tree and Shrub Planting Series Drawings			
10.0	**MISCELLANEOUS SITE FEATURES**			Refer to Water Design Drawings
10.1	Infinity Edge Pool and Reflection Basin	1 & 2WF-06		130001
10.2	Custom-Shaped Spa	3WF-06		130001
10.3	Circular Exterior Spa	4WF-06		130001
10.4	Serenity Oval Spa	5WF-06		130001
10.5	Contemporary Oval Spa	6WF-06		130001
10.6	Woodland Oval Spa	7WF-06		130001
10.7	Gas Fireplace	6L7-08		048600, 033000, 048100 & 055000
10.8	Gas Firepit Type 1	5L7-08		048600, 033000, 048100 & 055000
10.9	Gas Firepit Type 2	1L7-09		048600, 033000, 048100 & 055000
10.10	BBQ	2L7-09		047200
10.11	Landscape Boulder	3L7-09		044200.10
10.12	Sculpture Type 1	4L7-09	1L7-11	121400
10.13	Sculpture Type 2	5L7-09	2L7-11	121400

LEGEND

1. Site Detail Keynote List
2. Detail Number
3. Detail Title
4. Site Detail Keynote Reference
5. **Site Detail (includes final engineering)**

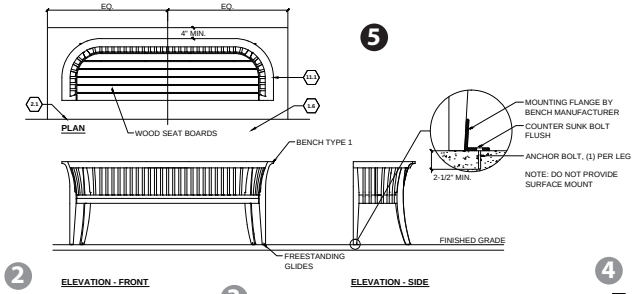
Note: **Boldface** items represent key distinctions between Construction Documentation documents and Design Development documents.

Example of CD Site Details—Site Furnishings

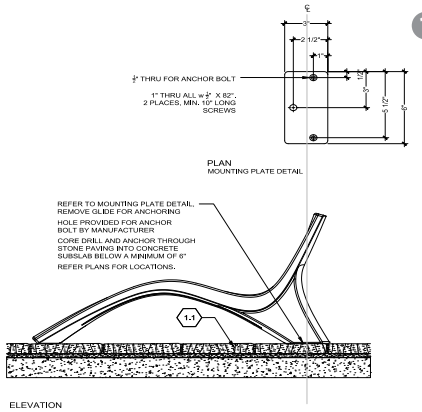
LEGEND

1. Site Detail Keynote List
2. Detail Number
3. Detail Title
4. Site Detail Keynote Reference
5. **Site Detail (includes final engineering)**

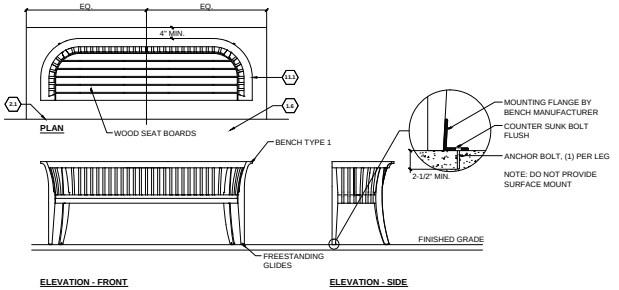
Note: **Boldface** items represent key distinctions between Construction Documentation documents and Design Development documents.



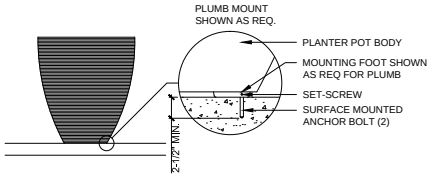
1 BENCH - TYPE 1 (5.1)
NOT TO SCALE



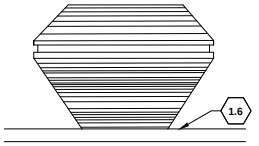
2 POOL LOUNGE CHAIR (5.2)
NOT TO SCALE



3 TRASH RECEPTACLE (5.3)
NOT TO SCALE



4 PLANTER POT - TYPE 1 (5.4)
NOT TO SCALE



5 PLANTER POT - TYPE 2 (5.5)
NOT TO SCALE

SITE DETAIL KEYNOTES:

		DETAIL/ SHEET	RELATED DETAILS	SPEC SECTION
1.0	**PAVEMENTS, RAMPS, CURBS**			
1.1	Stone Paving Type 1 (irregular stone on snowmelt concrete subslab)	1/L7-02	1/L7-10	096380 & 033000
1.2	Stone Paving Type 2 (irregular stone on concrete subslab)	2/L7-02	1 & 2/L7-10	096380 & 033000
1.3	Stone Paving Type 3 (rectilinear stone on snowmelt concrete subslab)	3/L7-02	3/L7-10	096380 & 033000
1.4	Stone Paving Type 4 (irregular stone on snowmelt concrete subslab for vehicular use)	4/L7-02	4/L7-10	096380 & 033000
1.5	Stone Coping	5/L7-02		096380
1.6	Concrete Type 1 (colored and snowmelted)	6/L7-02		321313
1.7	Concrete Type 2 (gray and non-snowmelted)	7/L7-02	4 & 5/L7-10	321313
1.8	Concrete Type 3 (colored and snowmelted for vehicular use)	8/L7-02		321313
1.9	Stepping Stone Type 1 (Pathway)	9/L7-02		096380
1.10	Stepping Stone Type 2 (Irregular)	1/L7-03		096380
1.11	Stone Banding	2/L7-03	1,2,3 & 4/L7-10	096380
1.12	Concrete Pavers	3/L7-03		321400
2.0	**JOINTING**			
2.1	Expansion Joint	4/L7-03		321313
2.2	Control Joint	5/L7-03		321313
2.3	Grout Joint	6/L7-03		096380
2.4	Sand Swept Joint	7/L7-03		321400
2.5	Planting Joint	8/L7-03		329113
3.0	**STEPS**			
3.1	Stairs Type 1 (stone slabs on snowmelt conc ftg)	9/L7-03		096380 & 033000
3.2	Stairs Type 2 (snowmelt concrete & conc footing)	10/L7-03		096380 & 033000
4.0	**SITE WALLS/ EMBANKMENTS**			
4.1	Stone Veneer Wall	1/L7-04	1/L7-10	048600 & 033000
4.2	Stone Veneer Retaining Wall Type 1	2/L7-04	2 & 3/L7-10	048600 & 033000
4.3	Stone Veneer Retaining Wall Type 2	3/L7-04	5/L7-10	048600 & 033000
4.4	Dry Stacked Stone Retaining Wall	4/L7-04		323223.10
5.0	**SITE FURNITURE**			
5.1	Bench	1/L7-05		129300
5.2	Pool Lounge Chair	2/L7-05		129300
5.3	Trash Receptacle	3/L7-05		129300
5.4	Planter Pot Type 1	4/L7-05		129300 & 329300
5.5	Planter Pot Type 2	5/L7-05		129300 & 329300
6.0	**RAILINGS, BARRIERS, FENCING**			
6.1	Split Rail Fence	1/L7-06		061063
6.2	Handrail	2/L7-06		057300
6.3	Guardrail	3/L7-06		057300
6.4	Bollards	4/L7-06		129300
7.0	**SITE LIGHTING**			
	Refer to Lighting and Electrical Series Drawings			
8.0	**DRAINAGE**			
8.1	Landscape Area Drain	1/L7-08		334600
8.2	Hardscape Area Drain	2/L7-08	2,4 & 5/L7-10	334600
8.3	Trench Drain	3/L7-08		334600
9.0	**PLANTING AND LANDSCAPE**			
	Refer to Tree and Shrub Planting Series Drawings			
10.0	**MISCELLANEOUS SITE FEATURES**		Refer to Water Design Drawings	
10.1	Infinity Edge Pool and Reflection Basin	1 & 2/WF-06		130001
10.2	Custom-Shaped Spa	3/WF-06		130001
10.3	Circular Exterior Spa	4/WF-06		130001
10.4	Serenity Oval Spa	5/WF-06		130001
10.5	Rectilinear Aspen Spa	6/WF-06		130001
10.6	Woodland Oval Spa	7/WF-06		130001
10.7	Gas Fireplace	4/L7-08		048600, 033000, 048100 & 055000
10.8	Gas Firepit Type 1	5/L7-08		048600, 033000, 048100 & 055000
10.9	Gas Firepit Type 2	1/L7-09		048600, 033000, 048100 & 055000
10.10	BBQ	2/L7-09		047200
10.11	Landscape Boulder	3/L7-09		044300.10
10.12	Sculpture Type 1	4/L7-09	1/L7-11	121400
10.13	Sculpture Type 2	5/L7-09	2/L7-11	121400

DESIGN DEVELOPMENT TREE PLANTING PLAN

Objective

The DD Tree Planting Plan establishes the position, form, size, and preliminary species for proposed trees in order to accomplish spatial, social, aesthetic, environmental, and engineering objectives.

General Requirements

The plan establishes design intent and the role of trees in accomplishing well-defined project objectives. A number of objectives are typical to planting design exercises. Spatial objectives may include the structuring or subdivision of spaces, the framing of views or even the guiding of circulation routes. Trees can play an important role in shaping space. Aesthetic and sensory objectives may include form, habit, texture, color, smell, and blooming periods. DD Tree Planting Plans may define seasonal tree attributes in succession across time. Environmental and engineering objectives may include erosion control, wind and solar control, bioremediation, energy conservation, temperature control, and habitat enhancement. Social or community goals may include education, gardening, crime prevention, or establishing seasonal activity spaces.

The plan solution is an objective response to site conditions, including climate and micro-climates, soils, drainage, urban conditions, pollutants, and coastal conditions, including salt spray. Tree species selection will largely be derived from these influences, together with design objectives. It is also important to determine the value of the existing mature landscape and potentially establish opportunities to preserve and integrate that landscape with the proposed design.

The DD Tree Planting Plan defines tree species and characteristics, locations, patterns, quantities in groupings, other requirements for installation, and relationships to construction by other disciplines.

Key Distinctions between DD and CD Site Tree Planting Plans

The landscape architect should be strategic in making content decisions for the Design Development documents. These guidelines suggest individual strategies for each of the DD sheets, subject to the unique role of that sheet in the design and documentation process.

Primary relationships between the DD and CD Site Tree Planting Plans are summarized:

1. The DD Tree Planting Plan is a fully developed, in-progress version of the CD Tree Planting Plan, with a complete set of preliminary decisions regarding tree species, locations, and desired attributes.
2. On the DD Tree Planting Key Legend, tree quantities do not need to be numerically quantified, although adequate information should be provided to complete a construction cost estimate. The plan should be adequately notated so quantities can be determined by others. The landscape architect may provide tree spacing requirements so that contractors can use formulas to calculate massed quantities of trees.
3. The DD Tree Planting Plan should undergo preliminary coordination with both allied and specialized disciplines such as civil engineering, irrigation design, architecture, water feature design, coastal engineering, and wetlands design. The CD Tree Planting Plan should undergo rigorous and detailed coordination with these and other disciplines. CD level coordination focuses, in part, on relationships and potential conflicts between proposed trees at mature size and other built design program.
4. The DD Tree Planting Plan focuses on accomplishing design intent and therefore may include larger scale Tree Planting Plan illustrations and three-dimensional documentation, including the use of imagery. This type of documentation is significantly more advanced than Schematic Design documentation, that is, it should be more specific, more detailed and well resolved.
5. The DD Tree Planting Plan does not yet reflect detailed documentation such as complete and final tree dimensioning, complete Reference Notes, and final tree species determinations. Typical tree spacing may be included. Site Detail Keynotes can be introduced but may not be completed exhaustively.

Specific Requirements

Plan

Survey base sheet to show all existing conditions to remain, including above-and below-grade structures, pavements, trees, topography, utilities, monuments, benchmarks, or other reference datum, and all legal conditions and restrictions such as property line bearings and distances, recorded

easements, zoning setbacks, deed restrictions, adjacent property owners, and zoning districts, if relevant to the project layout. Do not modify the base sheet to change or obscure content.

All existing conditions to remain and proposed site components, including rock outcroppings, pavements, utility structures, drainage structures, irrigation equipment, and any other component that may interface with tree planting work.

Existing trees, shrubs, undergrowth to remain, graphically identified to match that shown on Plant Protection Plan. Graphic identification of tree protection areas, for example, protective fencing is not necessary on the Tree Planting Plan, as redundant plan requirements are to be avoided. In addition, a Reference Note may be used to describe existing tree(s) to remain.

Existing wetlands or other waterways, delineated as surveyed.

Proposed hardscape site improvements, including pavements, utility structures, drainage structures, irrigation equipment, and any other component that may interface with tree planting work.

Proposed **site grading and drainage** relationships to tree planting, as illustrated with proposed grading contours, as part of the drawing base.

Preliminary **limits of project scope of work**, as agreed by landscape architect, civil engineer, contractor(s) (if applicable), and owner. Note that limits of work may not coincide with property lines, for example, when areas within the property area have been designated as non-work areas. Accurate determination of limits of work requires the investigation of a number of issues that the landscape architect may not have immediate access to, including contractor staging, mobilization, construction access, traffic control, and other construction-related issues. Consequently, the DD limits of work may be revised as they are better informed at the CD phase.

PLANTING DETAIL KEYNOTES:

		DETAIL/ SHEET	RELATED DETAILS	SPEC. SECTIONS
9.0	**PLANTING AND LANDSCAPE**			
9.1	Deciduous Tree Planting	1/L11-01		329300
9.2	Deciduous Tree Planting on Slope	2/L11-01	1 & 2/L7-01	329300
9.3	Deciduous Multi-Trunk Tree Planting	1/L11-02		329300
9.4	Coniferous Tree Planting	3/L11-01		329300
9.5	Coniferous Tree Planting on Slope	4/L11-01	2 &3/L7-01	329300
9.6	Perennial Planting	5/L11-01	1, 2 & 3/L7-01	329300
9.7	Shrub Planting	6/L11-01		329300
9.8	Shrub Planting on Slope	7/L11-01	2/L7-01	329300
9.9	Metal Edging	8/L11-01		329300

Sample Planting Keynote List

Sheet matchlines, identifying relationship of subject plan sheet to immediately adjoining plan sheets, with label on the side of the line you are matching your sheet to that reads "Matchline—Refer to Sheet L8-*x*. Show consistent, but minimal dimension of work outside matchline, for example, 1" on a full-sized sheet.

Primary plan labels to communicate primary content, for example, street names, buildings, adjacent context, utilities, easements, and major site program, especially as it relates to landscape and tree planting, for example, "event lawn," "palm court," or "meditation garden." Note that the Site Reference Plan is intended to illustrate and notate the primary landscape architectural spaces and programmatic components. It may be useful, however, to further highlight this program or define a more detailed set of elements on the Tree Planting Plan. Furthermore, these labels may be useful for those occasions when Tree Planting Plans are provided to landscape contractors as individual sheets, without the benefits of the entire drawing set. Note that some existing conditions labels should be included on the survey base. Note also that text plan labels are generally discouraged on landscape architectural plan sheets, with Site Detail Keynotes and Site Reference Notes used instead, for efficiency and clarity.

Preliminary Site Detail Keynote List, with references to typical Tree Planting Details. Note that extensive Site Detail Keynote references on the DD Tree Planting Plan are not necessary, as they should be developed on the CD Tree Planting Plan after the DD Plan has been confirmed. Typical Site Detail Keynote references may be included.

Enlargement plan references for detailed tree planting areas as necessary to convey design intent.

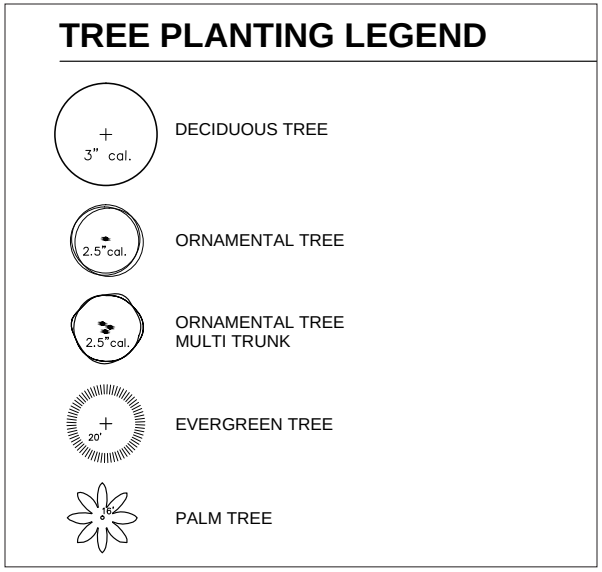
Preliminary Tree Planting Reference Notes to supplement graphic instruction and General Notes. The DD Tree Planting Plan may utilize a set of initial Site Reference Notes that communicate primary, rather than exhaustively annotated intent, for example, "Maintain 5' minimum offset from utility line."

Examples of Tree Planting Reference Notes are provided below (see the generic description of Site Reference Notes in the Chapter 9, Key Documentation Practices). Note that these are only sample notes and do not represent a comprehensive list. They address likely topics. Therefore, they should not be used by landscape architects for project applications. The landscape architect should customize Site Reference Notes to individual project needs. The landscape architect should establish Site Reference Notes by thinking through a logical order of tree planting operations. For example, confirming potential subgrade utility conflicts with proposed tree locations would need to occur prior to checking tree pits for satisfactory percolation rates.

Example Tree Planting Reference Notes

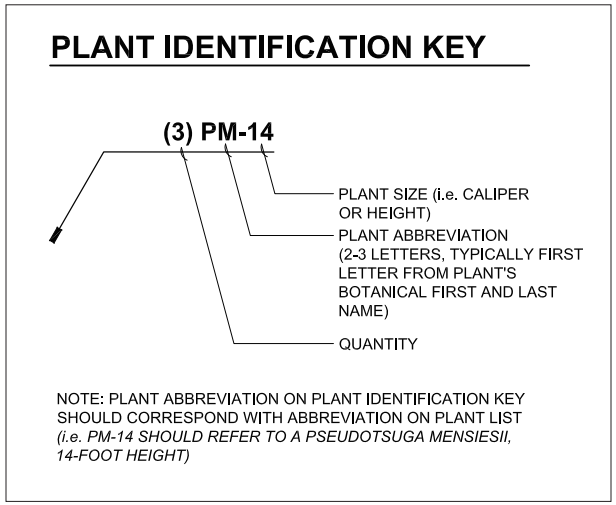
1. Align trees with street lights and other streetscape elements.
2. Stake trees in this area for review by landscape architect prior to installation.
3. Confirm location of existing trees prior to installation in this area.

Proposed tree planting, including deciduous, evergreen, and specialty trees such as palms. Tree symbols per graphic requirements noted below and in the landscape architect's CAD standards.



Sample Legend Graphic

Tree reference system, identifying tree species, quantities in groups on plan, and plant size, per graphic requirements below and landscape architect's customized system, for example, "6 AR-3" identifying six Acer rubrum trees at 3-inch caliper. Coordinate the Tree Reference System with the names, symbols, and quantities on Tree Planting Key Legend, per graphic conventions noted below.



Sample Identification Legend

Key dimensions to indicate important or typical tree spacing needs not readily conveyed on Tree Planting Key Legend.

Location of irrigation controller, indicated for reference and coordination, even if located inside a building. Also indicate backflow preventer location(s) and quick couplers if applicable. Carefully coordinate this with the Irrigation Plan.

Coastal tree planting, that is, those trees that are used as part of a coastal ecosystem to protect or restore habitat, control erosion, or accomplish other objectives. Municipal guidelines or requirements may be applicable. For example, the Auckland, New Zealand, Regional Council provides the "Coastal Planting Guide" for application along its coastline. The document highlights the importance of specialized expertise and practices in coastal environments and is included here to reinforce that importance.

Subgrade tree-planting trenches, vaults, or pits, if the plan extent is not clear on the details. Tree trenches generally cannot be shown accurately on details.

Subdrainage for tree pits and tree beds, referenced to the Site Grading and Drainage Plan.

Tree Planting Key Legend

The Tree Planting Key Legend includes the plan abbreviation and botanical and common name for each plant identification key. It is an abbreviated Plant List specifically developed for reference on the individual Tree Planting Sheets. Refer to *Graphic Requirements* for sample legend.

The Tree Planting Key Legend is organized by Tree Type in the following order by tree type:

- Deciduous Trees
- Evergreen Trees
- Ornamental Trees
- Palm Trees

Trees are alphabetized by genus within each grouping of tree types.

Tree Reference: The tree abbreviation label directly derived from tree genus and species, for example, Acer rubrum is labeled as AR. When similar Latin names establish duplicate abbreviations, supplement one abbreviation with one character to distinguish the two, for example, Acer ginnala and Aesculus glabra may be identified as AG and AGL, or AG and AG2.

Note that there is legitimate interest by some landscape architects in simplifying the use of plan tree references at the DD phase. For complex projects, the tree referencing process can be laborious and is subject to change as the DD scheme evolves. One approach suggests the sole use of tree symbols at the DD phase, without the use of tree references (tree identification labeling on the plan). That approach would require the extensive development of a tree symbol system that assigns a unique and distinguishable symbol for each tree. That approach runs contrary to the recommendation within these guidelines that a simple, single symbol be used for each tree type, for example, deciduous tree or evergreen tree. The landscape architect should not use two different systems for the DD and CD plans. Consequently, it is necessary to use tree references at the DD phase.

Tree Size Reference: In cases where it is necessary to distinguish size requirements for the same species on the plan, a simple alpha-numeric reference may be used, derived from the base system. For example, if three different caliper sizes are proposed for Acer Rubrum, the following system may be used:

- AR-2.5 – 2 ½" Caliper
- AR-3 – 3" Caliper
- AR-4– 4" Caliper

The abbreviations AR-2.5, AR-3, and AR-4 should be noted on the plan with leader lines directed at specific trees designated for specific size. Because the plant size is incorporated in the Plant Identification Key there is no need to replicate it in the Tree Planting Key Legend.

Alternative tree reference systems may be used when generically referencing trees. For example, trees may be labeled with a reference that begins with the letter "T" followed by a number, for example, T1, T2, etc. This system may be used if multiple tree types may satisfy a plan requirement and a final species selection has not been determined.

Genus Name: This is capitalized (if upper- and lowercase are utilized), followed by the species name in lowercase and variety or cultivar capitalized if it a proper name. It is traditional to italicize or underline genus and species. Separate variety or cultivar from genus and species by abbreviation "var." or "cv.," or the cultivar name included within single quotation marks if "cv." is not used. For example, *Gleditsia triacanthos var. inermis 'Shademaster.'*

Common Name: This is in lowercase unless a proper term, for example, sugar maple rather than Japanese maple. This rule is subject to varied application in the industry.

Tree Plant List: The Tree Plant List expands upon the Tree Planting Key Legend to include type, size, quantity* and notes. (*See the notes above and below concerning flexibility in defining tree quantities at the DD phase.)

Tree Quantity: This identifies the number of proposed trees. Utilize landscape architect's CAD standards and automated tree-counting tools. Note that Tree Planting General Notes should indicate that Tree Plant Lists are provided for contractor convenience and that plan quantities will govern. Planting General Notes are located on the General Information Sheet.

Size of Trees: In height, caliper, container, or box size. Height may be given as a range, but caliper and container size should generally not be given as a range in order to establish uniform bidding conditions. Note that, in some regions, there are exceptions to this general rule.

All specified tree sizes should be consistent with the *American Standard for Nursery Stock* (ANSI Z60.1) published by the American Nursery

and Landscape Association (ANLA). ANSI establishes a standardized system of tree sizing in order to provide buyers and sellers with a common terminology in order to facilitate transactions involving nursery stock. While the system may increase the likelihood that conforming trees are healthy, the system does not ensure tree health. The system includes standards for measuring trees (caliper, height, and branch height); specifying and stating the size of trees; establishing proper relationships between caliper, height, and branch number; and root ball, container, or box size standards.[39]

Tree List Notes or Comments: These concern the method of delivery or other unique conditions associated with tree or installation. Refer to the *American Standard for Nursery Stock* published by the American Association of Nurserymen for standard terms and requirements. Determine the most appropriate regional practice for selected species. A number of these terms are given in the list below, grouped under the headings "TYPE" or "COMMENTS," as they might be grouped on the tree list. Type generally refers to the tree delivery method and comments generally represent characteristics of the tree. The list is not intended to be comprehensive, as the landscape architect is encouraged to establish local or regional needs.

TYPE

- Balled and Burlapped
- Bare Root
- Boxed
- Bundle
- Manufactured Ball
- Transplant
- Seedling
- Container or Cutting

COMMENTS

- Well Branched
- Straight Trunk
- Strong Central Leader
- Full Trees
- Full Specimens
- Multi-Stem
- Single Stem
- Field collected
- No shearing
- Spacing as indicated

Include notes to describe tree spacing. Where unique site-specific dimensions are important, include those dimensions on the Tree Planting Plan.

TREE PLANTING LIST

ABBR.	QTY.	BOTANICAL NAME	COMMON NAME	TYPE	SIZE	NOTES
DECIDUOUS TREES						
PT-2.5	14	*Populus tremuloides*	Quaking Aspen	B&B	2.5" Cal.	Full, Single Stemmed, Field collected
PT-3	62	*Populus tremuloides*	Quaking Aspen	B&B	3 " Cal.	Full, Single Stemmed, Field collected
PT-4	75	*Populus tremuloides*	Quaking Aspen	B&B	4" Cal.	Full, Single Stemmed, Field collected
PT-6	56	*Populus tremuloides*	Quaking Aspen	B&B	6" Cal.	Full, Single Stemmed, Field collected
PTM-2.5	35	*Populus tremuloides*	Quaking Aspen	B&B	2.5" Cal.	Full, Multi Stemmed, Field collected
PTM-3	98	*Populus tremuloides*	Quaking Aspen	B&B	3 " Cal.	Full, Multi Stemmed, Field collected
PTM-4	79	*Populus tremuloides*	Quaking Aspen	B&B	4" Cal.	Full, Multi Stemmed, Field collected
PTM-6	56	*Populus tremuloides*	Quaking Aspen	B&B	6" Cal.	Full, Multi Stemmed, Field collected
CONIFEROUS TREES						
PP-14	20	*Picea pungens*	Colorado Blue Spruce	B&B	14' Hgt.	Full, Dense Specimens, No Shearing
PP-16	30	*Picea pungens*	Colorado Blue Spruce	B&B	16' Hgt.	Full, Dense Specimens, No Shearing
PP-18	29	*Picea pungens*	Colorado Blue Spruce	B&B	18' Hgt.	Full, Dense Specimens, No Shearing
PP-20	10	*Picea pungens*	Colorado Blue Spruce	B&B	20' Hgt.	Full, Dense Specimens, No Shearing
PP-22	16	*Picea pungens*	Colorado Blue Spruce	B&B	22' Hgt.	Full, Dense Specimens, No Shearing
PP-24	13	*Picea pungens*	Colorado Blue Spruce	B&B	24' Hgt.	Full, Dense Specimens, No Shearing
PP-26	6	*Picea pungens*	Colorado Blue Spruce	B&B	26' Hgt.	Full, Dense Specimens, No Shearing
PP-28	12	*Picea pungens*	Colorado Blue Spruce	B&B	28' Hgt.	Full, Dense Specimens, No Shearing
PO-16	1	*Pinus ponderosa*	Ponderosa Pine	B&B	16' Hgt.	Full, Dense Specimens, No Shearing
PO-18	1	*Pinus ponderosa*	Ponderosa Pine	B&B	18' Hgt.	Full, Dense Specimens, No Shearing
PO-20	2	*Pinus ponderosa*	Ponderosa Pine	B&B	20' Hgt.	Full, Dense Specimens, No Shearing
PO-22	4	*Pinus ponderosa*	Ponderosa Pine	B&B	22' Hgt.	Full, Dense Specimens, No Shearing
PO-24	7	*Pinus ponderosa*	Ponderosa Pine	B&B	24' Hgt.	Full, Dense Specimens, No Shearing
PO-26	7	*Pinus ponderosa*	Ponderosa Pine	B&B	26' Hgt.	Full, Dense Specimens, No Shearing
PO-28	4	*Pinus ponderosa*	Ponderosa Pine	B&B	28' Hgt.	Full, Dense Specimens, No Shearing
PO-30	2	*Pinus ponderosa*	Ponderosa Pine	B&B	30' Hgt.	Full, Dense Specimens, No Shearing

Sample Plant List

[39] American Standard for Nursery Stock. Vol. ANSI Z60.1-2014. Columbus, OH: AmericanHort.

Items Required on the General Information Sheet, to Be Coordinated with the Tree Planting Plan

Note that all General Notes, symbols legends, and charts should be included on the General Information Sheet or Series-Specific Key Plan and General Information Sheet, but are described here for reference. See *General Information Sheet* and *Series-Specific Key Plan and General Information Sheet* requirements for additional information.

- **General Tree planting notes** clarifying intent and requirements not clear on plan.
- **Tree Planting Symbols legend** illustrating graphic symbols used on the Tree Planting Plan to identify proposed trees.
- **Tree Plant List** with final tree species, sizes, quantities*, and key characteristics or comments.
- **Trees to be Transplanted chart** if necessary, to define trees designated on the Protection and Removal Plan to be transplanted, as indicated on the Tree Planting Plant.

Graphic Requirements

Existing conditions, distinguished from proposed improvements by graphically screening existing conditions to a degree that allows proposed improvements to read distinctly from existing conditions. It is also very useful to screen proposed hardscape improvements in order to allow the proposed Tree Planting Plan to read well. Furthermore, the landscape architect may find it useful to illustrate relationships between proposed trees and proposed shrubs and groundcovers. That may be necessary when the Tree Planting Plan is complex. If so, all trees can be shown on the same plan, with the shrubs and groundcovers screened to allow the trees to read vividly and the inverse to highlight shrubs and groundcover.

Proposed contour grading, also screened as necessary to illustrate intended relationships between the Tree Planting Design and Grading and Drainage Plans.

Limit of Project Scope of work line represented by an equally spaced dashed bold line, with "Limit of Project Scope of Work" note. Consider screening this line to distinguish from matchlines that separate sheets.

Line-weight hierarchy, from lightest to heaviest:

1. Screened survey base, existing conditions
2. Proposed hardscape, grading, and utilities
3. Tree call-outs, Site Detail Keynotes and Site Reference Notes, and associated leader lines
4. Proposed trees

Automated CAD tools, utilized from the landscape architect's CAD standards to choose symbols, place trees, label trees, count trees, and create the Tree Planting Key Legend.

- **Deciduous trees**, illustrated with simple circles with a cross in the center in the center, as a default symbol. Other illustrative symbols may be used to highlight the design intent, but this is discouraged and, if they are used, they shall be kept as simple as possible.
- **Evergreen trees**, illustrated with a simple circle with a cross in the center and lines radiating around the outside, as a default symbol.
- **Palm trees**, illustrated with the landscape architect's standard CAD symbol for palm trees.
- **Ornamental trees**, illustrated with simple circles with a cross in the center in the center, as a default symbol. Other illustrative symbols may be used to highlight the design intent, but this is discouraged and, if they are used, they shall be kept as simple as possible.

Tree crown symbols shown at 3/4 mature size, for example, 40-foot mature tree crown shown with 30-foot diameter. That will allow the designer to space trees appropriately. The landscape architect may find it useful to develop an electronic database to indicate mature tree sizes. That database would require regional applications to reflect species and growth rate variations

Where different sizes of the same tree species are proposed, they may be distinguished graphically on the plan with use of different size symbols. That approach may conflict with the recommendation above that a 3/4 mature size be used to illustrate correlations with mature tree species' sizes, and these approached should not be used jointly. A notation method may also be used to distinguish different sizes of the same tree species, as described above.

Connector lines, linking all tree centers per landscape architect's CAD standards. Organize connector lines in simplest fashion possible, that is, avoid excessive "zig-zagging." Utilize logical groupings, for example, break at plan gaps or dividing features such as walkways.

Plan tree reference, indicated with a leader line extending to quantity and tree abbreviation label, for example, (4) AR-3, at all tree groupings. Leader line should be developed as per landscape architect's standard leader symbol, automated if possible. Use 60-degree angle, leaders (from horizontal) as much as possible. See also Chapter 9, Key Documentation Practices for recommended labeling protocols.

Tree abbreviation labels per the landscape architect's standard CAD requirements and the recommendations above.

Subgrade tree planting trenches, vaults, or pits, with dashed lined indicating limits of these elements.

Legends

Symbols Legend: Tree symbol identification should be incorporated in the Tree Planting Legend and included on the General Information Sheet. Tree symbols should be precisely identical to that shown on plans, including size. These symbols may be incorporated into the Tree Plant Key Legend and Tree Plant List if abbreviations and tree plan references are not utilized.

Tree Planting Key Legend: Tree abbreviation key for ease of reference on drawings. Legend should include two-letter abbreviation and plant size and associated Latin name and common name.

Tree Plant List: See *Specific Requirements* above.

TREE PLANTING KEY

ABBR.	BOTANICAL NAME	COMMON NAME
DECIDUOUS TREES		
PT-2.5	*Populus tremuloides*	Quaking Aspen
PT-3	*Populus tremuloides*	Quaking Aspen
PT-4	*Populus tremuloides*	Quaking Aspen
PT-6	*Populus tremuloides*	Quaking Aspen
PTM-2.5	*Populus tremuloides*	Quaking Aspen (*Multi-Stem)*
PTM-3	*Populus tremuloides*	Quaking Aspen (*Multi-Stem)*
PTM-4	*Populus tremuloides*	Quaking Aspen (*Multi-Stem)*
PTM-6	*Populus tremuloides*	Quaking Aspen (*Multi-Stem)*
CONIFEROUS TREES		
PP-14	*Picea pungens*	Colorado Blue Spruce
PP-16	*Picea pungens*	Colorado Blue Spruce
PP-18	*Picea pungens*	Colorado Blue Spruce
PP-20	*Picea pungens*	Colorado Blue Spruce
PP-22	*Picea pungens*	Colorado Blue Spruce
PP-24	*Picea pungens*	Colorado Blue Spruce
PP-26	*Picea pungens*	Colorado Blue Spruce
PP-28	*Picea pungens*	Colorado Blue Spruce
PO-22	*Pinus ponderosa*	Ponderosa Pine
PO-24	*Pinus ponderosa*	Ponderosa Pine
PO-26	*Pinus ponderosa*	Ponderosa Pine
PO-28	*Pinus ponderosa*	Ponderosa Pine
PO-30	*Pinus ponderosa*	Ponderosa Pine

Sample Tree Planting Key Legend

Best Practices

Design

Think Three-Dimensionally

Utilize three-dimensional drafting or modeling software to represent fully mature (full growth) trees when possible. These trees should be illustrated in relationship to buildings and the site development program in order to confirm species choices and associated sizes, habits, forms, textures, locations, quantities, type of space being created, and sun/shade patterns. Emphasis should be placed on trees and large shrubs. It is common for trees to be spaced too closely to one another, or too close to buildings and other elements. These proximities result in spatial and circulation conflicts, visibility problems, maintenance challenges, and difficulties for trees to achieve normal size and form characteristics.

Determine and evaluate the mature size and form characteristics of proposed trees. Overplanting and excessively tight spacing is a common problem in tree planting design.

Establish intended design relationships between tree planting design and grading design. Modeling studies should include trees and topography.

Addressing Site Conditions

Existing soil on the site may be a factor in tree selection, especially if the soil is especially acidic or alkaline. Native tree selection is best achieved if matched to desirable soil, light and moisture conditions. Before making final tree selections, collect and analyze soil samples on the site to determine desirable tree associations. Amendments may need to be made to the soil to achieve better nutrient content—these amendments should be specified.

Native site soils are an important factor in an ecologically healthy site. (Note that disturbed soils can also be good for plants.) Native site soils can be confirmed by comparing on-site soil samples within the regional context. It is important to analyze the existing native site soil in order to determine if the soil is healthy and can properly support the vigorous growth of trees and habitat. If healthy native soil is determined to exist, care should be taken to preserve and reuse the soil, even if disturbed by construction activities. Ideally, healthy native soil will be adequate to serve the entire needs of the redeveloped site, minimizing the need for importing "foreign" soils.[40]

[40] Hopper, Leonard J. *Landscape Architectural Graphic Standards.* Hoboken, NJ: John Wiley and Sons, 2007, p. 62.

Determine the native tree palette for the site conditions, that is, trees that would naturally thrive in these conditions. Consider that palette as part of proposed tree planting scheme.

On some sites, wildlife habitats may exist. These habitats may include migration routes or flyways. Existing landscapes, including trees, drainage patterns, and geology represent the primary features of these habitats. A survey of these habitats, including a determination of current wildlife occupation is important to determining the location and extent of proposed improvements in order to avoid undesirable impacts. As part of the wildlife and habitat analysis, an inventory of native tree communities should be established. Invasive or noxious species may be found, and may need to be removed. New tree planting patterns may play a role in enhancing existing habitat conditions. Proposed tree species may be selected to match or complement the native tree community. Landscape buffers may be established to protect the habitat area.

As soil, light (sun), topographic and moisture conditions vary across the site, it is important to make tree selections that fit and thrive in these sometimes disparate conditions. Establish a tree zoning map (at Schematic Design) to depict limits of each major zone. The tree zoning map must be prepared as an overlay to the Grading Plan so to reflect solar orientation and aspect. Planting zone examples might include "Hot, Dry, South-Facing Slopes," and "Cool Wet Existing Tree Understory."

Drought-tolerant and low-water needing trees may be important to accomplishing sustainable water use objectives. When trees that require similar water needs are grouped in irrigation "zones," necessary water application rates can be most effectively managed. Some drought-tolerant trees may even thrive in poor soil conditions. The Plant Zoning Map described above can be further developed and utilized to reflect tree watering needs, in order to group tree species with similar needs.

Coordination

Maintenance

Review maintenance capabilities and issues with owner's landscape maintenance personnel and determine key issues. Determine intended maintenance levels for the project as it influences tree selection and tree planting design. For example, the landscape maintenance program may not be well suited to maintain flowering or fruit-bearing trees. Or, a corporate mission may not support maintenance and watering needs of non-native species.

Irrigation

Coordinate tree locations and watering needs with irrigation consultant. Note that the reduction or elimination of irrigated plants may become more prevalent as water resources grow scarcer.

Graphically overlay Tree Planting Plans with Irrigation Plans to determine any potential conflicts or necessary adjustments. Irrigation equipment should be located to be accessible but visually discrete.

Civil

Graphically overlay Tree Planting Plans with Civil Engineering Plans to determine any potential conflicts or necessary adjustments. While minor adjustments of civil infrastructure may be made in the field, more significant conflicts, for example, between rows of trees and utility lines, may require adjustment of one element or the other during the design and documentation process.

Graphically overlay Tree Planting Plans with Grading Plans to determine any potential conflicts or necessary adjustments. For example, tree positions in drainage ways should be evaluated for species' appropriateness to potentially wet conditions. Tree planting relationships to proposed grading must be well-resolved. It may be necessary to illustrate that intent with sections, such as those described in "Composite Reference Sections" or "Site Grading and Drainage."

Tree Protection

Coordinate the Tree Planting Plan with the Plant Protection and Removal Plan, and/or Protection and Control Plan, if utilized. Cross-reference these plans in General Notes if applicable. Proposed trees and other plants should be positioned with careful consideration of root zones at existing trees. Any planting within the root zone can be just as damaging as grading within this area. Even groundcover planting should be avoided in the root zone of existing and newly planted trees.

Note that good tree protection is inherently good soils protection.

Cross-Referencing

It is common for landscape architects to use notes on drawings and General Notes to cross-reference relationships between drawings, for example, between the Tree Planting Plan, Irrigation Plan, Irrigation Details, and Tree Planting Details. This practice is unnecessary as these relationships are implicit. Refer to Chapter 3, Operational Principles, ***CROSS-REFERENCING CAUTIONS: A METHOD TO THE MADNESS*** for a description of the implicitness principle.

The landscape architect may consider establishing a general note on the General Information Sheet to reinforce the principle of implicitness, suggesting that relationships between drawings, and between drawings and specifications are complementary and understood.

Tree Availability

Prior to preparing Design Development and Construction Document Tree Planting Plans, check for general availability of selected quantities of matched trees. Quality root systems should be considered as part of the availability search. The contractor is responsible for locating specific material, but the landscape architect should ensure that trees are available within reasonable means.

The landscape architect may confirm availability of specified tree species, sizes, and quantities by contacting nurseries in the project area or utilizing a landscape contractor to conduct a tree search.

Municipal Requirements

Verify that tree selection meets zoning and landscape requirements of the local municipality. These requirements may include a minimum landscape area, usually a percentage, as part of the overall site acreage. In addition, municipalities may require a specific number of trees per street frontage or parking area, or minimum tree sizes.

Prior to preparing Design Development and Construction Document Tree Planting Plans, verify that tree palette is approved by agencies with jurisdiction over the project, for example, the forestry or parks department, or other city, county, town, state, or federal agency. Verify compliance with any protective covenants and/or design guidelines for the project area.

Technical

Locate trees to assure that long-term tree root growth does not conflict with utilities, buildings, structure foundations, ponds liners, or other sensitive infrastructure.

In order to conserve water use, determine a water budget for irrigated landscape, and pair water application rates with associated tree species' water needs.

Strategies

Say the Most with the Least Graphic Information

Do not overrender the Tree Planting Plan. The document is not intended to be illustrative and should communicate contractual requirements in the simplest fashion possible. Subtle differences in tree symbols may be useful to readily distinguish tree species or types.

Strategic Notes and Key Requirements

Use notes or comments on the Tree Plant List to stipulate special requirements that are very important to the success of the tree planting design. For example, in an urban condition such as a pedestrian mall or streetscape, it may be critical that pedestrians can walk under and directly beside trees. That intent may require a lowermost limb height in order to establish the desired clearance. This requirement should be noted in the Comments section of the Tree Plant List, as described earlier under *Tree Plant List*. The landscape architect should think carefully about the most important tree characteristics, those unique characteristics that are not communicated in the specifications.

Be Generic

Do not include specification information on Tree Planting Plans or details, for example, specific soil amendments, detailed mulch requirements and tree stake materials. Instead, generic references should be used. Generic references do not include proprietary, technical, or descriptive references. For example, mulches may be referenced on plans with Site Detail Keynotes as Mulch Type 1, Mulch Type 2, and so on. Soil should be referenced with terms that precisely match specification references, for example, existing topsoil, imported topsoil, backfill or structural soil.

Evaluate Tree Positions, Spacing, and Potential Conflicts

Confirm tree spacing and tree proximities with adjoining elements by reviewing mature tree sizes. Check conformance to municipal requirements.

In urban conditions where tree planting space for the tree root ball is limited, verify that the "American Standard for Nursery Stock" minimum root ball dimensions are satisfied relative to specified caliper. For example, for each inch of caliper, 10" of root diameter is required. A 4"-caliper tree is required to be delivered with a 40"-diameter ball. Confirm that the designed pavement opening will allow a 40" diameter to be placed, including room to handle the tree for installation and potential removal. A similar analysis may be completed for trees specified by box size.

Check for conflicts between proposed tree materials and light poles, fire hydrants, drains and pipes, fire department connections on buildings, sediment traps, signs, site distance triangles, easements, property setbacks, swales, irrigation equipment, or other restrictions. Overlay Tree Planting plans with composite site utility plans prior to beginning Construction Documents. Be aware of soil depths when tree planting above building structures to ensure that appropriate trees are specified.

Review possible screening needs, for example, transformers; heat pumps; trash and recycling areas; irrigation, electrical or mechanical equipment; parking lots; and above-grade vaults or storage facilities and rooms.

Example of a DD Tree Planting Plan

LEGEND

SHEET REQUIREMENTS

1. Survey Base Sheet
2. Proposed Site Improvements
3. Preliminary Limits of Work (if able to define) or Limits of Project Scope of Work
4. Planting Detail Keynotes
5. Preliminary Site Reference Notes (for example purposes only, should be project specific)
6. Planting Key Legend

SERIES REQUIREMENTS

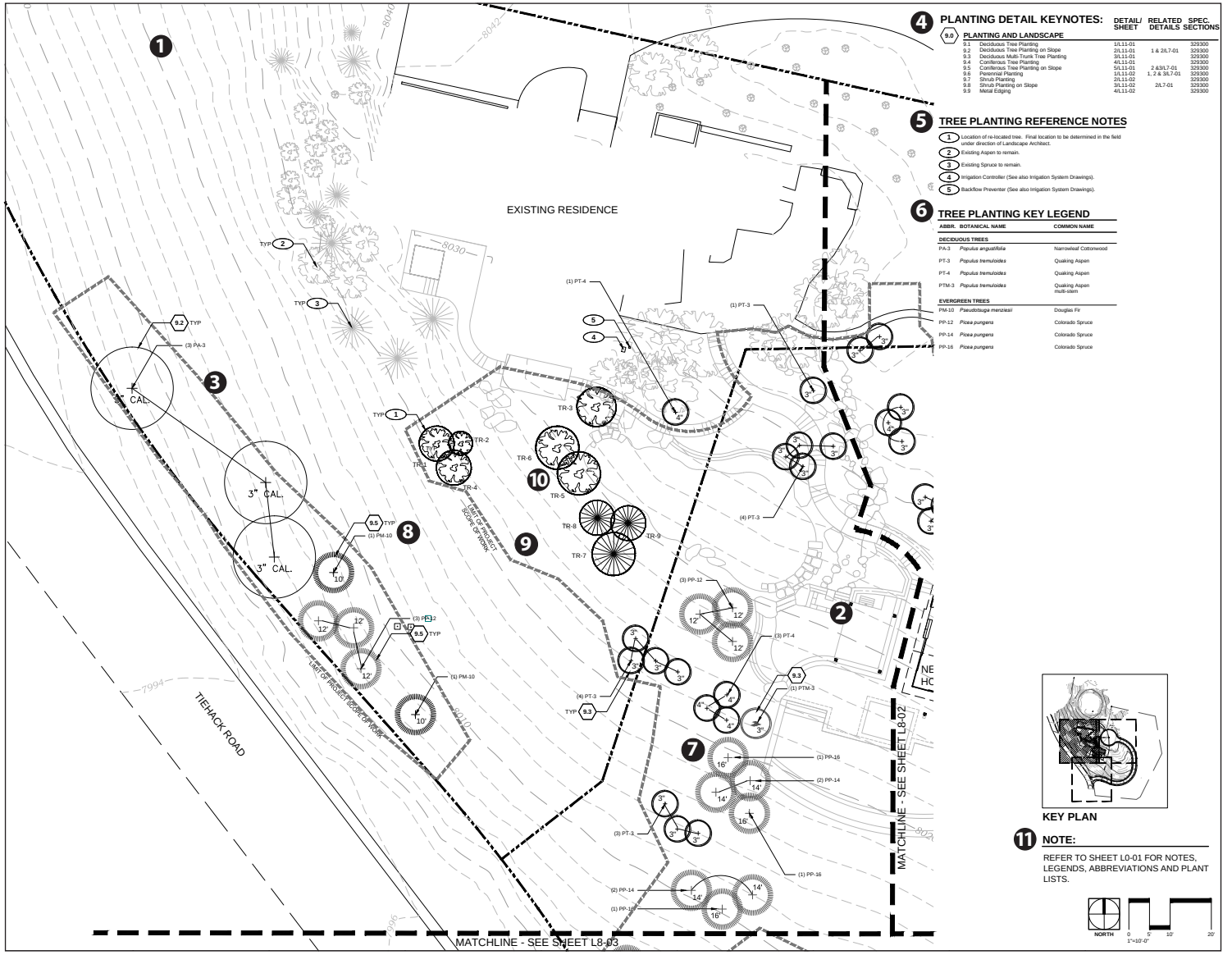
7. Proposed Tree Planting
8. Preliminary Tree Reference System
9. Proposed Site Grading and Drainage
10. Proposed Transplanted Tree Planting (if applicable)
11. Planting Sheet Note

Other items that may be provided, but not currently depicted, if the project requires it, include:

–Proposed utilities

–Enlargement Plan References

*Note: This sample only depicts the Drawing Area for this sheet. For Title Block requirements refer to beginning of this section.



4 PLANTING DETAIL KEYNOTES:

	PLANTING AND LANDSCAPE	DETAIL/ SHEET	RELATED DETAILS	SPEC. SECTIONS
9.0				
9.1	Deciduous Tree Planting	1/L11-01		329300
9.2	Deciduous Tree Planting on Slope	2/L11-01	1 & 2/L7-01	329300
9.3	Deciduous Multi-Trunk Tree Planting	3/L11-01		329300
9.4	Coniferous Tree Planting	4/L11-01		329300
9.5	Coniferous Tree Planting on Slope	5/L11-01	2 &3/L7-01	329300
9.6	Perennial Planting	1/L11-02	1, 2 & 3/L7-01	329300
9.7	Shrub Planting	2/L11-02		329300
9.8	Shrub Planting on Slope	3/L11-02	2/L7-01	329300
9.9	Metal Edging	4/L11-02		329300

5 TREE PLANTING REFERENCE NOTES

1. Location of re-located tree. Final location to be determined in the field under direction of Landscape Architect.
2. Existing Aspen to remain.
3. Existing Spruce to remain.
4. Irrigation Controller (See also Irrigation System Drawings).
5. Backflow Preventer (See also Irrigation System Drawings).

6 TREE PLANTING KEY LEGEND

ABBR.	BOTANICAL NAME	COMMON NAME
DECIDUOUS TREES		
PA-3	*Populus angustifolia*	Narrowleaf Cottonwood
PT-3	*Populus tremuloides*	Quaking Aspen
PT-4	*Populus tremuloides*	Quaking Aspen
PTM-3	*Populus tremuloides*	Quaking Aspen multi-stem
EVERGREEN TREES		
PM-10	*Pseudotsuga menziesii*	Douglas Fir
PP-12	*Picea pungens*	Colorado Spruce
PP-14	*Picea pungens*	Colorado Spruce
PP-16	*Picea pungens*	Colorado Spruce

11 NOTE:

REFER TO SHEET L0-01 FOR NOTES, LEGENDS, ABBREVIATIONS AND PLANT LISTS.

CONSTRUCTION DOCUMENTATION TREE PLANTING PLAN

Objective

The CD Tree Planting Plans defines contractual requirements for tree locations, species, sizes and other characteristics.

General Requirements

Confirm that design intent and the role of trees in accomplishing measurable project goals have been accomplished. Aesthetic and sensory objectives may include form, habit, texture, color, smell, and color. Environmental and engineering objectives may include erosion control, wind, and solar control, bioremediation, or habitat enhancement. Social or community goals may include education, gardening, crime prevention, or establishing seasonal activity spaces.

Meet municipal requirements for number and location of trees.

Specific Requirements

Plan

Final **limits of project scope of work,** as agreed on by the landscape architect, civil engineer, contractor(s) (if applicable), and owner. Note that limits of project scope of work may not coincide with property lines, for example, when areas within the property area have been designated as non-work areas. Accurate determination of limits of work requires the investigation of a number of issues that the landscape architect may not have immediate access to, including contractor staging, mobilization, construction access, traffic control, and other construction-related issues. Consequently, the DD limits of work may be revised as they are better informed at the CD phase.

A Comprehensive **Planting Detail Keynote List**, with references to typical Tree Planting Details, for example, "Tree Planting over Structure," "Tree Planting at Streetscape."

Final **Planting Reference Notes** to supplement graphic instruction and General Notes.

Dimensions to indicate typical tree spacing needs not readily conveyed on plant list. Some landscape architects prefer to include all dimensions on the Planting Plan, rather than the Plant List. This practice is somewhat risky, as spacing information may be difficult to locate on a plan, when not consolidated in a Plant List.

Final **plant reference system,** identifying final plant species and quantities in groups on plan. Coordinate the plant reference system with the Plant List, Planting Key Legend and Plant Symbols Legend.

Plant List

Include a final **Plant List** containing species and varieties, selection, associated common names, and abbreviations, sizes, types, notes, and quantities.

Planting Key Legend

Include a final Planting Key Legend with abbreviations and associated species/varieties. Latin and common names should correspond with final plant list. The planting key legend shall be located on each tree planting series plan in accordance with landscape architect's CAD standards.

Graphic Requirements

Graphic requirements described at the DD phase should also be applied at the CD phase.

Best Practices

Strategies

Verify that illustrated tree quantities coincide with plant list. Utilize computer symbols in such a manner that computer can tabulate quantities. Note that plan quantities on plan govern. Plant lists are used for Contractor convenience. Contractor to count and confirm tree quantities.

Example of a CD Tree Planting Plan

LEGEND

SHEET REQUIREMENTS

1. Survey Base Sheet
2. Proposed Site Improvements
3. **Final Limits of Work (if able to define) or Limits of Project Scope of Work**
4. **Planting Detail Keynotes**
5. **Site Reference Notes (for example purposes only, should be project specific)**
6. **Planting Key Legend**

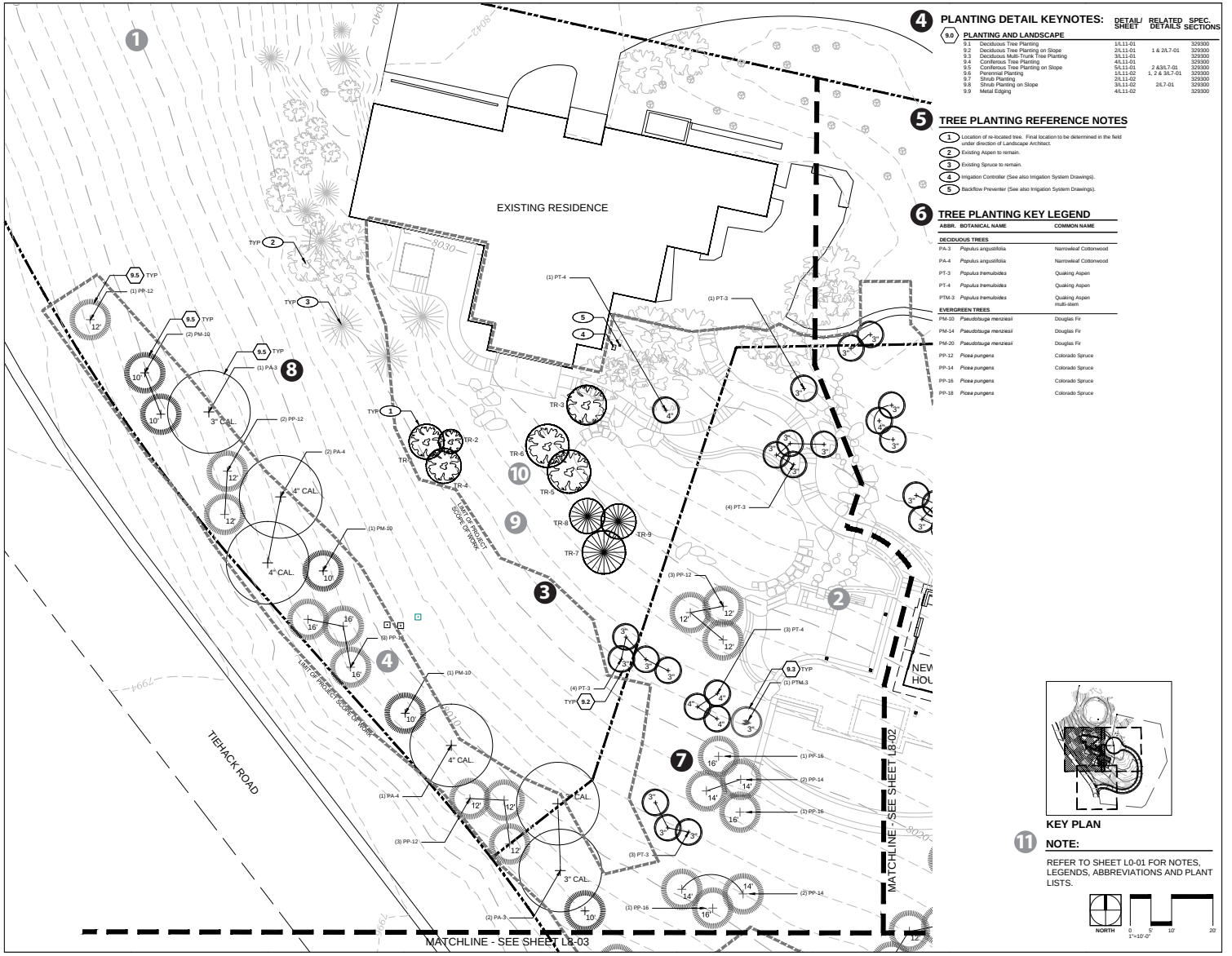
SERIES REQUIREMENTS

7. **Proposed Tree Planting**
8. **Tree Reference System**
9. Proposed Site Grading and Drainage
10. Proposed Transplanted Tree Planting (if applicable)
11. Planting Sheet Note

Other items that may be provided, but not currently depicted, if the project requires it, include:

–Proposed utilities
–Enlargement Plan References

Note: **Boldface** items represent key distinctions between Construction Documentation documents and Design Development documents.



*Note: This sample only depicts the Drawing Area for this sheet. For Title Block requirements refer to beginning of this section.

DESIGN DEVELOPMENT
SHRUB AND GROUNDCOVER PLANTING PLAN

Objective

The DD Shrub and Groundcover Planting Plan establishes the position, form, size, and preliminary species for all shrubs and groundcovers in order to accomplish spatial, social, aesthetic, environmental, and engineering objectives.

General Requirements

The plan establishes design intent and the role of shrubs and groundcovers in accomplishing well-defined project objectives. A number of objectives are typical to planting design exercises. Spatial objectives may include the structuring or subdivision of spaces, the framing of views, or even the guiding of circulation routes. Shrubs and groundcovers can play an important role in shaping space. Aesthetic and sensory objectives may include form, habit, texture, color, smell, and blooming periods. Shrub and Groundcover Planting Plans may define seasonal plant attributes in succession across time. Environmental and engineering objectives may include erosion control, wind and solar control, bioremediation, energy conservation, temperature control, and habitat enhancement. Social or community goals may include education, gardening, crime prevention, or establishing seasonal activity spaces.

The plan solution is an objective response to site conditions, including climate and micro-climates, soils, drainage, urban conditions, pollutants, and coastal conditions including salt spray. Plant species selection will largely be derived from these influences, together with design objectives. It is also important to determine the value of the existing mature landscape and potentially establish opportunities to preserve and integrate that landscape with the proposed design.

The DD Shrub and Groundcover Planting Plan defines plant species and characteristics, locations and patterns, quantities in groupings, other requirements for installation, and relationships to construction by other disciplines.

Key Distinctions between DD and CD Shrub and Groundcover Planting Plans

The landscape architect should be strategic in making content decisions for the Design Development documents. These guidelines suggest individual strategies for each of the DD sheets, subject to the unique role of that sheet in the design and documentation process.

Primary relationships between the DD and CD Site Planting Plans are summarized here:

- The DD Shrub and Groundcover Planting Plan is a fully developed, in-progress version of the CD Shrub and Groundcover Planting Plan, with a complete set of preliminary decisions regarding plant species, locations and desired attributes.
- The complete graphic definition of individual shrubs and groundcovers may not be necessary on the DD Planting Plan. A large labor effort can be expended in defining many individual shrubs and groundcovers. Consequently, where expansive fields of small shrubs or perennials are proposed, the DD Planting Plan may illustrate that shrub or perennial mass with a hatch pattern, rather than with individual shrub symbols.
- The landscape architect may choose to show all individual shrubs and groundcovers to ensure a more accurate quantification of shrubs and groundcovers. Massed plant quantities can be miscalculated when using quantification formulas. For CD-level plant definition and quantification, individual plant symbols should be accurately reflected on plant list quantities via automated technology. For example, CAD may be used to define plant (or other) symbols as blocks with attributes that can be automatically counted and extracted to an electronic spreadsheet, which can be displayed on the Planting Plan.
- On the DD Plant List, plant quantities do not need to be numerically quantified, although enough information should be provided to complete a construction cost estimate. The plan should be adequately annotated so quantities can be determined by others. The landscape architect may provide plant spacing requirements so that contractors can use formulas to calculate massed quantities of shrubs, groundcover, and perennials.
- The DD Shrub and Groundcover Planting Plan should undergo preliminary coordination with both allied and specialized disciplines such as civil engineering, irrigation design, architecture, water feature design, coastal engineering, and wetlands design. The CD Plan should undergo rigorous and detailed coordination with these and other disciplines. CD level coordination focuses, in part, on relationships and potential conflicts between proposed shrubs and groundcovers at mature size and other built design program.
- The DD Shrub and Groundcover Planting Plan focuses on accomplishing design intent, and as such may include larger scale planting plan illustrations and three-dimensional documentation, including the use

of imagery. This type of documentation is significantly more advanced than Schematic Design documentation, that is, it should be more specific, more detailed and well-resolved.

- The DD Planting Plan does not yet reflect detailed documentation such as complete and final plant dimensioning, complete instructional Reference Notes, and final plant species determinations. Typical plant spacing may be included. Planting Detail Keynotes can be introduced but may not be completed exhaustively.

Specific Requirements

Survey base sheet to show all existing conditions to remain, including above- and below-grade structures, pavements, shrubs and groundcovers, topography, utilities, monuments, benchmarks or other reference datum, and all legal conditions and restrictions such as property line bearings and distances, recorded easements, zoning setbacks, deed restrictions, adjacent property owners, and zoning districts, if relevant to the project layout. Do not modify base sheet to change or obscure content.

All **existing conditions to remain** and proposed site components, including rock outcroppings, pavements, utility structures, drainage structures, irrigation equipment, and any other component that may interface with planting work.

Existing trees, shrubs, undergrowth to remain, graphically identified to match that shown on the Tree Protection Plan. Graphic identification of tree protection areas, for example, protective fencing is not necessary on the Planting Plan, as redundant plan requirements are to be avoided. In addition, a reference note may be used to describe existing tree(s) to remain.

Existing wetlands or other waterways, delineated as surveyed.

Proposed hardscape site improvements, including pavements, utility structures, drainage structures, irrigation equipment, and any other component that may interface with planting work.

Proposed grading relationships to planting, as illustrated by proposed grading contours, as part of the drawing base.

Proposed above- and below-grade **site utilities** from civil engineer's plans, in order to coordinate with proposed planting.

Preliminary limits of project scope of work, as agreed by landscape architect, civil engineer, contractor(s) (if applicable), and owner. Note that limits of project scope of work may not coincide with property lines, for example, when areas within the property area have been designated as non-work areas. Accurate determination of limits of work requires the investigation of a number of issues that the landscape architect may not have immediate access to, including contractor staging, mobilization, construction access, traffic control, and other construction-related issues. Consequently, the DD limits of work may be revised as they are better informed at the CD phase.

Sheet matchlines, identifying relationship of subject plan sheet to immediately adjoining plan sheets, with label on the side of the line you are matching your sheet to that reads "Matchline—Refer to Sheet L9-*x*. Show consistent, but minimal dimension of work outside matchline, for example, 1" on a full-sized sheet.

Primary **plan labels** to communicate primary content, for example, street names, buildings, adjacent context, utilities, easements, and major site program, especially as it relates to landscape and planting, for example, "event lawn," "palm court," or "meditation garden." Note that the Site Reference Plan is intended to illustrate and notate the primary landscape architectural spaces and programmatic components. It may be useful, however, to further highlight this program or define a more detailed set of elements on the Planting Plan. Furthermore, these labels may be useful for those occasions when Planting Plans are provided to landscape contractors as individual sheets, without the benefits of the entire drawing set. Note that some existing conditions labels should be included on the survey base. Note also that text plan labels are generally discouraged on landscape architectural plan sheets, with Planting Detail Keynotes and Planting Reference Notes used instead, for efficiency and clarity.

Preliminary Planting Detail Keynote List, with references to typical Planting Details, for example, shrub planting detail. Note that extensive Planting Detail Keynote references on the DD Planting Plan are not necessary, as they should be developed on the CD Planting Plan after the DD Plan has been confirmed. Typical Planting Detail Keynote references may be included.

PLANTING DETAIL KEYNOTES:

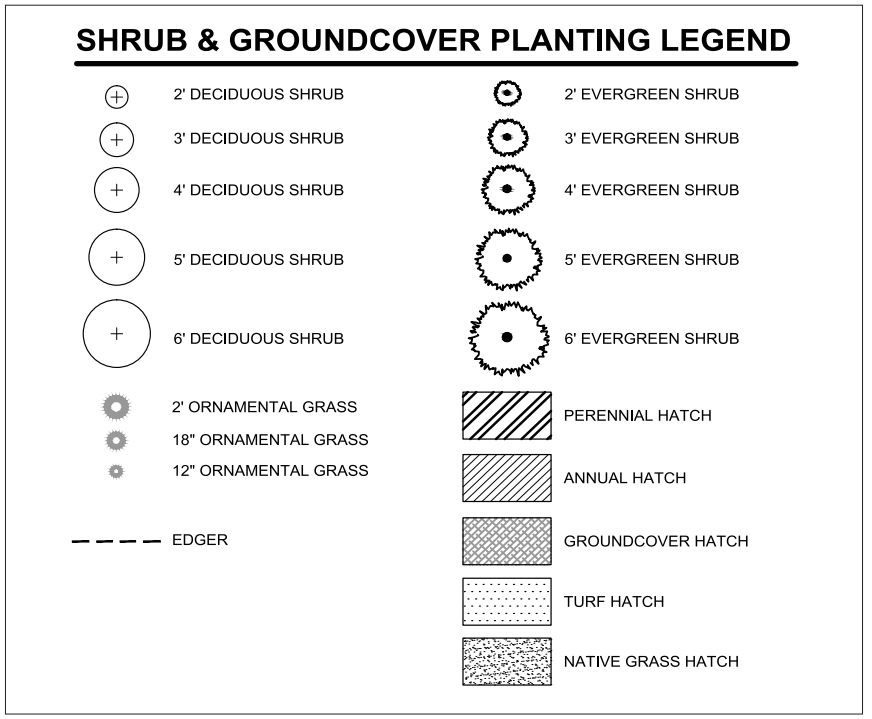
9.0	PLANTING AND LANDSCAPE	DETAIL/ SHEET	RELATED DETAILS	SPEC. SECTIONS
9.1	Deciduous Tree Planting	1/L11-01		329300
9.2	Deciduous Tree Planting on Slope	2/L11-01	1 & 2/L7-01	329300
9.3	Deciduous Multi-Trunk Tree Planting	1/L11-02		329300
9.4	Coniferous Tree Planting	3/L11-01		329300
9.5	Coniferous Tree Planting on Slope	4/L11-01	2 &3/L7-01	329300
9.6	Perennial Planting	5/L11-01	1, 2 & 3/L7-01	329300
9.7	Shrub Planting	6/L11-01		329300
9.8	Shrub Planting on Slope	7/L11-01	2/L7-01	329300
9.9	Metal Edging	8/L11-01		329300

Sample Planting Detail Keynote List

Enlargement Plan References for detailed plantings as necessary to convey design intent.

Preliminary Shrub and Groundcover Planting Reference Notes to supplement graphic instruction and General Notes. The DD Shrub and Groundcover Planting Plan may utilize a set of initial Site Reference Notes that communicate primary, rather than exhaustively annotated intent, for example, "Maintain 2' minimum clearance from fire hydrant."

Examples of Shrub and Groundcover Planting Reference Notes are provided below (see the generic description of Shrub and Groundcover Planting Reference Notes in Chapter 9, Key Documentation Practices). Note that these are only sample notes and do not represent a comprehensive list. They address likely topics. Therefore, they should not be used by landscape architects for project applications. The landscape architect should customize Shrub and Groundcover Planting Reference Notes to individual project needs. The landscape architect should establish Shrub and Groundcover Planting Reference Notes by walking through a logical order of planting operations. For example, confirming potential subgrade utility conflicts with proposed tree locations should occur prior to checking plant pits for satisfactory percolation rates.



Sample Shrub and Groundcover Planting Graphic

Example Shrub and Groundcover Planting Reference Notes

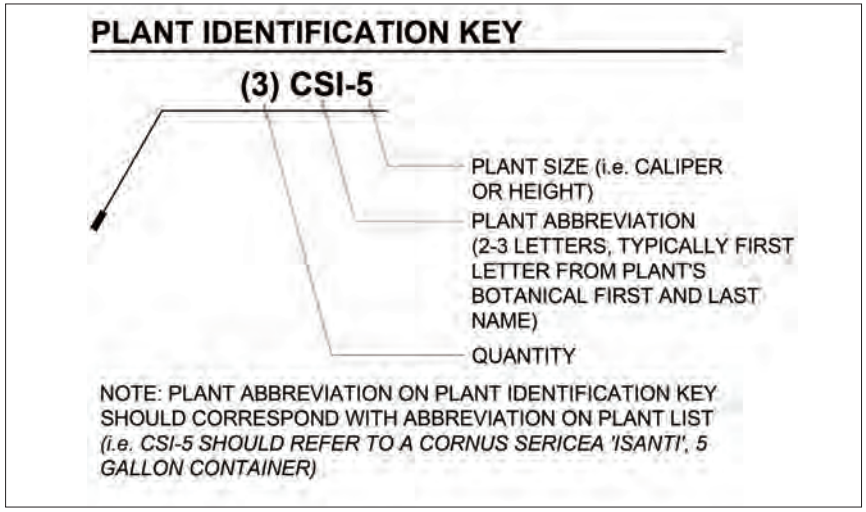
1. Verify fine grading work has been completed in this area prior to installation of shrubs.
2. Stake typical shrub layout in this area prior to installation.
3. Align shrub layout grid with pavement grid.
4. Position shrubs at toe of slope.

Proposed plants, including shrubs, groundcovers, perennials, annuals, grasses, seeded areas, plugged, sodded, sprigged, lawn/turf areas, native or dune grasses, xeric, cacti, succulents, ferns, fungi, tropical, and any other shrubs and groundcovers. Plant symbols per graphic requirements noted below and landscape architect's CAD standards.

Note: For areas to be seeded or sodded, it may be useful to provide a blanket note stating that all areas not otherwise treated or graphically designated shall be seeded.

Proposed trees, screened back, for reference and assisting in layout of proposed plants.

Plant reference system, identifying plant species and quantities in groups on plan, per graphic requirements below and landscape architect's customized system, for example, "24 HS-5" potentially identifying twenty-four *Hibiscus syriacus* (Rose of Sharon) 5 gallon container shrubs. Coordinate Plant Reference System with names, symbols and quantities on plant list, per graphic conventions noted below.



Sample Shrub and Groundcover Planting Graphic

Key dimensions to indicate important or typical plant spacing needs not readily conveyed on plant list.

Landscape edging, which is integral to the planting plan, laid out with dimension and curve information. Note that landscape edging is commonly installed by landscape contractor and should be shown on the Shrub and Groundcover Planting Plan. Layout information should be provided on one plan only. Include landscape edging on Site Layout Plan if layout complexity or relationships to hardscape require emphasis.

Planting Soil Plan, as necessary when different types of soils are used and when geographical location is not clear via notes or specifications. See separately defined requirements for the Site Soils Plan. The development of a separate Site Soils Plans is highly recommended. When that plan is developed, planting soil should not be shown on Planting Plans also.

Mulch Plan, as necessary when different types of mulches are used and when plan location is not clear via notes or specifications. Identify mulch areas per symbols legend. Note that all areas to be mulched or planted should be graphically delineated in some fashion. A blanket General Note may be provided to describe how areas not depicted are to be treated.

Mulches vary by locale and include two primary options—organic and inorganic. Organic mulches come from natural sources and include compost, wood chips, bark, straw, or pine needles. Inorganic mulches include rock, crushed glass, or recycled rubber.

Location of irrigation controller, indicated for reference and coordination, even if located inside a building. Also indicate backflow preventer location(s) and quick couplers if applicable. Carefully coordinate with the Irrigation Plan.

Erosion control plants, either temporary during construction, or permanent. Graphically distinguish temporary from permanent shrubs and groundcovers, and itemize separately on the Plant List. Note that engineering netting and related erosion control should be located on the Erosion and Sedimentation Control Plan.

Wetlands plants, that is, those shrubs and groundcovers positioned in permanent or intermittently wet conditions. Note that the expertise of a wetlands plant specialist is usually required to design wetlands environments.

Bioretention plants, that is, those shrubs and groundcovers that are used as part of a designed system to both retain and cleanse stormwater runoff via natural microbial processes.

Coastal planting, that is, those shrubs and groundcovers that are used as part of a coastal ecosystem to protect or restore habitat, control erosion or accomplish other objectives. Municipal guidelines or requirements may be applicable.

Revitalization or regeneration planting for disturbed areas, disturbed prior to construction. Planting may include reseeding, groundcover, or woody shrubs and groundcovers, for example, in a woodland area. Additional measures such as selective clearing, soil remediation, and fertilization may be necessary. The execution of the revitalization or regeneration program should be described in the Specifications.

Subgrade planting trenches, vaults or pits, if the plan's extent is not clear on details. Plants trenches cannot be shown accurately on details alone.

Subdrainage for plant pit and plant bed, referenced to Site Grading and Drainage Plan.

Plant List

Plant List with final plant species, sizes, quantities,* and key characteristics or comments.

Plant List organized by Plant Type in the following order by plant type:

- Deciduous Shrubs
- Evergreen Shrubs
- Cacti
- Groundcovers, Including Succulents
- Perennials
- Annuals
- Ornamental Grasses, Including Wildflower and Meadow Mixes
- Turf
- Wetland Shrubs and Groundcovers

Shrubs and groundcovers alphabetized by genus within each grouping of plant types.

Plant reference: Plant abbreviation label directly derived from plant genus and species, for example, Mahonia repens is labeled as MH. When similar Latin names establish duplicate abbreviations, supplement one abbreviation by one character to distinguish the two, for example, Spirea nipponica 'Snowmound' and Salvia nemorosa 'May Night' may be identified as SNS and SN, or SN1 and SN2.

Note that there is legitimate interest by some landscape architects in simplifying the use of plan plant references at the DD phase. For complex projects, the plant referencing process can be laborious and is subject to change as the DD scheme evolves. One approach suggests the sole use of plant symbols at the DD phase, without the use of plant references (plant identification labeling on the plan). That approach would require the extensive development of a plant symbol system that assigns a unique and distinguishable symbol for each plant. That approach runs contrary to the recommendation within these guidelines that a simple, single symbol be used for each plant type, for example, deciduous tree or evergreen tree. The landscape architect should not use two different systems for the DD and CD plans. Consequently, it is necessary to use plant references at the DD phase.

- **Plant Size Reference:** In cases where it is necessary to distinguish size requirements for the same species on the plan, a simple alpha-numeric reference may be used, derived from the base system. For example, if three different caliper sizes are proposed for *Euonymus elatus*, the following system may be used:
    - EA-8 – 8-Gallon Container
    - EA-5 – 5-Gallon Container
    - EA3 – 3-Gallon Container

  The abbreviations EA-8, EA-5, and EA-3 should be noted on the plan with leader lines directed at specific shrubs and groundcovers designated for specific size. The container references, for example, "8 Gal." for 8 gallon container should be identified on the Plant List under the "Type" column.

Alternative plant reference systems may be used. For example, shrubs may be labeled with a reference that begins with the letter "S" followed by a number, for example, S1, S2, and so forth, and groundcovers G1, G2, and so on.

Genus name capitalized (if upper and lowercase utilized), Species name in lowercase, and variety or cultivar capitalized if it a proper name. It is traditional to italicize or underline genus and species. Separate variety or cultivar from genus and species by abbreviation "var." or "cv.," or cultivar name included within single quotation marks if "cv." not used. For example, *Berberis thunbergii* var. atropupurea "Crimson Pygmy.

Common name in lowercase unless a proper term, for example, dwarf fragrant sumac and Japanese lilac.

Plant quantity always as a number of shrubs and groundcovers except for turf areas where square feet of areas to be planted may be used. Utilize landscape architect's CAD standards and automated plant-counting tools. Note that planting General Notes should indicate that plant lists are provided for contractor convenience and that plan quantities will govern. Shrub and Groundcover Planting General Notes are located on the General Information Sheet.

Size of shrubs and groundcovers in height or caliper (for large shrubs), or, more commonly, container size. Height may be given as a range, but caliper and container size should generally not be given as a range in order to establish uniform bidding conditions. Note that in some regions there are exceptions to this general rule.

All specified plant sizes should be consistent with the American Standard for Nursery Stock (ANSI Z60.1) published by the American Nursery and Landscape Association (ANLA). ANSI establishes a standardized system of plant sizing in order to provide buyers and sellers with a common terminology in order to facilitate transactions involving nursery stock. While the system may increase the likelihood that conforming shrubs and groundcovers are healthy, the system does not assure plant health. The system includes standards for measuring shrubs and groundcovers (caliper, height, and branch height); specifying and stating the size of shrubs and groundcovers; establishing proper relationships between caliper, height, and branch number; and root ball, container, or box size standards. [42]

[42] American Standard for Nursery Stock. Vol. ANSI Z60.1-2014. Columbus, OH: AmericanHort.

SHRUB/GROUNDCOVER PLANTING LIST

ABBR.	QTY.	BOTANICAL NAME	COMMON NAME	TYPE	SPACING	NOTES
DECIDUOUS & EVERGREEN SHRUBS						
AG-5	20	*Acer glabrum*	Rocky Mountain Maple	5' B&B	60" o.c.	Full Plants
AR-5	329	*Actaea rubra*	Red Baneberry	5 Gal.	30" o.c.	Full Plants
AU-1	437	*Arctostaphylos uva-ursi*	Kinnikinnick	1 Gal.	16" o.c.	Full Plants
CA-5	124	*Cotoneaster apiculatus*	Cranberry Cotoneaster	5 Gal.	30" o.c.	Full Plants
CS-5	367	*Cornus sericea*	Red Osier Dogwood	5 Gal.	48" o.c.	Full Plants
CS-7	200	*Cornus sericea*	Red Osier Dogwood	7 Gal.	48" o.c.	Full Plants
CV-5	60	*Ceanothus velutinus*	Snowbrush Ceanothus	5 Gal.	30" o.c.	Full Plants
JB-s	726	*Juncus balticus*	Baltic Rush	Spikes	10" o.c.	Full Plants
JC-5	79	*Juniperus communis 'Effusa'*	Common Juniper 'Effusa'	5 Gal.	36" o.c.	Full Plants
LI-5	285	*Lonicera involucrata*	Twinberry Honeysuckle	5 Gal.	36" o.c.	Full Plants
MR-1	130	*Mahonia repens*	Dwarf Oregon Grape	1 Gal.	30" o.c.	Full Plants
PB-5	33	*Prunus besseyi* 'Pawnee Buttes'	Creeping Sand Cherry	5 Gal.	30" o.c.	Full Plants
PF-5	202	*Potentilla fruiticosa*	Shrubby Cinquefoil	5 Gal.	30" o.c.	Full Plants
PM-5	205	*Paxistima myrsinites*	Mountain Lover	5 Gal.	30" o.c.	Full Plants
PMN-5	135	*Physocarpus opulifolius 'Nanus'*	Dwarf Mountain Ninebark	5 Gal.	30" o.c.	Full Plants
RA-5	604	*Rhus aromatica 'Gro-Low'*	Dwarf Fragrant Sumac (Gro-Low)	5 Gal.	30" o.c.	Full Plants
RD-5	106	*Rubus deliciosus*	Boulder Raspberry	5 Gal.	30" o.c.	Full Plants
RP-5	282	*Rubus parviflorus*	Western Thimbleberry	5 Gal.	16" o.c.	Full Plants
RW-5	264	*Rosa Woodsii*	Wood's Rose	5 Gal.	36" o.c.	Full Plants
SD-5	149	*Salix drummondiana*	Drummond Willow	5 Gal.	36" o.c.	Full Plants
SM-5	431	*Salix monticola*	Yellow Mountain Willow	5 Gal.	36" o.c.	Full Plants
SNS-5	229	*Spirea nipponica 'Snowmound'*	Snowmound Spirea	5 Gal.	36" o.c.	Full Plants
SP-5	10	*Sambucus pubens*	Native Elderberry	5 Gal.	48" o.c.	Full Plants
SR-5	81	*Symphoricarpos rotundifoli*	Mountain Snowberry	5 Gal.	36" o.c.	Full Plants
SS-5	73	*Sorbus scopulina*	Mountain Ash	5' B&B	60" o.c.	Full Plants
PERENNIALS						
AM-1	74	*Alchemilla mollis 'Thriller'*	Lady's Mantle	1 Gal.	16" o.c.	Full Plants
AQC-1	218	*Aquilegia caerulea*	Blue Columbine	1 Gal.	16" o.c.	Full Plants
CG-1	88	*Campanula glomerata 'Superba'*	Bellflower	1 Gal.	16" o.c.	Full Plants
CT-1	199	*Cerastium tomentosum 'Yo Yo'*	Snow in Summer	1 Gal.	9" o.c.	Full Plants
DPG-1	256	*Delphinium X Pac Giant Black Knight*	Subalpine Larkspur	1 Gal.	16" o.c.	Full Plants
GJB-1	311	*Geranium 'Johnson's Blue'*	Blue Cranesbill Geranium	1 Gal.	16" o.c.	Full Plants
LSA-1	105	*Leucanthemum x superbum 'Alaska'*	Shasta Daisy	1 Gal.	18" o.c.	Full Plants
MV-1	249	*Mertensia virginica*	Mountain Bluebell	1 Gal.	16" o.c.	Full Plants
PG-1	45	*Pediculairs groenlandica*	Elephant-Head	1 Gal.	12" o.c.	Full Plants
SA-p	157	*Sedum acre*	Sedum	4" Pots	12" o.c.	Full Plants
SAJ-1	53	*Sedum 'Autmn Joy'*	Stonecrop Sedum	4" Pots	16" o.c.	Full Plants
SN-1	365	*Salvia nemorosa 'May Night'*	Salvia 'May Night'	1 Gal.	16" o.c.	Full Plants
SNC-1	127	*Salvia nemorosa 'Caradonna'*	Salvia 'Caradonna'	1 Gal.	16" o.c.	Full Plants
VL-1	255	*Veronica longifolia 'Blue'*	Speedwell	1 Gal.	16" o.c.	Full Plants

TURFGRASS, SEED MIXES AND EDGING

31,690 SF	TURF	Turfgrass Sod: Kentucky Bluegrass
240,352 SF	SM1	Seed Mix 1
1,870 LF	EDGER	Metal Edging

Sample Shrub and Groundcover Planting

Plant list notes or comments concerning the method of delivery or other unique conditions associated with plant or installation. Refer to *American Standard for Nursery Stock*, published by the American Association of Nurserymen, for standard terms and requirements. Determine the most appropriate regional practice for selected species. A number of these terms are given in the following list, grouped under the headings "TYPE" or "COMMENTS," as they might be grouped on the plant list. Type generally refers to the plant delivery method and Comments generally represent characteristics of the plant. The list is not intended to be comprehensive, as the landscape architect is encouraged to establish local or regional needs.

TYPE

- Balled and Burlapped
- Bare Root
- Boxed size
- Bundle
- Manufactured Ball
- Transplant
- Seedling
- Container
- Cutting
- Pots
- Flats

COMMENTS

- Full Plants
- Full Specimens
- Multi-Stem, min. of 3 - 1" dia. stems
- Single Stem
- Espalier

Include notes to describe plant spacing, especially spacing for shrubs, perennials, and annuals. Where unique site-specific dimensions are important, include those dimensions on the Planting Plan.

Items Required on the General Information Sheet, to Be Coordinated with the Shrub and Groundcover Planting Plan

Note that all General Notes, symbols legends, and charts should be included on the General Information Sheet or Series Specific Key Plan and General Information Sheet, but are described here for reference. See *General Information Sheet* and *Series Specific Key Plan and General Information Sheet* requirements for additional information.

- **General Shrub and Groundcover planting notes** clarifying intent and requirements not clear on plan.
- **Shrub and Groundcover Symbols legend** illustrating graphic symbols used on the Shrub and Groundcover Planting Plan to identify proposed shrubs and groundcovers, mulches, metal edging, and other elements to be installed by the landscape contractor (see *Graphic Requirements* below).
- **Shrub and Groundcover Plant list** with final plant species, sizes, quantities, and key characteristics or comments.
- **Shrubs and groundcovers to be transplanted chart** if necessary, to define shrubs and groundcovers designated on the Plant Protection and Removal Plan to be transplanted, as indicated on the Shrub and Groundcover Planting Plan.

Graphic Requirements

Plan

Existing conditions, distinguished from proposed improvements by graphically screening existing conditions to a degree that allows proposed improvements to read distinctly from existing conditions. It is also very useful to screen back proposed hardscape improvements in order to allow proposed planting to read well. Furthermore, the landscape architect may find it useful to distinguish proposed trees from shrubs and groundcovers. That may be necessary when the planting plan is complex. If so, all shrubs and groundcovers can be shown on the same plan, with the shrubs and groundcovers screened to allow the trees to read vividly and the inverse to highlight shrubs and groundcover.

Proposed contour grading, also screened as necessary to illustrate intended relationships between planting design and grading and drainage plans.

Proposed site utilities, screened as necessary to illustrate intended relationships between the proposed utilities and shrub and groundcover planting design.

Limit of Project Scope of work line represented by an equally spaced dashed bold line, with a "Limit of Project Scope of Work" note. Consider screening this line to distinguish from matchlines that separate sheets.

Line-weight hierarchy from lightest to heaviest:

1. Screened survey base, existing conditions
2. Proposed hardscape, grading, trees and utilities
3. Plant call-outs, Planting Keynotes and Site Reference Notes and associated leader lines
4. Proposed shrubs and groundcovers, edgers and landscape elements

Automated CAD Tools, utilized from the landscape architect's firm IT systems to choose symbols, place shrubs and groundcovers, label shrubs and groundcovers, count shrubs and groundcovers, and create the plant list.

Deciduous shrubs, illustrated with simple circles with a cross in the center as a default symbol. Other illustrative symbols may be used to highlight the design intent, but are discouraged and if used, shall be kept as simple as possible.

Evergreen shrubs, illustrated with a graphic bold circle, irregular squiggled edge, and bold dot in the center as a default symbol.

Cactus, illustrated with the landscape architect's standard CAD symbol for cacti.

Shrub symbols shown at 1/2 to 3/4 mature size, for example, 4-foot mature shrub shown with 2 to 3-foot diameter. That will allow the designer to space shrubs and groundcovers appropriately. The landscape architect may find it useful to develop an electronic database to indicate mature plant sizes. That database would require regional applications to reflect species and growth rate variations.

Where different sizes of the same plant species are proposed, they may be distinguished graphically on the plan with use of different size symbols. That approach may conflict with the recommendation above that a 3/4 mature size be used to illustrate correlations with mature plant species' sizes and these approached should not be used jointly. A notation method may also be used to distinguish different sizes of the same plant species, as described above.

Erosion control shrubs and groundcovers, either temporary during construction, or permanent, illustrated with the landscape architect's standard CAD hatch symbols for erosion control shrubs and groundcovers. Graphically distinguish temporary from permanent shrubs and groundcovers, and itemize separately on the Plant List.

Connector lines, linking all shrub centers per landscape architect's CAD standards. Organize connector lines in simplest fashion possible, that is, avoid excessive "zig-zagging." Utilize logical groupings, for example, break at plan gaps or dividing features such as walkways.

Plan plant reference, indicated with a leader line extending to quantity and plant abbreviation label, for example, 20 CS-5, at all plant groupings. Leader line should be developed as per landscape architect's standard leader symbol, automated if possible. Use 60-degree angle from horizontal leader lines as much as possible.

Plant abbreviation labels per the landscape architect's standard CAD requirements and the recommendations above.

Groundcovers, perennials, ornamental grasses, and turf area represented on plans with diagrammatic symbols, each distinct per landscape architect's standard CAD symbols.

All **landscape edging**, a bold dashed line per landscape architect's standard CAD linetype.

Mulch intentions represented on plans with landscape architect's standard CAD symbols if mulch type varies per area, and not adequately communicated on details. It is generally not necessary to define mulch on plans.

Subgrade planting trenches, vaults, or pits, with dashed lined indicating limits of these elements.

Legends

Symbols Legend: Plant symbol identification should be incorporated in the Shrub and Groundcover Plant Legend and included on the General Information Sheet. Plant symbols should be identical to that shown on plans, including size. They may also be incorporated into the Shrub and Groundcover Plant Key Legend and Shrub and Groundcover Plant List if abbreviations and tree plan references not utilized.

Planting Key Legend: Shrub and groundcover abbreviation key for ease of reference on drawings legend—should include two-letter abbreviation and plant size, associated Latin name and common name and spacing.

SHRUB/GROUNDCOVER PLANTING KEY

ABBR.	BOTANICAL NAME	COMMON NAME	SPACING
DECIDUOUS & EVERGREEN SHRUBS			
AG-5	*Acer glabrum*	Rocky Mountain Maple	*30" O.C.*
AR-5	*Actaea rubra*	Red Baneberry	*30" O.C.*
AU-1	*Arctostaphylos uva-ursi*	Kinnikinnick	*16" O.C.*
CA-5	*Cotoneaster apiculatus*	Cranberry Cotoneaster	*30" O.C.*
CS-5	*Cornus sericea*	Red Osier Dogwood	*48" O.C.*
CS-7	*Cornus sericea*	Red Osier Dogwood	*48" O.C.*
CV-5	*Ceanothus velutinus*	Snowbrush Ceanothus	*30" O.C*
JB-s	*Juncus balticus*	Baltic Rush	*10" O.C*
JC-5	*Juniperus communis 'Effusa'*	Common Juniper 'Effusa'	*36" O.C*
LI-5	*Lonicera involucrata*	Twinberry Honeysuckle	*36" O.C*
MR-1	*Mahonia repens*	Dwarf Oregon Grape	*30" O.C*
PB-5	*Prunus besseyi* 'Pawnee Buttes'	Creeping Sand Cherry	*30" O.C*
PF-5	*Potentilla fruiticosa*	Shrubby Cinquefoil	*30" O.C*
PM-5	*Paxistima myrsinites*	Mountain Lover	*30" O.C*
PMN-5	*Physocarpus opulifolius 'Nanus'*	Dwarf Mountain Ninebark	*30" O.C*
RA-5	*Rhus aromatica 'Gro-Low'*	Dwarf Fragrant Sumac (Gro-Low)	*30" O.C*
RD-5	*Rubus deliciosus*	Boulder Raspberry	*30" O.C*
RP-5	*Rubus parviflorus*	Western Thimbleberry	*18" O.C*
RW-5	*Rosa Woodsii*	Wood's Rose	*36" O.C*
SD-5	*Salix drummondiana*	Drummond Willow	*36" O.C*
SM-5	*Salix monticola*	Yellow Mountain Willow	*36" O.C*
SNS-5	*Spirea nipponica 'Snowmound'*	Snowmound Spirea	*36" O.C*
SP-5	*Sambucus pubens*	Native Elderberry	*48" O.C*
SR-5	*Symphoricarpos rotundifoli*	Mountain Snowberry	*36" O.C*
SS-5	*Sorbus scopulina*	Mountain Ash	*30" O.C*
PERENNIALS			
AM-1	*Alchemilla mollis 'Thriller'*	Lady's Mantle	*16" O.C.*
AQC-1	*Aquilegia caerulea*	Blue Columbine	*16" O.C.*
CT-1	*Cerastium tomentosum 'Yo Yo'*	Snow in Summer	*9" O.C.*
DPG-1	*Delphinium X Pac Giant Black Knight*	Subalpine Larkspur	*16" O.C.*
GJB-1	*Geranium 'Johnson's Blue'*	Blue Cranesbill Geranium	*16" O.C.*
LSA-1	*Leucanthemum x superbum 'Alaska'*	Shasta Daisy	*18" O.C*
MV-1	*Mertensia virginica*	Mountain Bluebell	*16" O.C*
PG-1	*Pediculairs groenlandica*	Elephant-Head	*12" O.C*
SA-p	*Sedum acre*	Sedum	*12" O.C*
SAJ-1	*Sedum 'Autmn Joy'*	Stonecrop Sedum	*16" O.C*
SN-1	*Salvia nemorosa 'May Night'*	Salvia 'May Night'	*16" O.C*
SNC-1	*Salvia nemorosa 'Caradonna'*	Salvia 'Caradonna'	*16" O.C*
VL-1	*Veronica longifolia 'Blue'*	Speedwell	*16" O.C*
TURFGRASS, SEED MIXES AND EDGING			
TURF	Turfgrass Sod: Kentucky Bluegrass		
SM1	Seed Mix 1		
▬ ▬ ▬	Metal Edging		

Sample Shrub/Groundcover Plant Key

Plant List

See *Specific Requirements* above.

Best Practices

Design

Think Three-Dimensionally

Utilize three-dimensional drafting or modeling software to represent fully mature (full growth) shrubs and groundcovers when possible. These shrubs and groundcovers should be illustrated in relationship to buildings and the site development program in order to confirm species choices and associated sizes, habits, forms, textures, locations, quantities, type of space being created, and sun/shade patterns. Emphasis should be placed on large shrubs. It is common for shrubs to be spaced too closely to one another, or too close to buildings and other elements. These proximities result in spatial and circulation conflicts, visibility problems, maintenance challenges, and difficulties for shrubs and groundcovers in achieving normal size and form characteristics.

Determine and evaluate mature size and form characteristics of proposed shrubs and groundcovers. Overplanting and excessively tight spacing is a common problem in planting design.

Establish intended design relationships between planting design and grading design. Modeling studies should include shrubs and groundcovers and topography.

Addressing Site Conditions

Existing soil on the site may be a factor in plant selection, especially if the soil is especially acidic or alkaline. Native plant selection is best achieved if matched to desirable soil, light, and moisture conditions. Before making final plant selections, collect and analyze soil samples on the site to determine desirable plant associations. Amendments may need to be made to the soil to achieve better nutrient content—these amendments should be specified.

Native site soils are an important factor in an ecologically healthy site. Native site soils can be confirmed by comparing on-site soil samples within the regional context. It is important to analyze the existing native site soil in order to determine if the soil is healthy and can properly support the vigorous growth of shrubs and groundcovers and habitat. If healthy native soil is determined to exist, care should be taken to preserve and reuse the soil, even if it is disturbed by construction activities. Ideally, healthy native soil will be

adequate to serve the entire needs of the redeveloped site, minimizing the need for importing "foreign" soils.[43]

Determine an appropriate native plant palette for the site conditions, that is, shrubs and groundcovers that would naturally thrive in these conditions. Consider that palette as part of proposed planting scheme.

On some sites, wildlife habitats may exist. These habitats may include migration routes or flyways. Existing landscapes, including trees, shrubs and groundcovers, drainage patterns, and geology represent the primary features of these habitats. A survey of these habitats, including a determination of current wildlife occupation is important to determining the location and extent of proposed improvements in order to avoid undesirable impacts. As part of the wildlife and habitat analysis, an inventory of native plant communities should be established. Invasive or noxious species may be found and may need to be removed. New planting patterns may play a role in enhancing existing habitat conditions. Proposed plant species may be selected to match or complement the native plant community. Landscape buffers may be established to protect the habitat area.

As soil, light (sun), topographic, and moisture conditions vary across the site, it is important to make plant selections that fit and thrive in these sometimes disparate conditions. Establish a plant zoning map (at Schematic Design) to depict limits of each major zone. The plant zoning map should be prepared as an overlay to the Grading Plan so to reflect solar orientation and aspect. Planting zone examples might include "Hot, Dry, South-Facing Slopes," and "Cool Wet Existing Tree Understory."

Drought-tolerant and low-water needing shrubs and groundcovers may be important to accomplishing sustainable water use objectives. When shrubs and groundcovers that require similar water needs are grouped in irrigation "zones," necessary water application rates can be most effectively managed. Some drought-tolerant shrubs and groundcovers may even thrive in poor soil conditions. The Plant Zoning Map described above can be further developed and utilized to reflect plant watering needs, in order to group plant species with similar needs.

Coordination

Maintenance

Review maintenance capabilities and issues with owner's landscape maintenance personnel and determine key issues. Determine intended maintenance levels for the project as it influences plant selection and planting design. For example, the landscape maintenance program may not be well suited to maintaining perennials and annuals. Or, a corporate mission may not support maintenance and watering needs of extensive lawns.

Irrigation

Coordinate plant locations and watering needs with an irrigation consultant. Graphically overlay Planting Plans with Irrigation Plans to determine any potential conflicts or necessary adjustments. Irrigation equipment should be located to be accessible but visually discrete.

Civil

Graphically overlay Planting Plans with Civil Engineering Plans to determine any potential conflicts or necessary adjustments. While minor adjustments of civil infrastructure may be made in the field, more significant conflicts, for example, shrubs planted over or adjacent to utility lines, may require adjustment of one element or the other during the design and documentation process.

Graphically overlay Planting Plans with Grading Plans to determine any potential conflicts or necessary adjustments. For example, plant positions in drainage ways should be evaluated for species' appropriateness to potentially wet conditions. Planting relationships to proposed grading must be well resolved. It may be necessary to illustrate that intent with sections, such as those described elsewhere in this document as "Composite Reference Sections."

Tree Protection

Coordinate the Shrub and Groundcover Planting Plan with the Plant Protection and Removal Plan, and/or the Protection and Control Plan, if one is utilized. Cross-reference these plans in General Notes if applicable. Proposed shrubs and groundcovers should be positioned with careful consideration of root zones at existing trees.

Cross-Referencing

It is common for landscape architects to use notes on drawings and General Notes to cross reference relationships between drawings, for example, between the Planting Plan, Irrigation Plan, Irrigation Details and Planting Details. This practice is unnecessary as these relationships are implicit. Refer to *Chapter 3, Operational Principles,* ***CROSS-REFERENCING CAUTIONS: A METHOD TO THE MADNESS*** for a description of the Implicitness Principle.

The landscape architect may consider establishing a General Note on the General Information Sheet to reinforce the principle of implicitness, suggesting that relationships between drawings, and between drawings and specifications are complementary and understood.

[43] Hopper, Leonard J. Landscape Architectural Graphic Standards. Hoboken, New Jersey: John Wiley and Sons, 2007, p. 62.

Plant Availability

Prior to preparing Design Development and Construction Documentation Planting Plans, check for general availability of selected quantities of shrubs and groundcovers. The contractor is responsible for locating specific material, but the landscape architect should ensure that plants are available within reasonable means.

The landscape architect may confirm availability of specified plant species, sizes, and quantities by contacting nurseries in the project area or utilizing a landscape contractor to conduct a plant search.

Municipal Requirements

Verify that plant selection meets zoning and landscape requirements of the local municipality. These requirements may include a minimum landscape area, usually a percentage, as part of the overall site acreage. In addition, municipalities may require a specific number of shrubs per street frontage or parking area, or minimum plant sizes.

Prior to preparing Design Development and Construction Documentation Planting Plans, verify that plant palette is approved by agencies with jurisdiction over the project, for example, the forestry or parks department, or other city, county, town, state, or federal agency. Verify compliance with any covenants and/or design guidelines for the project area.

Technical

Locate shrubs and groundcovers to ensure that long-term root growth does not conflict with utilities, buildings, structure foundations, ponds liners, or other sensitive infrastructure.

In order to conserve water, determine a water budget for irrigated landscape, and pair water application rates with associated plant species' water needs.

Strategies

Say the Most with the Least Graphic Information

Do not overrender the planting plan. The document is not intended to be illustrative and should communicate contractual requirements in the simplest fashion possible. Subtle differences in plant symbols may be useful to readily distinguish plant species or types.

Strategic Notes and Key Requirements

Use notes or comments on the Plant List to stipulate special requirements that are important to the success of the planting design. For example, in an urban condition it may be critical that site lines are clear at automobile intersections. That intent may require a maximum mature plant height in order to establish the desired visual clearance. This requirement should be noted in the Comments section of the Plant List, as described above under *Plant List*. The landscape architect should think carefully about the most important plant characteristics, those unique characteristics that are not communicated in the specifications.

Be Generic

Do not include specification information on planting plans or details, for example, specific soil amendments, detailed mulch requirements, and tree stake materials. Instead, generic references should be used. Generic references do not include proprietary, technical, or descriptive references. For example, mulches may be referenced on plans with Planting Detail Keynotes as Mulch Type 1, Mulch Type 2, and so on. Soil should be referenced with terms that precisely match specification references, for example, existing topsoil, imported topsoil, backfill, or structural soil.

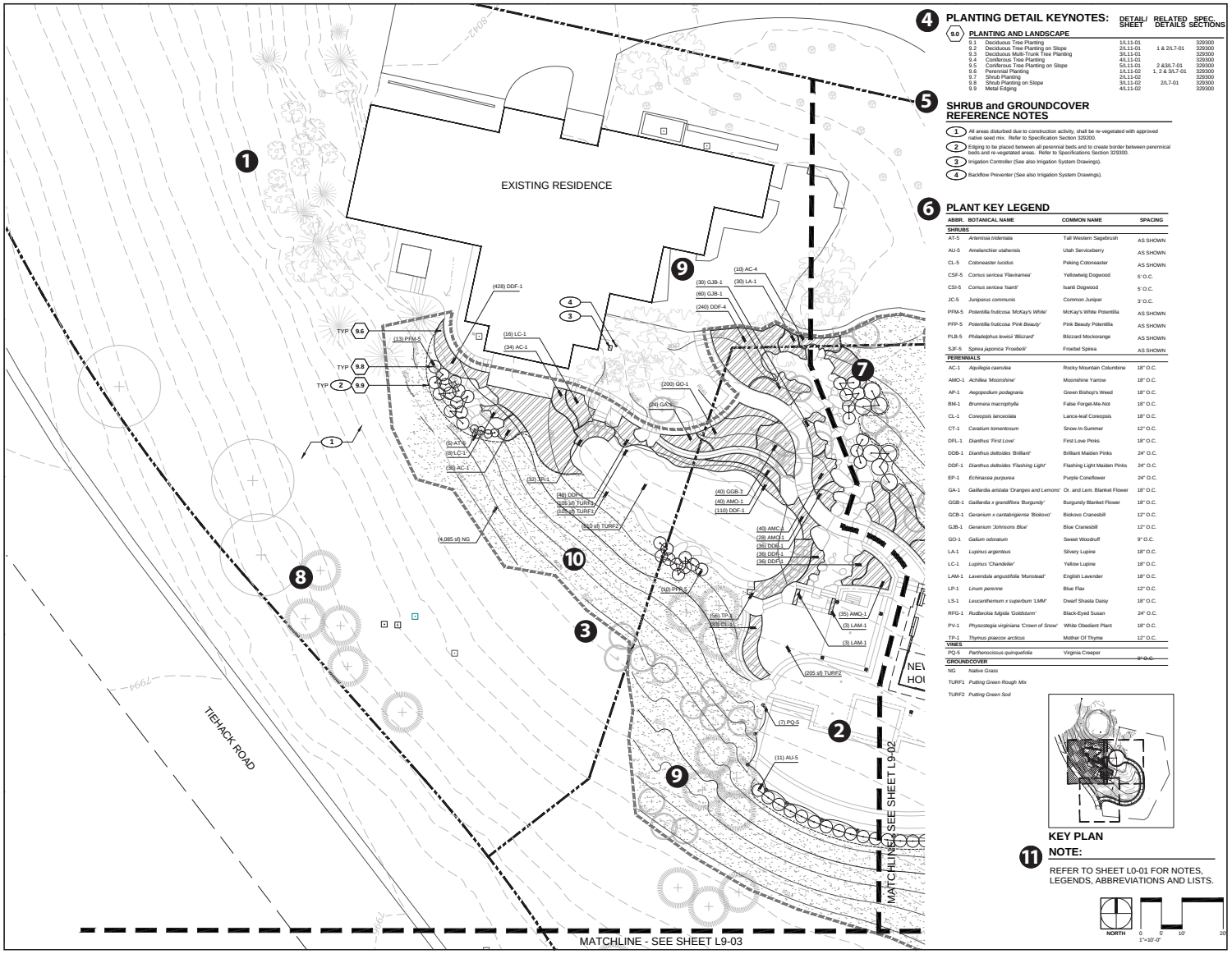
Evaluate Plant Positions, Spacing, and Potential Conflicts

Confirm plant spacing and plant proximities with adjoining elements by reviewing mature plant sizes. Check conformance to municipal requirements.

Check for conflicts between proposed plant materials and light poles, fire hydrants, drains, and pipes; fire department connections on buildings; sediment traps; signs; site distance triangles; easements; property setbacks; swales; irrigation equipment; or other restrictions. Overlay Planting Plans with composite Site Utility Plans prior to beginning Construction Documents. Be aware of soil depths when planting above building structures to ensure that appropriate shrubs are specified.

Review possible screening needs, for example, transformers; heat pumps; trash and recycling areas; irrigation, electrical or mechanical equipment; parking lots; above-grade vaults, or storage facilities and rooms.

Example of a DD Shrub and Groundcover Planting Plan



4 PLANTING DETAIL KEYNOTES:

		DETAIL/ SHEET	RELATED DETAILS	SPEC. SECTIONS
9.0	**PLANTING AND LANDSCAPE**			
9.1	Deciduous Tree Planting	1/L11-01		329300
9.2	Deciduous Tree Planting on Slope	2/L11-01	1 & 2/L7-01	329300
9.3	Deciduous Multi-Trunk Tree Planting	3/L11-01		329300
9.4	Coniferous Tree Planting	4/L11-01		329300
9.5	Coniferous Tree Planting on Slope	5/L11-01	2 &3/L7-01	329300
9.6	Perennial Planting	1/L11-02	1, 2 & 3/L7-01	329300
9.7	Shrub Planting	2/L11-02		329300
9.8	Shrub Planting on Slope	3/L11-02	2/L7-01	329300
9.9	Metal Edging	4/L11-02		329300

5 SHRUB and GROUNDCOVER REFERENCE NOTES

1. All areas disturbed due to construction activity, shall be re-vegetated with approved native seed mix. Refer to Specification Section 329200.
2. Edging to be placed between all perennial beds and to create border between perennical beds and re-vegetated areas. Refer to Specifications Section 329300.
3. Irrigation Controller (See also Irrigation System Drawings).
4. Backflow Preventer (See also Irrigation System Drawings).

6 PLANT KEY LEGEND

ABBR.	BOTANICAL NAME	COMMON NAME	SPACING
SHRUBS			
AT-5	*Artemisia tridentata*	Tall Western Sagebrush	AS SHOWN
AU-5	*Amelanchier utahensis*	Utah Serviceberry	AS SHOWN
CL-5	*Cotoneaster lucidus*	Peking Cotoneaster	AS SHOWN
CSF-5	*Cornus sericea 'Flaviramea'*	Yellowtwig Dogwood	5' O.C.
CSI-5	*Cornus sericea 'Isanti'*	Isanti Dogwood	5' O.C.
JC-5	*Juniperus communis*	Common Juniper	3' O.C.
PFM-5	*Potentilla fruticosa 'McKay's White'*	McKay's White Potentilla	AS SHOWN
PFP-5	*Potentilla fruticosa 'Pink Beauty'*	Pink Beauty Potentilla	AS SHOWN
PLB-5	*Philadelphus lewisii 'Blizzard'*	Blizzard Mockorange	AS SHOWN
SJF-5	*Spirea japonica 'Froebeli'*	Froebel Spirea	AS SHOWN
PERENNIALS			
AC-1	*Aquilegia caerulea*	Rocky Mountain Columbine	18" O.C.
AMO-1	*Achillea 'Moonshine'*	Moonshine Yarrow	18" O.C.
AP-1	*Aegopodium podagraria*	Green Bishop's Weed	18" O.C.
BM-1	*Brunnera macrophylla*	False Forget-Me-Not	18" O.C.
CL-1	*Coreopsis lanceolata*	Lance-leaf Coreopsis	18" O.C.
CT-1	*Ceratium tomentosum*	Snow-In-Summer	12" O.C.
DFL-1	*Dianthus 'First Love'*	First Love Pinks	18" O.C.
DDB-1	*Dianthus deltoides 'Brilliant'*	Brilliant Maiden Pinks	24" O.C.
DDF-1	*Dianthus deltoides 'Flashing Light'*	Flashing Light Maiden Pinks	24" O.C.
EP-1	*Echinacea purpurea*	Purple Coneflower	24" O.C.
GA-1	*Gaillardia aristata 'Oranges and Lemons'*	Or. and Lem. Blanket Flower	18" O.C.
GGB-1	*Gaillardia x grandiflora 'Burgundy'*	Burgundy Blanket Flower	18" O.C.
GCB-1	*Geranium x cantabrigiense 'Biokovo'*	Biokovo Cranesbill	12" O.C.
GJB-1	*Geranium 'Johnsons Blue'*	Blue Cranesbill	12" O.C.
GO-1	*Galium odoratum*	Sweet Woodruff	9" O.C.
LA-1	*Lupinus argenteus*	Silvery Lupine	18" O.C.
LC-1	*Lupinus 'Chandelier'*	Yellow Lupine	18" O.C.
LAM-1	*Lavendula angustifolia 'Munstead'*	English Lavender	18" O.C.
LP-1	*Linum perenne*	Blue Flax	12" O.C.
LS-1	*Leucanthemum x superbum 'LMM'*	Dwarf Shasta Daisy	18" O.C.
RFG-1	*Rudbeckia fulgida 'Goldsturm'*	Black-Eyed Susan	24" O.C.
PV-1	*Physostegia virginiana 'Crown of Snow'*	White Obedient Plant	18" O.C.
TP-1	*Thymus praecox arcticus*	Mother Of Thyme	12" O.C.
VINES			
PQ-5	*Parthenocissus quinquefolia*	Virginia Creeper	9" O.C.
GROUNDCOVER			
NG	*Native Grass*		
TURF1	*Putting Green Rough Mix*		
TURF2	*Putting Green Sod*		

KEY PLAN

11 NOTE:

REFER TO SHEET L0-01 FOR NOTES, LEGENDS, ABBREVIATIONS AND LISTS.

NORTH 0 5 10' 20' 1"=10'-0"

LEGEND

SHEET REQUIREMENTS

1. Survey Base Sheet
2. Proposed Site Improvements
3. Preliminary Limits of Work (if able to define) or Limit of Project Scope of Work
4. Site Detail Keynote List
5. Preliminary Site Reference Notes (for example purposes only, should be project specific)
6. Planting Key Legend

SERIES REQUIREMENTS

7. Proposed Shrub and Groundcover Planting
8. Proposed Tree Planting *(screened–for reference only)*
9. Preliminary Plant Reference System
10. Proposed Site Grading and Drainage
11. Planting Sheet Note

Other items that may be provided, but not currently depicted, if the project requires it, include:

–Proposed utilities

–Enlargement Plan References

*Note: This sample only depicts the Drawing Area for this sheet. For Title Block requirements refer to beginning of this section.

CONSTRUCTION DOCUMENTATION SHRUB AND GROUNDCOVER PLANTING PLAN

Objective

The CD Shrub and Groundcover Planting Plan defines contractual requirements for shrub and groundcover locations, species, sizes, and other characteristics.

General Requirements

Confirm that the design intent, and the role of shrubs and groundcovers in accomplishing measurable project goals, has been accomplished. Aesthetic and sensory objectives may include form, habit, texture, color, and scent. Environmental and engineering objectives may include erosion control, wind and solar control, bioremediation, or habitat enhancement. Social or community goals may include education, gardening, crime prevention, or establishing seasonal activity spaces.

Meet municipal requirements for number and location of plants.

Specific Requirements

Plan

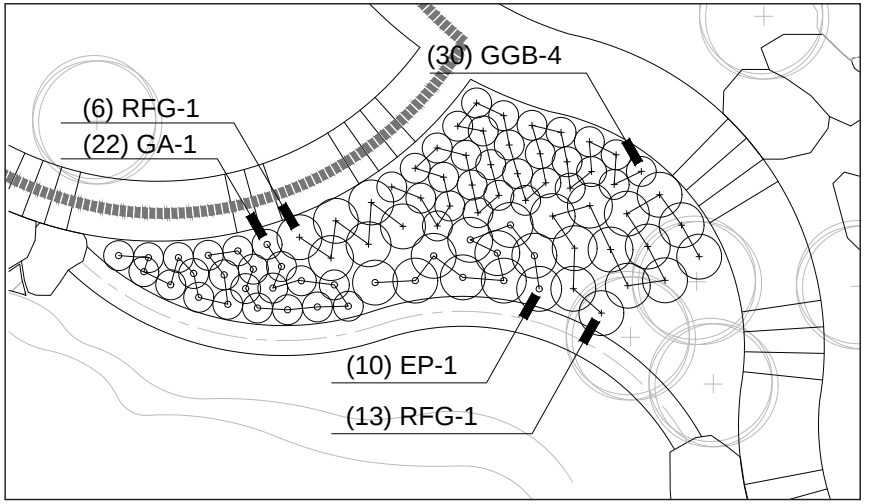
Final **limits of project scope of work,** as agreed on by landscape architect, civil engineer, contractor(s) (if applicable), and owner. Note that limits of Project Scope of work may not coincide with property lines, for example, when areas within the property area have been designated as non-work areas. Accurate determination of limits of work require the investigation of a number of issues that the landscape architect may not have immediate access to, including contractor staging, mobilization, construction access, traffic control, and other construction-related issues. Consequently, the DD limits of work may be revised as they are better informed at the CD phase.

Comprehensive Planting **Detail Keynote List,** with references to typical Planting Details, for example, "Shrub Planting on Slope,""Shrub Planting in Planter."

Final Shrub and Groundcover **Reference Notes** to supplement graphic instruction and General Notes.

Dimensions to indicate typical plant spacing needs not readily conveyed on plant list.

Final **Plant Reference System**, identifying final plant species and quantities in groups on plan. Coordinate the Plant Reference System with the Plant List, Planting Key Legend, and Plant Symbols Legend.



Sample Enlargement Plan when additional detail is required to convey the design intent. Graphic may either utilize hatching protocols as established in the landscape architect's CAD Manual or simple symbols to differentiate plants and represent sizes or spacing.

Plant List

Final *Plant List* including species and varieties, selection, associated common names and abbreviations, sizes, types, notes, and quantities.

Planting Key Legend

Final **Planting Key Legend** with abbreviations and associated species/varieties. Latin and common names to correspond with final plant list. The Planting Key Legend shall be located on each shrub and groundcover planting series plan in accordance with landscape architect's CAD standards.

Graphic Requirements

The graphic requirements described at the DD phase should also be applied at the CD phase.

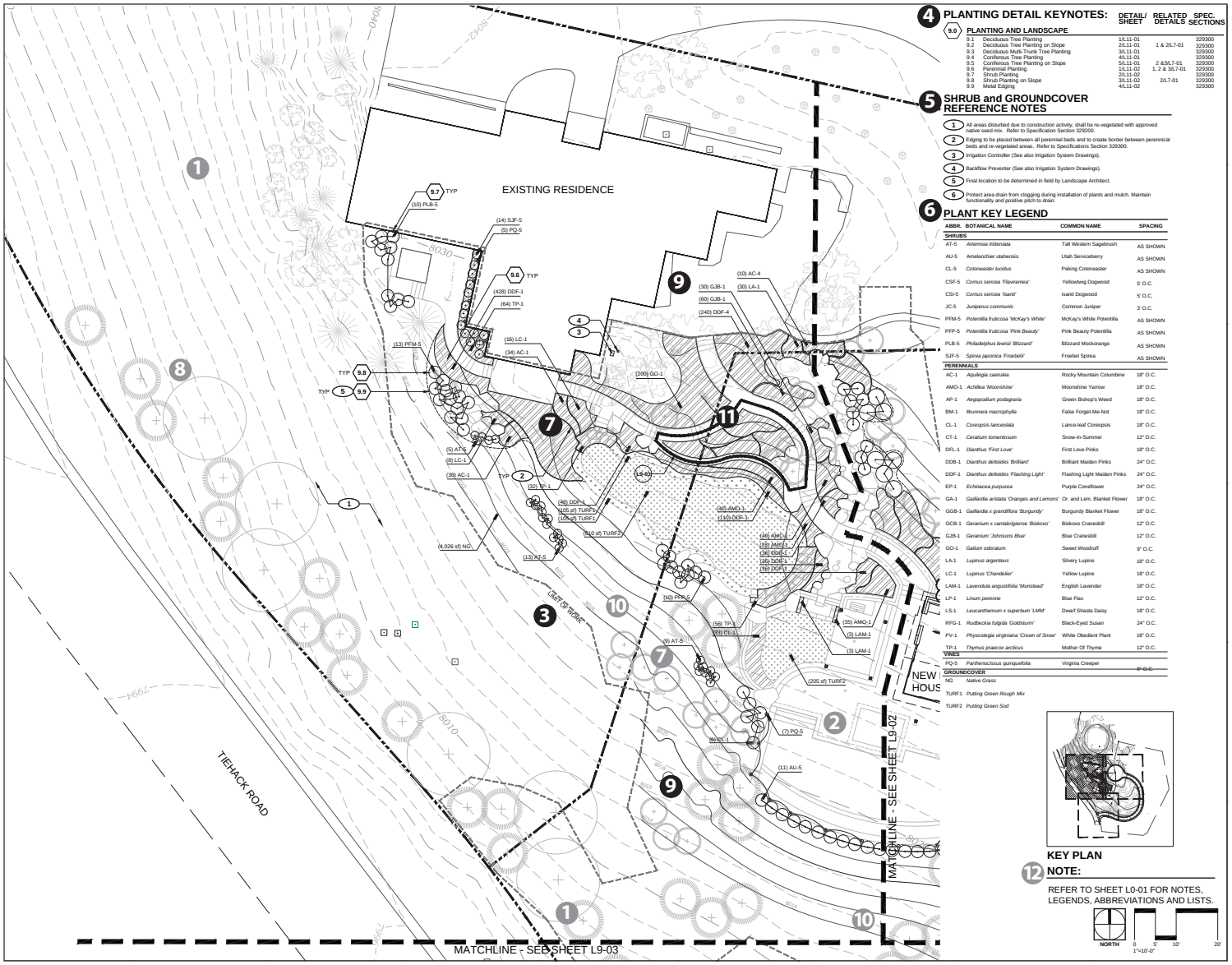
Best Practices

Best practices described at the DD phase should also be applied at the CD phase.

Strategies

Verify plant quantities with the Plant List. Utilize computer-generated symbols in such a manner that computer can tabulate quantities, including square feet of groundcover, perennials, and grasses. Note that quantities on the plan govern. Plant Lists are used for contractor convenience. The contractor is to count and confirm plant quantities.

Example of a CD Shrub and Groundcover Planting Plan



LEGEND

SHEET REQUIREMENTS

1. Survey Base Sheet
2. Proposed Site Improvements
3. Limits of Work (if can be defined) or Limit of Project Scope of Work
4. Site Detail Keynote List
5. **Site Reference Notes (for example purposes only, should be project specific)**
6. Planting Key Legend

SERIES REQUIREMENTS

7. Proposed Shrub and Groundcover Planting
8. Proposed Tree Planting *(screened–for reference only)*
9. Plant Reference System
10. Proposed Site Grading and Drainage
11. Enlargement Plan References
12. Planting Sheet Note

Other items that may be provided, but not currently depicted, if the project requires it, include:

–Proposed utilities

Note: **Boldface** items represent key distinctions between Construction Documentation documents and Design Development documents.

*Note: This sample only depicts the Drawing Area for this sheet. For Title Block requirements refer to beginning of this section.

DESIGN DEVELOPMENT SITE SOILS PLAN

Objective

The DD Site Soils Plan establishes the location and type of proposed planting soils on a project in order to promote the successful installation and future viability of proposed plants, and facilitate proper drainage, and groundwater recharge.

General Requirements

The DD Site Soils Plan defines the planting soil types and locations, other requirements for installation, and relationships to construction indicated elsewhere in the drawing set.

The DD Soils Plan establishes design intent and the role of planting soils in accomplishing project objectives. Typical planting soil objectives and issues include the following:

- Ensure that proposed soil medium is adequately paired with the correct plants to ensure viability.
- Ensure that proposed soil medium is thoroughly investigated and has incorporated the correct mix of products, for example, topsoil, compost, sand, organic amendments, and so on, to ensure successful plant establishment and growth.
    - Are there erosion or sedimentation concerns that should be addressed with soil selection?
    - Are there drainage concerns that should be addressed with soil selection?
    - How should soil percolation rates be devised to either address sub-drainage needs or promote groundwater infiltration?
    - How should proposed planting soil be designed to coexist with existing site subsoil conditions, for example, clay, sand, bedrock, and so forth?
- Ensure that proposed planting soil has been designed properly for intended uses, for example, turf sports fields, native grass areas, planting beds, wetlands, roof gardens, bioretention swales, and so forth.
- Ensure that proposed planting soil incorporates or reuses existing salvaged site soils, including stripped topsoil and subsoils, to minimize unnecessary use of soils from other sources.

Key Distinctions between DD and CD Site Soils Plans

The landscape architect should be strategic in making content decisions for the Design Development documents. These guidelines suggest individual strategies for each of the DD sheets, subject to the unique role of that sheet in the design and documentation process.

Primary relationships between the DD and CD Site Soils Plans are summarized here:

- The DD Site Soils Plan is a fully developed, in-progress version of the CD Site Soils Plan, with a complete set of preliminary decisions regarding planting soil type locations and desired attributes. The plan should be adequately notated so quantities can be determined by others.
- The DD Site Soils Plan should undergo preliminary coordination with both allied and specialized disciplines, as required, such as civil engineering, irrigation design, coastal engineering, and wetlands design. DD coordination is focused on the viability of selected soils. The CD Site Soils Plan should undergo rigorous and detailed coordination with these and other disciplines, including the evaluation of location, extent and depth of the soil program.
- The DD Site Soils Plan focuses on accomplishing design intent, and as such may include larger scale Site Soils Plan illustrations and three-dimensional documentation, including the use of imagery. This type of documentation is significantly more advanced than Schematic Design documentation, that is, it should be more specific, more detailed and well resolved.
- The DD Site Soils Plan does not yet reflect detailed documentation such as complete and final dimensioning, complete instructional Planting Reference Notes, and final planting soil type determinations. Planting Detail Keynotes should be introduced at DD but may not be completed exhaustively.

Specific Requirements

Plan

Survey base sheet to show all existing conditions to remain, including above-and below-grade structures, pavements, trees, topography, utilities, monuments, benchmarks or other reference datum, and all legal conditions and restrictions such as property line bearings and distances, recorded

easements, zoning setbacks, deed restrictions, adjacent property owners, and zoning districts, if relevant to the project layout. Do not modify base sheet to change or obscure content.

All **existing conditions to remain** and proposed site components, including rock outcroppings, pavements, utility structures, drainage structures, irrigation equipment, and any other component that may interface with planting and soil work.

Existing trees, shrubs, undergrowth to remain, graphically identified to match that shown on Plant Protection and Removal Plan. Graphic identification of plant protection areas, for example, protective fencing is not necessary on the Site Soils Plan, as redundant plan requirements are to be avoided.

Existing wetlands or other waterways, delineated as surveyed.

Proposed hardscape site improvements, including pavements, utility structures, drainage structures, irrigation equipment, and any other component that may interface with site soils work.

Proposed Site grading and drainage relationships to site soils, as illustrated by proposed grading contours, as part of the drawing base.

Proposed Site Utilities Proposed above- and below-grade site utilities from civil engineer's plans, in order to coordinate with proposed planting soils.

Proposed trees and planting beds shown hatched only. Plant symbols per graphic requirements noted in Tree Planting and Shrub and Groundcover Planting sections and landscape architect's CAD standards.

Preliminary limits of project scope of work, as agreed on by the landscape architect, civil engineer, contractor(s) (if applicable), and owner. Note that limits of project scope of work may not coincide with property lines, for example, when areas within the property area have been designated as non-work areas. Accurate determination of "limits of work" requires the investigation of a number of issues that the landscape architect may not have immediate access to, including contractor staging, mobilization, construction access, traffic control, and other construction-related issues. Consequently, the DD limits of project scope of work should be utilized as these parameters are closely tied to the client's site program for the project and may be revised as they are better informed at the CD phase.

Sheet matchlines, identifying relationship of subject plan sheet to immediately adjoining plan sheets, with label on the side of the line that reads "Matchline—Refer to Sheet L10-x. Show consistent, but minimal dimension of work outside matchline, for example, 1" on a full-sized sheet.

Primary plan labels to communicate primary content, for example, street names, buildings, adjacent context, utilities, easements, and major site program, especially as it relates to landscape and site soils installation, for example, "event lawn," "palm court," or "meditation garden." Note that the Site Reference Plan is intended to illustrate and notate the primary landscape architectural spaces and programmatic components. It may be useful, however, to further highlight this program or define a more detailed set of elements on the Site Soils Plan. Furthermore, these labels may be useful for those occasions when Site Soils Plans are provided to landscape contractors as individual sheets, without the benefits of the entire drawing set. Note that some existing conditions labels should be included on the survey base. Note also that text plan labels are generally discouraged on landscape architectural plan sheets, with Planting Detail Keynotes and Site Soils Reference Notes used instead, for efficiency and clarity.

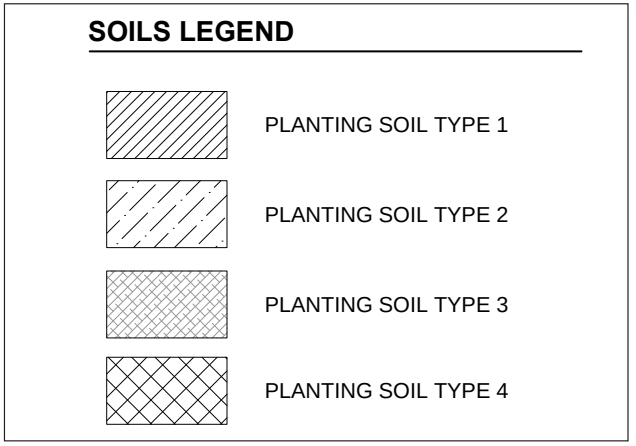
Preliminary Planting Detail Keynote List, with references to typical planting soils details. Note that extensive Planting Detail Keynote references on the DD Site Soils Plan are not necessary, as they should be developed on the CD Site Soils Plan after the DD Plan has been confirmed. Typical Planting Detail Keynote references may be included.

Enlargement Plan References for detailed planting soil installations as necessary to convey design intent.

Preliminary Soils Reference Notes to supplement graphic instruction and General Notes. The DD Site Soils Plan may utilize a set of initial Site Reference Notes that communicate primary, rather than exhaustively annotated intent, for example, "Site soils at tree trench to extend to existing tree trench as shown."

Example *Site Reference Notes* are provided in Chapter 9, Key Documentation Practices. Note that these are only sample notes and do not represent a comprehensive list. They address likely topics. Therefore, they should not be used by landscape architects for project applications. The landscape architect should customize Site Soils Reference Notes to individual project needs.

Proposed planting soils, including planting beds; backfill for plants; planter pots; subgrade structures; for example, Silva Cells, to enhance plant growth; and over structure conditions. Planting soil symbols shall be per graphic requirements noted below and landscape architect's CAD standards.



Sample Site Soils Graphic

Subgrade tree planting trenches, vaults, or pits, if plan extent is not clear on details. Include required soils on plans. Tree trenches cannot be shown accurately on details.

Items Required on the General Information Sheet, to Be Coordinated with the Site Soils Plan

Note that all General Notes, symbols legends, and charts should be included on the General Information Sheet or Series Specific Key Plan and General Information Sheet but are described here for reference. See *General Information Sheet* and *Series Specific Key Plan and General Information Sheet* requirements for additional information.

- **General site soils notes** clarifying intent and requirements not clear on plan.
- **Symbols legend** illustrating graphic symbols used on the Site Soils Plan to identify proposed planting soil types.

Graphic Requirements

Plan

Existing conditions, distinguished from proposed improvements by graphically screening existing conditions to a degree that allows proposed improvements to read distinctly from existing conditions.

Proposed hardscape improvements, screened as necessary, but clearly distinguished from existing conditions, to illustrate intended relationships between the proposed hardscape improvements and planting soil design.

Proposed contour grading, screened as necessary to illustrate intended relationships between planting soil design and grading and drainage plans.

Proposed site utilities, screened as necessary to illustrate intended relationships between the proposed utilities and planting soil design.

Limit of project scope of work line represented by equally spaced dashed bold line, with a "Limit of Project Scope of Work" note. Consider screening this line to distinguish from matchlines that separate sheets.

Line-weight hierarchy from lightest to heaviest:

1. Screened survey base, existing conditions
2. Proposed hardscape and grading
3. Proposed trees, plants, and landscape elements
4. Proposed planting soil types (hatches and boundaries)
5. Site Soil Detail Keynotes, Site Reference Notes and associated leader lines

Proposed tree planting, illustrated with the landscape architect's standard CAD symbols and screened.

Proposed shrub planting, illustrated with the landscape architect's standard CAD symbols and screened.

Site Soil Detail Keynotes, indicated with a leader line, if necessary, extending to hatched, planting soil boundaries. Leader line should be developed as per landscape architect's standard leader symbol, automated if possible.

Site Soil Reference Notes, indicated with a leader line, if necessary, extending to specific elements or areas. Leader line should be developed as per landscape architect's standard leader symbol, automated if possible.

Legends

Symbols Legend: Planting soil symbol identification should be incorporated in the Site Soils Symbols Legend and provided on the General Information Sheet. Planting soil symbol hatches should be identical to that shown on Site Soils Plans.

Best Practices

Design

Planting soil design is critical to the success of proposed tree, shrub, and groundcover plantings. Without proper soil preparation, the long-term viability of the proposed plants may be compromised. The landscape architect should become familiar withunique soils requirements for specified plants and the process required to recommend suitable planting soils.

Planting soil design should be considered for all planting conditions, including but not limited to plant backfill, manicured turf areas, native grass and wildflower areas, tree, shrub, groundcover and other plants planting beds, planter pots, planters over structure, wetland, coastal and desert planting beds.

Coordination

Planting soil design should be coordinated with the proposed and existing hardscape.

PLANTING DETAIL KEYNOTES:

9.0 PLANTING AND LANDSCAPE

		DETAIL/ SHEET	RELATED DETAILS	SPEC. SECTIONS
9.1	Deciduous Tree Planting	1/L11-01		329300
9.2	Deciduous Tree Planting on Slope	2/L11-01	1 & 2/L7-01	329300
9.3	Deciduous Multi-Trunk Tree Planting	3/L11-01		329300
9.4	Coniferous Tree Planting	4/L11-01		329300
9.5	Coniferous Tree Planting on Slope	5/L11-01	2 &3/L7-01	329300
9.6	Perennial Planting	1/L11-02	1, 2 & 3/L7-01	329300
9.7	Shrub Planting	2/L11-02		329300
9.8	Shrub Planting on Slope	3/L11-02	2/L7-01	329300
9.9	Metal Edging	4/L11-02		329300
9.10	Planting Soil Type 1 (manicured grass)	5/L11-02		329113
9.11	Planting Soil Type 2 (native grass)	5/L11-02		329113
9.12	Planting Soil Type 3 (perennials)	1/L11-02		329113
9.13	Planting Soil Type 4 (shrubs)	2&3/L11-02		329113
9.14	Planting Soil Type 5 (trees)	1-5/L11-01		329113

Sample Site Soil Graphic

Note: The Site Soils Keynote System information should be added to the Planting Detail Keynote List. A separate series keynote is not required.

Example DD Site Soils Plan

LEGEND

SHEET REQUIREMENTS

1. Survey Base Sheet
2. Proposed Site Improvements
3. Preliminary Limits of Work (if able to define) or Limits of Project Scope of Work
4. Proposed Shrub Planting *(screened for reference only)*
5. Proposed Tree Planting *(screened for reference only)*
6. Proposed Site Grading and Drainage
7. Site Keynote References (if necessary)
8. Preliminary Reference Notes (for example purposes only, should be project specific)

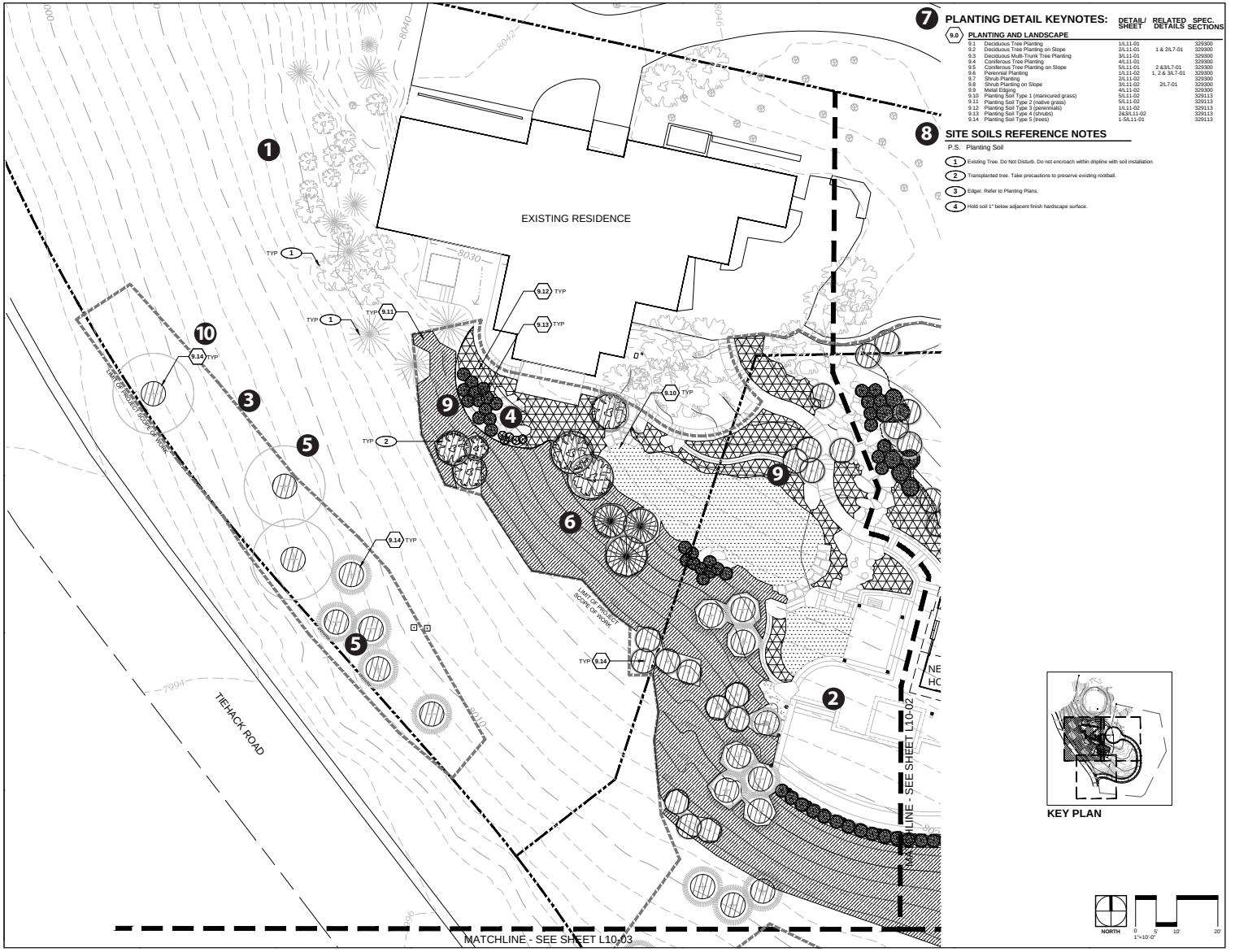
SERIES REQUIREMENTS

9. Proposed Site Soils
10. Preliminary Soils Reference System

Other items that may be provided, but not currently depicted, if the project requires it, include:

–Proposed utilities

–Enlargement Plan References



*Note: This sample only depicts the Drawing Area for this sheet. For Title Block requirements refer to beginning of this section

CONSTRUCTION DOCUMENTATION SITE SOILS PLAN

Objective

The CD Site Soils Plan defines contractual requirements for planting soil types and locations.

General Requirements

Confirm that design intent and the role of planting soils in accomplishing measurable project goals have been accomplished. Objectives may include successful plant establishment, erosion control, bioremediation, water infiltration, and/or groundwater recharge enhancement.

Specific Requirements

Plan

Final **limits of project scope of work**, as agreed on by landscape architect, civil engineer, contractor(s) (if applicable), and owner. Note that limits of project scope of work may not coincide with property lines, for example, when areas within the property area have been designated as non-work areas. Accurate determination of "limits of work" requires the investigation of a number of issues that the landscape architect may not have immediate access to, including contractor staging, mobilization, construction access, traffic control, and other construction-related issues. The DD limits of project scope of work may be revised as they are better informed at the CD phase.

Comprehensive **Planting Detail Keynote List,** with references to typical planting soil details, for example, "Planting Soil in Planters over Structure," "Planting Soil in Silva Cells at Streetscape Tree Pits," "Planting Soil in Planter Pots."

Final **Site Soils Reference Notes** to supplement graphic instruction and General Notes.

Final **planting soil Reference System,** identifying planting soil types and quantities in groups on plan, per graphic requirements below and landscape architect's customized system, for example, "1200 sf Planting Soil Type 1" to identify one thousand, two hundred square feet of planting soil type 1. Coordinate the planting soil Reference System with names and symbols on the soils legend, per graphic conventions noted below.

Graphic Requirements

Graphic requirements described at the DD phase should also be applied at the CD phase.

Example of a CD Site Soils Plan

LEGEND

SHEET REQUIREMENTS

1. Survey Base Sheet

   Proposed Site Improvements

3. Final Limits of Work (if able to define) or Limits of Project Scope of Work
4. Proposed Shrub Planting
5. Proposed Tree Planting *(screened—for reference only)*

SERIES REQUIREMENTS

6. Proposed Site Grading and Drainage
7. Final Site Detail Keynote List
8. Final Site Reference Notes (for example purposes only, should be project specific)
9. Proposed Site Soils
10. Final Site Soils Reference System

Other items that may be provided, but not currently depicted, if the project requires it, include:

–Proposed utilities

–Enlargement Plan References

*Note: **Boldface** items represent key distinctions between Construction Documentation documents and Design Development documents

*Note: This sample only depicts the Drawing Area for this sheet. For Title Block requirements refer to beginning of this section.

DESIGN DEVELOPMENT PLANTING DETAILS

Objective

Design Development Planting Details display all preliminary decisions associated with the installation of plants on the site. DD Planting Details should function as "design details," where all issues associated with designing an aesthetic and healthy growing environment for plants is established as a response to local site conditions.

General Requirements

Intent

DD Planting Details should manifest the project's mission and vision, demonstrating design principles, intended character, quality, and performance. Plants play a central role in the performance of the built landscape. In this sense, Planting Details are integral to the success of the project and should be evaluated relative to project goals and metrics prior to advancing into Construction Documentation. The landscape architect should identify any unresolved Design Development design or technical issues.

The DD Planting Details place special emphasis on understanding local conditions and their impact on establishing long-term plant health. These conditions include climate, micro-climate, soils, drainage, human use patterns and impacts, maintenance, and pollution. The landscape architect should also take initiative in developing and coordinating the interface between planting systems and building, civil, structural, environmental, and other systems.

Extent—Determining What Details to Develop

Comprehensiveness

A basic and important consideration pertains to what details to provide in the DD and CD documents. Some landscape architects elect to provide fewer details, preferring to address any unresolved issues in the field or through the shop drawing process. In some cases, landscape architects choose to use standard Planting Details, regardless of unique regional or local influences.

Others believe that a comprehensive and site-specific set of Planting Details results in best plant health, most accurate and lowest contractor bids, highest built quality, and best client service. This group abides by the premise that only those details provided in the Construction Documents are legitimately part of the owner–contractor contract. Complete and accurate pricing cannot be accomplished without a comprehensive set of details. It is recommended that the landscape architect assign a detail, or set of details for every plant condition under the landscape architect's work scope.

More specifically, a comprehensive Planting Detail selection should address the following conditions:

- Every proposed plant type and planting condition, for example, deciduous trees in landscape, deciduous trees in hardscape.
- Critical or unique design features, for example, plants in over-structure conditions.
- All locations where hardscape systems adjoin or integrate with proposed planting, for example, pavements.
- Detailed responses to unique soil and drainage conditions, for example, subdrainage requirements in plant pits. Note that the Site Soils Plan plays a primary role in communicating soils requirements.

Typical and Unique Conditions

Resolve and document all typical and nontypical three-dimensional conditions, for example, planting in planters, planting on slopes, tree trenches, and planting in streetscape or urban conditions. If necessary, utilize axonometric or multiple elevation drawings to complement plans and sections.

Enlarged Plans

Develop large-scale plans for planting areas that are complex, involve varied species, or require a detailed interface with other systems such as grading, paving, furnishings, or lighting.

Sections

Maintain and further develop selected Design Development Site Composite Sections in order to illustrate relationships between planting and adjoining systems and components. Details within these sections will need to be updated as they are advanced.

Relationships to Adjoining Systems

A landscape architectural detail most usually depicts an assembly of materials or components connected to one another. Some of the most fundamental, important and challenging detail elements are the connections between different materials and systems. The interface between Planting Details and adjoining systems requires attention. Standard Planting Details sometimes neglect to define or reference these relationships. While planting often occurs in the immediate vicinity of

other systems, these elements should generally not be explicitly detailed on the Planting Details. These elements should be shown for reference and keynoted with Site Detail Keynotes.

Planting Details should include all systems directly associated with the installation of the plant and support of its health, including the plant pit; generic soil requirements (see Site Soils Plan for specific types); mulch or other finish medium, weed control; softscape drainage; staking and guying; and plant positioning, both horizontally and vertically. Other systems, such as pavements, planters, walls, and structural waterproofing, and hardscape drainage should be clearly illustrated and referenced with Site Detail Keynotes.

Key Distinctions between DD and CD Planting Details

The landscape architect should be strategic in making content decisions for the Design Development documents. These guidelines suggest individual strategies for each of the DD sheets, subject to the unique role of that sheet in the design and documentation process.

Primary relationships between the DD and CD Planting Details are summarized here:

- DD Planting Details establish and graphically highlight form, scale, materials, and preliminary technical relationships between adjoining components and systems. Design Development details should make these characteristics especially evident, for example, with the use of three-dimensional drawings, composite interdisciplinary drawings, and scale elements. CD Planting Details are strictly developed without graphic embellishment, illustrated with the least amount of graphic information to communicate contractual requirements.
- DD Planting Details are organized as a comprehensive set of in-progress construction details, for further development as "implementation details" during the Construction Documentation phase. A DD planting detail should be developed for all planting conditions included on the project, that is, the DD plant detail set should be comparable with the CD detail set in terms of extent and number of details.
- DD Planting Details are not intended to be "implementation details" as they do not provide the necessary technical, dimensional, or instructional information to construct the planting environment.
- DD Planting Details are used together with plans to conduct preliminary, feasibility level coordination with all associated disciplines, for example, architecture, civil, structural, electrical, irrigation, and mechanical, if necessary. Feasibility-level coordination is primarily oriented toward concluding that details can "work," that is, that the designed planting environment is viable and does not conflict with other requirements. CD Planting Details require advanced and comprehensive technical coordination, assuring that the documents include no errors or omissions.
- DD Planting Details fully utilize the Site Detail Keynote system to highlight relationships to other systems and details. More liberal use of Keynotes over written notes is preferable at this point. CD Site Details apply the Site Detail Keynote system in similar fashion.

Specific Requirements

Detail Content

Subject Elements

The DD Planting Detail shall include the elements listed below, strictly focused on the subject detail. The subject detail is that element named in the detail title.

- Graphic shape, size, position, and relationships between elements within the detail, shown precisely and to scale
- Primary or key dimensions to indicate shape, size, position of the plant, plant pit, and relationships between components within the detail assembly
- Generic description of material and finish requirements, for example, mulch
- Site Detail Keynote references to adjoining details

Adjoining Systems

While the detail should focus on the subject component or system, the detail should also illustrate adjoining systems, for reference. In some cases, adjoining work may be shown simplified, for example, where a plant detail illustrates a relationship to adjoining paving, the paving section may be shown without reinforcement or jointing.

All plant details must show full-depth subgrade requirements, including subgrade preparation, to an undisturbed condition below the plant pit, trench, or other planting environment.

Do not draft work by others that is outside landscape architect's contract. Liability and inaccuracies may occur. If such work needs to be shown for reference, "cut and paste" associated detail files from the applicable consultant, or draft a simple outline of the project component.

Detail sections should represent only elements that physically occur within the specific section cut line, rather than incorporating elements that would occur if the section cut line would be jogged. "True" sections present less opportunity for confusion or misrepresentation.

Elevations and sectional details should be constructed from a known vertical reference point. A reference point is a point whose vertical elevation has been defined on the Site Grading and Drainage Plan. Reference points are often reflected as finished grade elevations.

Scale Relationships between Details

Where a collection of related Planting Details are assembled, choose scales between details that relate to one another, for example, 1/2" to 1", 1" to 2", 3/8" to 3/4", 1½" to 3". Do not mix scale types, that is, architectural, engineering, and metric.

Graphic Requirements

General

DD details represent a transition between "design" and "implementation" documentation. Therefore, they should be organized graphically as in-progress construction details, utilizing CD-level graphics such as line weights and symbol hatches. The design role of DD Planting Details allows the limited use of illustrative graphics that can be removed or simplified as the details transition to Construction Documents. Plant forms and relative sizes may be important to illustrate in order to communicate and evaluate Design Development intent.

Spare outline-oriented details may also be used at the DD phase, supplemented with scale elements and amenities, such as people and furnishings, to help define and evaluate the complete design environment. This type of drawing is readily developed as a construction detail. The only role of graphics in the CD detail should be to define and distinguish the limits of materials.

Sheet Composition

The sheet layout and detail module should be organized per the landscape architect's CAD standards. Each detail should be positioned within its own orthogonal territory, not infringed on by other detail graphics. That territory may be defined by a simple outline or by blocking out the detail space, or that territory may be imaginary, implied by the limits of the detail graphic and associated title. When details "invade" the territory of other details, the legibility of the sheet is compromised.

Details should be organized on sheets to follow master Site Detail Keynote order in the following list. Organize details numerically from left to right, top to bottom, unless organized otherwise by the prime consultant.

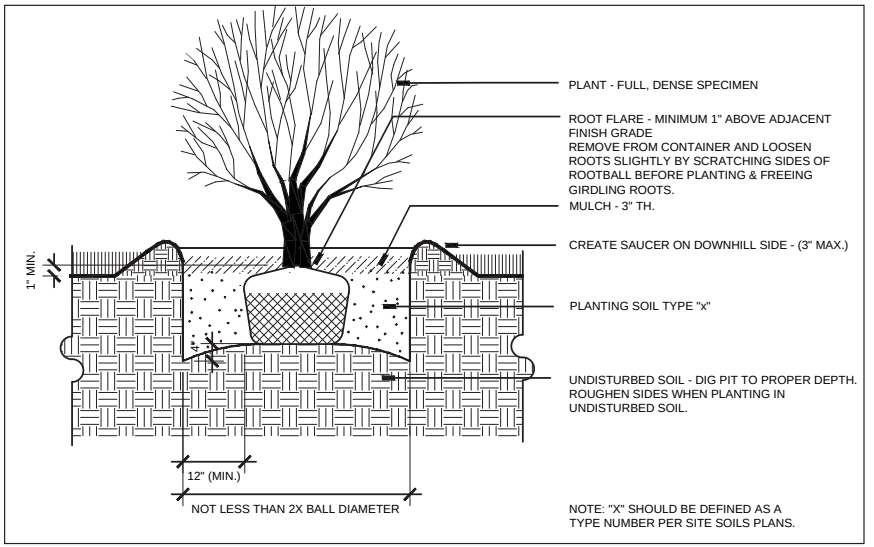
Planting Details Groupings ordered as recommended below. Note that plant detail groupings should coincide with the Site Detail Keynote organization. A more detailed description of the Site Detail Keynote Systems is presented in the Introduction of this book.

- Deciduous Trees (with various contextual conditions)
- Evergreen Trees, (with various contextual conditions)
- Palm Trees (with various contextual conditions)
- Shrubs (with various contextual conditions)
- Perennials, Annuals, and Groundcovers
- Grasses
- Wetland Plants

Multiple corresponding details are grouped, that is, those that relate to a specialized component or plan enlargement area are grouped together on the same page. For example, a group of plantings situated over a parking garage or other structure, or plantings integrated with an art feature, may utilize a grouping of these details in a dedicated portion of a detail sheet.

Organize all details to fit within an 8½" x 11" format, unless using an oversized format is unavoidable. This format will allow for easy paper space organization on the detail sheets, easy hardcopy filing, and intranet accessibility.

Align the left edge of detail graphic with the left edge of the detail's title (detail number in circle), even if dimensions or notes.



Sample Planting Detail

Detail Title

Descriptive but concise detail title, with emphasis placed on the generic planting condition. Do not include prescriptive information. For example, use "Deciduous Tree in Tree Trench," not" Deciduous Tree in 36" Deep Tree Trench."

Finish requirements generally are not used to distinguish systems by title, for example, "Streetscape Tree" may be used to reflect a range of variously finished pavements at the base of the tree. Hatch symbols should be used on plans to distinguish various pavement finishes. The principle promotes the identification of specific materials by solely one reference, so that if a modification is necessary, only one reference will need to be changed.

One component, multiple details. Where multiple details are used to convey a single component or system, distinguish detail titles by either drawing type or emphasis of drawing, for example, "Trees in Planter—Elevation," "Trees in Planter—Section," and "Trees in Planter—End Detail."

Detail title reference number in circle, with number, sized per landscape architect's CAD standards. Extend a horizontal "title bar" from the middle of the circle, aligned with the rightmost edge of the detail graphic content and/or notes.

Site Detail Keynote reference number on the far-right-justified end of detail title line, in a hexagon, floating above the title line, with sizes and offsets per the landscape architect's CAD standards. It is important to remember that these details all describe one component or system and should be reflected accordingly in the Site Detail Keynote List. Each type of detail drawing should not be represented by a separate site detail keynote reference.

Scale reference, written in feet and inches, left-justified to and immediately below detail title, to read as follows, with capital letters: "ORIGINAL SCALE: 3/4" = 1'-0".

Detail Graphics

The landscape architect's CAD standards should be studied and fully utilized by the landscape architect.

Scale Choice

The detail scale selection is not an arbitrary decision and should be informed by a number of factors. The ideal detail scale should allow clear and legible depiction of all primary components, but may not necessarily show in explicit detail the smallest components such as hardware, which may be shown diagrammatically. The detail should be scaled to allow all geometries to read, including geometric transitions, for example, radius tangent points.

Do not choose a larger scale than necessary, that is, if the next smaller scale can readily portray components, use that. 1/4" = 1'-0" is recommended as a minimum scale, unless the detail is very simple. For Planting Details, 1" = 1'-0" or 1½" = 1'-0" may be considered, with 1" = 1'-0" the preferred scale.

Line-weight hierarchy requirements, from heaviest to lightest are:

1. Principle edges for subject component in detail, for example, tree or plant
2. Changes of plane, such as steps in planter shape
3. Material changes that do not occur along aforementioned lines
4. Dimension and extension or leader lines
5. Hidden lines or objects beyond
6. Pattern symbols

Distinctive hatch patterns used on section details to designate each component of the detail that occurs along the section cut, for example, planting soil, root ball. For elements shown beyond or in elevation only, show outline of those elements only, without hatch patterns.

Clean, orthogonal plan bounding box on plan details, to define plan limits.

Cut lines to graphically terminate or "cut" an end to the detail, generally occurring on each side of the detail section drawing. Cut lines should occur on right and left sides of detail, but not on top or bottom. All cut lines should be oriented vertically, rather than angled.

Standard line types and hatches as defined within the landscape architect's CAD standards, used to represent materials.

Detail Dimensions

Dimensions organized above, to left, and below the detail per the landscape architect's CAD standards. Dimensions should not conflict with detail notes or keynote leader lines.

Graphic dimensions used on the detail, rather than narrative dimensions in notes. Use narrative dimensions in notes only when referring to the complete size of a component that cannot be dimensioned in full on the detail.

Dimensions are noted in architectural scale (feet and inches), for example, 1'- 6", not 18". Where dimensions are less than 1 foot, note the dimension in inches only, for example, 8", not 0'– 8". Do not use fractions less than 1/16" for site details—site work component construction tolerances are limited to this threshold. Show fractions with a diagonal slash, for example, 3/4". Engineering dimensions (feet and tenths) are generally not used for Planting Details.

Use actual instead of nominal dimensions.

Annotation Requirements—Graphic

Capitalize all notes and detail titles. Use a font for all notes per the landscape architect's CAD standards.

Do not use abbreviations in detail titles. It is acceptable to use abbreviations in detail notes only if the abbreviations match standard abbreviations list included in document set.

Position text notes and position Site Detail Keynotes primarily on the right side of the drawing, left-justified in a text block, 1/4" minimum from graphic edge of detail, per landscape architect's automated CAD standards. Avoid long leader lines as they are difficult to follow.

Fully horizontal leader lines used as much as possible. If angled leaders are necessary, choose a single angle established in the landscape architect's CAD standards, with all leaders parallel after break from horizontal.

Leader lines never cross one another. It is customary, however for note leader lines to cross dimension lines. In this application break or discontinue the leader line as it crosses the dimension line. The landscape architect's CAD standards should automate this process.

Center leader lines on text, stopping 1/8" short of text, per landscape architect's automated CAD standards.

Organize blocks of General Notes, if necessary, without leaders in the lower-right corner of the detail drawing. If space is not available, locate the notes in the upper-left corner. These notes apply to conditions which cannot be specifically located on the detail. For example, the notes "Limb lower branches of street trees to 7' height as necessary. Coordinate with landscape architect prior to pruning." would be appropriate.

Annotation Requirements–Content

Notes focused on size, shape, and relationships of materials and components. Do not describe material characteristics or assembly instructions on details. This information is required in the project specification manual.

Generic labeling used to identify materials. Do not use manufacturer's name or product number. Do not use proper material name. For example, use label "landscape stake" not "8" plastic-coated steel landscape stake." Precise materials should be described in specifications.

Use **Site Detail Keynotes** where references to other details are necessary, with one of two methods:

- A typical Site Detail Keynote symbol with typical leader line, where leader arrowhead location clearly designates component.
- A typical Site Detail Keynote symbol with typical leader line to circle designating area detailed more fully elsewhere. A circle technique should be used where emphasis is necessary or when enlargement detail has been provided.

Use Site Detail Keynotes used as much as possible to note all situations detailed elsewhere, rather than written notes.

Notes

Material finishes noted on details. Do not use symbols alone to communicate finishes around plants. Where various finishes are proposed for a material, note: "Finish varies—Refer to Plan." For example, mulches and pavement materials may vary around trees and plants.

Notes organized top-down by hierarchy or logical sequence where practical, for example, note "Tree trunk plumb" above "root ball on undisturbed or compacted subgrade" above "perforated pipe subdrainage."

Use most concise description for each note, without sacrificing content. For example, instead of "2" x 2" wood tree stake or T-111 post—drive 3' into soil outside of root ball, minimum of two stakes per tree," use "Tree stakes, two per tree" and include dimensions to show depth and distance from root ball. Note that in this example type of stake (2x2 wood or T-III post) is defined in specifications and should not be included on drawings.

Notes focused only on subject detail in title, that is, avoid descriptions of adjacent details shown for reference only. Do not describe materials that have been detailed elsewhere.

Avoid notes repeated from detail to detail. Where detail systems appear in more than one place, reference base or primary detail for information. Select primary detail and completely note its components. For similar details, note only variations from the base or typical condition. Reference the base detail as a note on the detail variation.

Use consistent references when referring to other details and project components, for example, "planting soil" must be referred to consistently in the drawings, details, and specifications. The words "planting soil," "soil," "soil mix," "planting medium," and "backfill" should not be used interchangeably. Cross-check terms on details with terms on plans, legend, and specifications.

Minimize abbreviations in notes for ease of reading. If used, abbreviations sould match the standard abbreviation list made available under the landscape architect's CAD standards pull-down menu.

Do not use the "See Specification" phrase. This is implicit in the construction industry.

Do not use the "As Necessary" phrase. The note is vague and does not communicate useful or legally binding information.

References to specific Specification sections are not to be used. These relationships are implicit, and the contractor is expected to understand the organization and content of the projects specifications. For example, it is not necessary to include a note to follow the note "Compacted Subgrade" that reads "Refer to Earthwork Specifications."

"No Scale" or "Not To Scale" detail references are not to be used. Details should always be drawn to scale.

Do not use "@" to substitute for "at."

Best Practices

Design

Plant Health: It goes without saying that Planting Details must be well suited to their regional environment. A number of principles guide that responsibility, some of which vary regionally, others of which suggest more universal applicability.

Natural Context: Planting details should fit contextual natural conditions such as hydrology, topography soils, and existing flora.

Serving the Design Mission

Details should support the mission of the project as a unified and rigorously iterated expression. Consequently, design principles should manifest themselves in the details. Relationships between individual parts and the whole must be understood, including relationships between plants, and softscape and hardscape conditions. Detail development should occur as a holistic project effort, rather than a separate activity near the end of the design process. Detail decisions should be tied to project objectives. Each built landscape should be distinguishable by a set of attributes that are represented in the details. If, for example, a street, courtyard, or garden is intended to "establish a regional sense of place," each plant may play a role in serving that mission. Or, if it is most important that a project protect water resources, a variety of detailed systems may play a role, including planting, drainage, and irrigation.

Suitability

Planting detail materials should be developed with an understanding of their inherent properties and suitability for intended applications. Material capabilities and limitations should be studied and understood during Design Development decision making. For Planting Details, these include soils, mulches, and other finish materials; drainage infrastructure; staking and guying; and geotextile systems. Weathering attributes for material candidates should be examined. Materials may perform well in one region and poorly in another, poorly enough to fail.

Sustainability

Environmental impacts and sustainability measures should be major considerations when selecting project materials and devising details. In the LEED for New Construction standards, the United States Green Building Council (USGBC) refers to at least three project checklist areas that have implications to planting: Sustainable Sites, Water Efficiency, and Materials and Resources. Under these headings, credits are given for heat island effect,

stormwater design, water efficient landscape, water use reduction, material reuse, recycled content, and regional materials. Planting design and Planting Details play an important role in addressing these and other sustainability objectives.

The Sustainable Sites Initiative places specialized emphasis on topics such as soil and vegetation and should be pursued for most all projects. The program suggests that "healthy soil and vegetation are the foundation of ecosystems, and provide services such as reduction in water runoff, improvement in groundwater recharge, and regulation of climate. The SITES v2 Rating System is the most comprehensive tool for guiding and measuring landscape sustainability."[44]

Coordination

The most effective details are those that are developed and coordinated with a host of participants, including plant and material suppliers, product representatives, project maintenance personnel, construction contractors, and interdisciplinary design team consultants.

The landscape architect should develop project plans, details, and specifications in tandem, with careful coordination between the three, so that the specifications describe in greater "specificity" the general information contained within the details. It is imperative that the Site Detail Keynote List (proposed project systems and components), specifications, and details are aligned with one another to avoid errors and omissions and potential implications to cost estimating.

Drawing-Specification Relationships

Carefully coordinate detail content and terminology to be consistent with specifications. Specification development should take place by carefully reviewing all project plans and details and developing a CSI-based outline of project materials and systems. All quality-control reviews must be conducted with plans, details, and specifications simultaneously.

Architectural Coordination

"Walk around" the building with the architect to confirm all proposed planting-building interface conditions. Evaluate these conditions with an eye to mature plant sizes.

Drainage Requirements

Coordinate and resolve subdrainage requirements for Planting Details. Many trees and plants suffer from poorly drained plant pits, where oxygen is displaced by water, sometimes known as the "bathtub" effect. Plant pits must be checked for infiltration prior to planting. Review and coordinate subdrainage details with the civil engineer and planting procedures adjacent to site structures and buildings with the geotechnical engineer prior to initiating Construction Documents. Planting Details should show typical drainage infrastructure and Site Grading and Drainage Plans should show corresponding requirements in plan.

Plant and Material Suppliers

Determine and confirm constructability of proposed plant detailing systems. Work with fabricators and contractors during the design and documentation process to determine construction parameters and limitations. Determine plant and plant installation material availability and cost implications.

Technical

Mix specified planting soil together with on-site soil in order to reduce the extreme distinction between planting soil and contextual soil, in order to encourage roots to grow beyond the pit itself. If the soil inside the pit is overly desirable relative to the soil outside the pit, that is, uncompacted, nutrient-rich and well watered, the roots may not seek extension beyond the pit. Some agricultural extension agencies recommend backfilling the pit with soil removed when digging the hole, and applying no amendments.

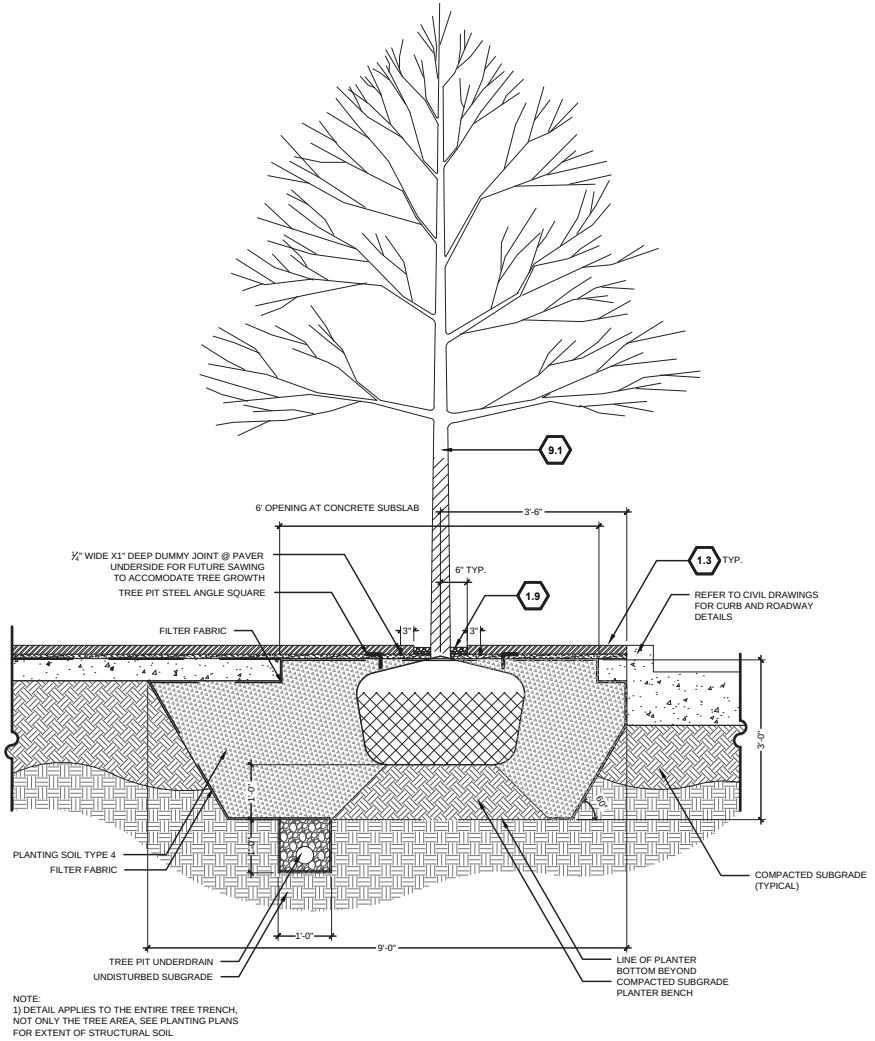
Emphasize the need to remove staking and guying after the first full growing seasons. If the stakes and guys are not removed, the tree will become somewhat dependent upon them for support and will less readily develop an extensive and stabilizing root system. Some agricultural extension agencies recommend no staking at all, and suggest using them only when tree trunks look especially unstable. Remember that trees are not staked in the nursery.

Dig the planting pit a minimum width of two to three times the root ball size. That will allow the root system to expand properly before seeking departure from the pit. Dig the sides of the pit at an outward angle (not vertical) so to encourage outward root growth. Break up soil outside the pit in order to further encourage root growth outside the pit.

Establish an undisturbed soil mound or pedestal on the bottom of the pit, measured to allow the trunk collar or root flare to sit just above the finish grade, approximately 1 to 2 inches. The undisturbed soil mound will keep the roots in a well-drained environment and ensure that the tree does not settle into a low condition susceptible to wet and poorly drained conditions.

[44] Sustainable Sites Initiative. www.sustainablesites.org/.

Glazing of the tree pit occurs when mechanical digging operations result in smooth and taught sides of the pit, where water and roots have difficulty penetrating. That situation can result in roots growing encircled within the pit, an undesirable condition for stable, long-term growth. The sides of the pit should be roughened or scribed in order to mitigate the glazing. In addition, the hole can be dug with an irregular shape, rather than round. That technique may help to reduce root encirclement.



Sample Tree Pit Planting Detail

Strategies

Process

Iterating the Details

Develop or "layer" a cumulative level of detail in the Planting Details as the plan and design proposal matures. Utilize design reviews, quality-control reviews, interdisciplinary coordination, and value engineering sessions to inform the development of details. Do not attempt to finalize or provide full documentation, for example, exhaustive dimensioning or full annotation until the Design Development program and cost confirmation has been completed.

Place emphasis on three-dimensional design. Two-dimensional drawings (plans, sections, and elevations) do not always provide a full understanding of the component. Determine the most critical three-dimensional aspects of the project and determine a method for improved depiction, for example, isometric, perspective, plan-section, or exploded views. This is especially useful where Planting Details are integrated with other hardscape systems.

Establish strong relationships between the DD Planting Details and Site Composite Reference sections. Utilize these complementary drawings to inform one another. For example, use the sections to inform scale and form relationships between individual details.

Resolution

Details must be thoroughly studied and well resolved, with a rigorous level of precision. Precision relates to the degree of definition, not the exactness of the installation. Components and systems must be fully understood and represented, not left to field interpretation. Poorly resolved details leave necessary requirements undefined.

Well-resolved details can be achieved with a number of specific techniques highlighted next.

Three-Dimensional Study

Landscape architectural details should be drafted three-dimensionally and reviewed from every perspective, and Planting Details also deserve such attention. Plan and section drawings alone neglect key considerations. All unique site conditions should be studied as they influence the primary detail. Large scale study models can provide a very useful form development tool. Few projects can be well executed without the use of three-dimensional study and documentation tools.

Interdisciplinary Cross-Checking

The landscape architect's perspective should be complemented with that of collaborating disciplines. The project architect, civil engineer, irrigation designer, and horticulturalist should review the Planting Details as part of a comprehensive quality-control review process. The review will likely determine inaccuracies, inconsistencies, or incomplete information.

Design Phase Mock-Ups

The ultimate test for level of resolution in construction details rests with actual construction. If fees allow, and if select Planting Details are important to the project aesthetic, a preconstruction mock-up will provide all the evidence that the designer needs to complete the design detailing process at a high level of resolution. The design phase mock-up should be integrated with the design services contract by enlisting the services of a subcontractor capable of the specialized construction required within the mock-up.

As-Built Records

Maintain project shop drawings on file for future project use. These drawings precisely illustrate how components are built, as represented by the industry specialists. Theoretically, these details should be well resolved. These drawings are usually more advanced and may represent improvements to construction details.

UStandard details are those details previously developed by the landscape architect that are kept on file for use in similar project applications. When adapting standard details to new project applications, the landscape architect must scrutinize each detail for applicability to all project circumstances. In addition, the landscape architect should not assume that the standard detail is complete or well-developed. Standard details often land in archived files without full or rigorous quality-control reviews. The standard detail should only be used as a point of departure for further development during the Design Development and Construction Documentation process.

When using standard Planting Details from a government agency such as a parks department, changes should not be made to details other than incorporating dimensional information to fit the component or system to project circumstances. Original detail authorship and ownership should be carefully recorded as a general note within the individual detail block. Use of these details by the landscape architect should not result in his proprietary liability, unless details by others are manipulated. In some cases, standard public agency details should not be provided by the landscape architect but rather identified in General Notes as directed by the agency.

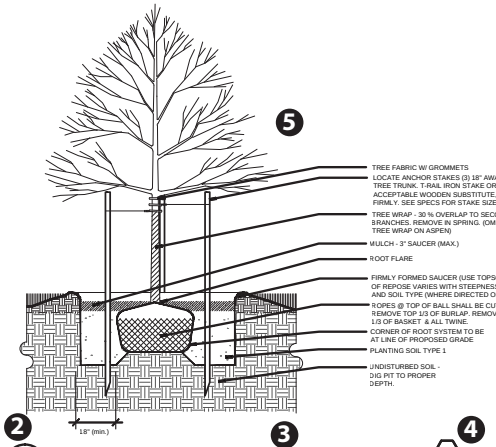
Avoid redundancy by including the same information repeatedly in similar details. Instead, develop a base detail with common or standard information. Develop additional details that vary from the base detail, but only note variations from the standard.

Catalog cut sheets or proprietary details should not be used within Contract Documents. These details may contain references to work not included within the contract. In addition, they are often not drawn to scale, and may change if an alternate product is chosen during the design, bid, or construction process. If a proprietary product is to be used, it may be illustrated with a generic outline. Installation intent should be communicated within the detail.

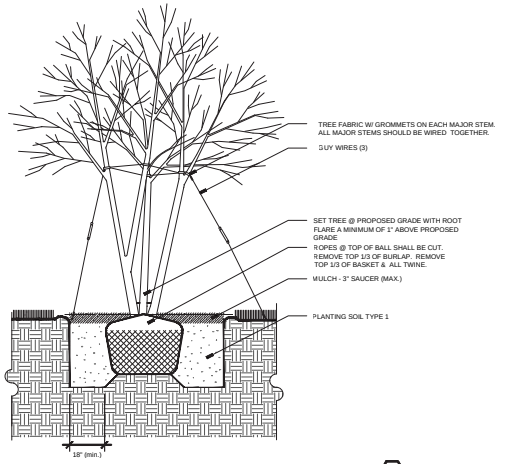
Example of DD Planting Details

LEGEND

1. Site Detail Keynote List
2. Detail Number
3. Detail Title
4. Planting Detail Keynote Reference
5. Preliminary Planting Detail



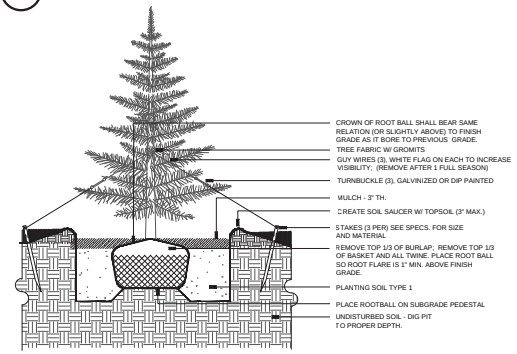
1 Deciduous Tree Planting (9.1)
3/4"=1'-0"



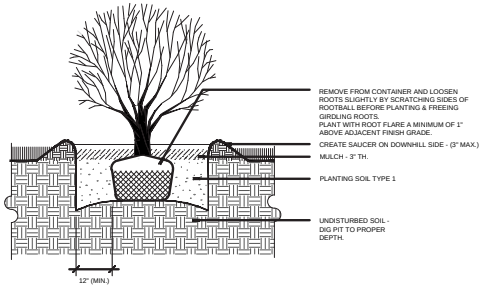
2 Deciduous Multi-Trunk Tree Planting (9.2)
3/4"=1'-0"

1 PLANTING DETAIL KEYNOTES:

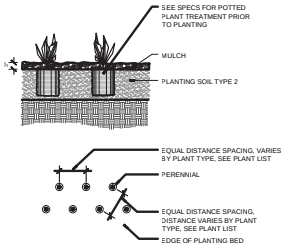
9.0	PLANTING AND LANDSCAPE	DETAIL/ SHEET	RELATED DETAILS	SPEC. SECTIONS
9.1	Deciduous Tree Planting	1/L11-01	1, 2 & 3/L7-01	329300
9.2	Deciduous Multi-Trunk Tree Planting	2/L11-01		329300
9.3	Coniferous Tree Planting	3/L11-01	1 & 3/L7-01	329300
9.4	Shrub Planting	4/L11-01	1, 2 & 3/L7-01	329300
9.5	Perennial Planting	5/L11-01		329300
9.6	Metal Edging	6/L11-01		329300
9.7	Planting Soil Type 1	1-4/L11-01		329113
9.8	Planting Soil Type 2	5/L11-01		329113
9.9	Planting Soil Type 3	7/L11-01		329113



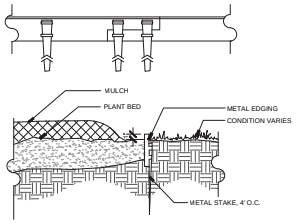
3 Coniferous Tree Planting (9.3)
3/4"=1'-0"



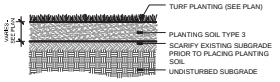
4 Shrub Planting (9.4)
N.T.S.



5 Perennial Planting (9.5)
N.T.S.

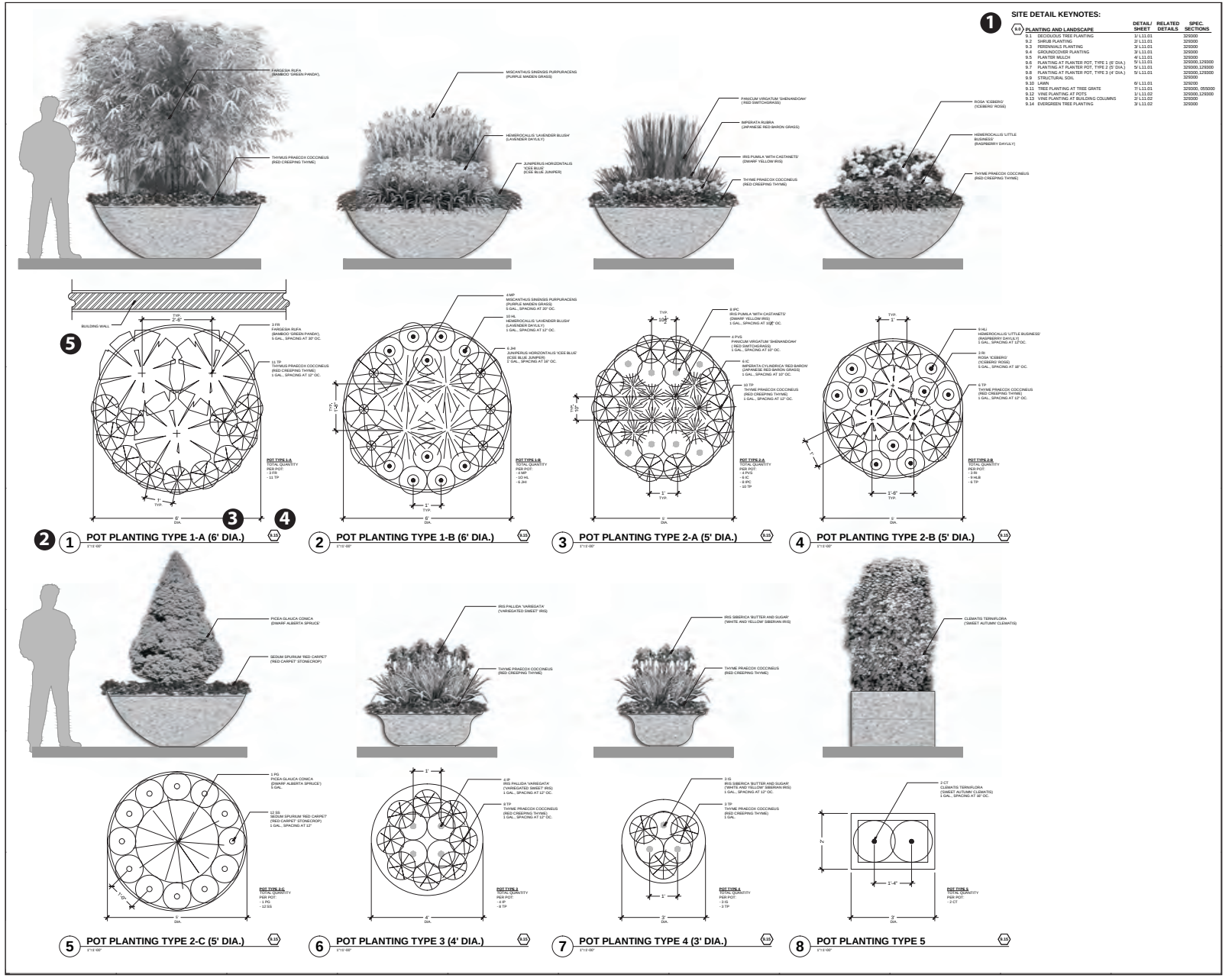


6 Metal Edging (9.6)
3/4"=1'-0"



7 Planting Soil Type 3 (9.9)
N.T.S.

Example of DD Planting Details—Planter Pots



LEGEND

1. Planting Detail Keynote List
2. Detail Number
3. Detail Title
4. Planting Detail Keynote Reference
5. Preliminary Planting Detail

CONSTRUCTION DOCUMENTATION PLANTING DETAILS

Objective

Defines physical contractual requirements for planting trees, shrubs, groundcovers, and other plants and maintaining them for the contractual warranty period.

General Requirements

Intent

CD Planting Details are developed exclusively as "implementation details," contrasted with "design details" developed during the Design Development phase. As such, they establish a legal definition of project construction requirements, binding the landscape architect to conformity with accepted standards for constructability and workmanship, assuming the contractor constructs the details as documented. If the contractor does not construct the project as the details illustrate, legal responsibility for failure or other liability shifts to the contractor. Consequently, the landscape architect must explicitly define how the site planting should be constructed with details. Construction details should not vary in their interpretation by different parties.

Construction Planting Details precisely illustrate sizes, shapes, and relationships between plants, installation systems, and associated support components. Materials, joining methods, and dimensions of components are described. Material properties or proprietary information should not be included on drawings.

Together with plans, Planting Details are used to establish construction cost estimates and bids. Planting Details must clearly differentiate the extent of material systems in order to conduct quantity takeoffs.

They illustrate all types of planting conditions, for example, in natural ground, in planters, over structure, or on steep slopes.

Define site-specific planting strategies and associated details, for example, to reflect soil and drainage conditions, plant hardiness zones, precipitation and other weather patterns.

Specific Requirements

Subject Elements

The landscape architectural CD Planting Detail shall include the elements listed below, strictly focused on the subject detail. The subject detail is that element named in the detail title.

- Graphic shape, size, position, and relationships between components within the planting environment shown precisely and to scale.
- Fully dimensioned shape, size, position, and relationships between components within the planting environment.
- Generic description of material and finish requirements.
- Jointing requirements detailed or Detail Keynote references to jointing details.
- Keynoted relationships to adjoining details.

DETAIL CONTENT

- Size, shape and treatment at sides of tree pit.
- Backfill, planting soil mix—generic description, coordinated with specification requirements.
- Surface treatment at root ball and in immediate vicinity of trunk, including any mulching requirements.
- Drainage requirements, based upon local soil and percolation requirements.
- Staking and guying requirements, coordinated with specifications.
- Unique sizing requirements not otherwise designated on plant list, for example, lowermost limb height and associated clearance requirements.
- Disposition of wire basket, burlap, plastic, ties, and any other nursery packaging.
- Any pruning requirements.
- Irrigation requirements.

Drainage Requirements

Utilize one of two strategies for depiction of subdrainage requirements, as per the landscape architect's contractual relationship with the client and/or civil engineer:

- **Strategy 1:** The landscape architect defines and illustrates potential subdrainage needs if plant pits fail to meet specified requirements for infiltration upon drainage testing prior to planting. Site Grading and Drainage Plans reflect piping subgrade connections from plant pits to storm drainage system, as coordinated with and illustrated by the civil engineer.
- **Strategy 2:** The landscape architect defines and illustrates potential subdrainage needs if plant pits fail to meet specified requirements for infiltration upon drainage testing prior to planting. Site Grading and Drainage Plans do not reflect piping subgrade connections from plant pits to storm drainage system, as coordinated with and illustrated by the civil engineer, but are studied to be sure that the drainage can work.

Graphic Requirements

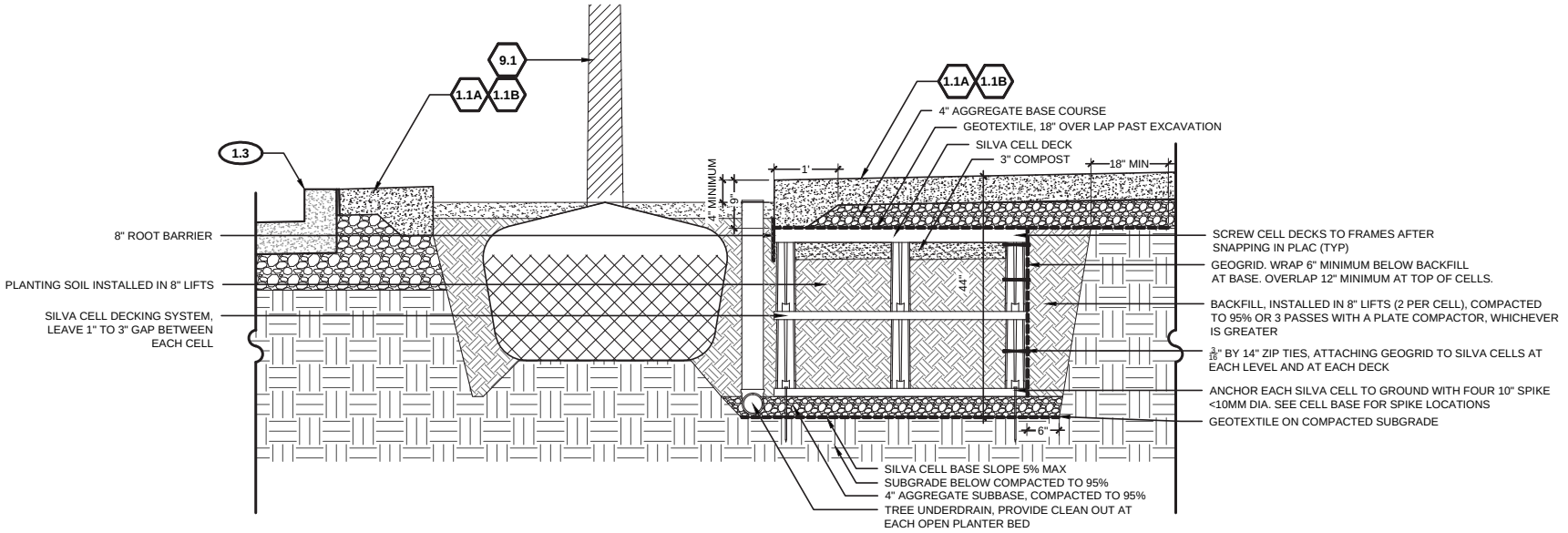
Graphic requirements described at the DD phase should also be applied at the CD phase.

Best Practices

Coordination

Determine any potential utility conflicts. Determine subdrainage requirements, anticipating potential connections to storm drainage system.

Review Planting Details with local university-based agricultural extension agency or municipal or federal forestry divisions as necessary to ensure compliance with local codes or practices



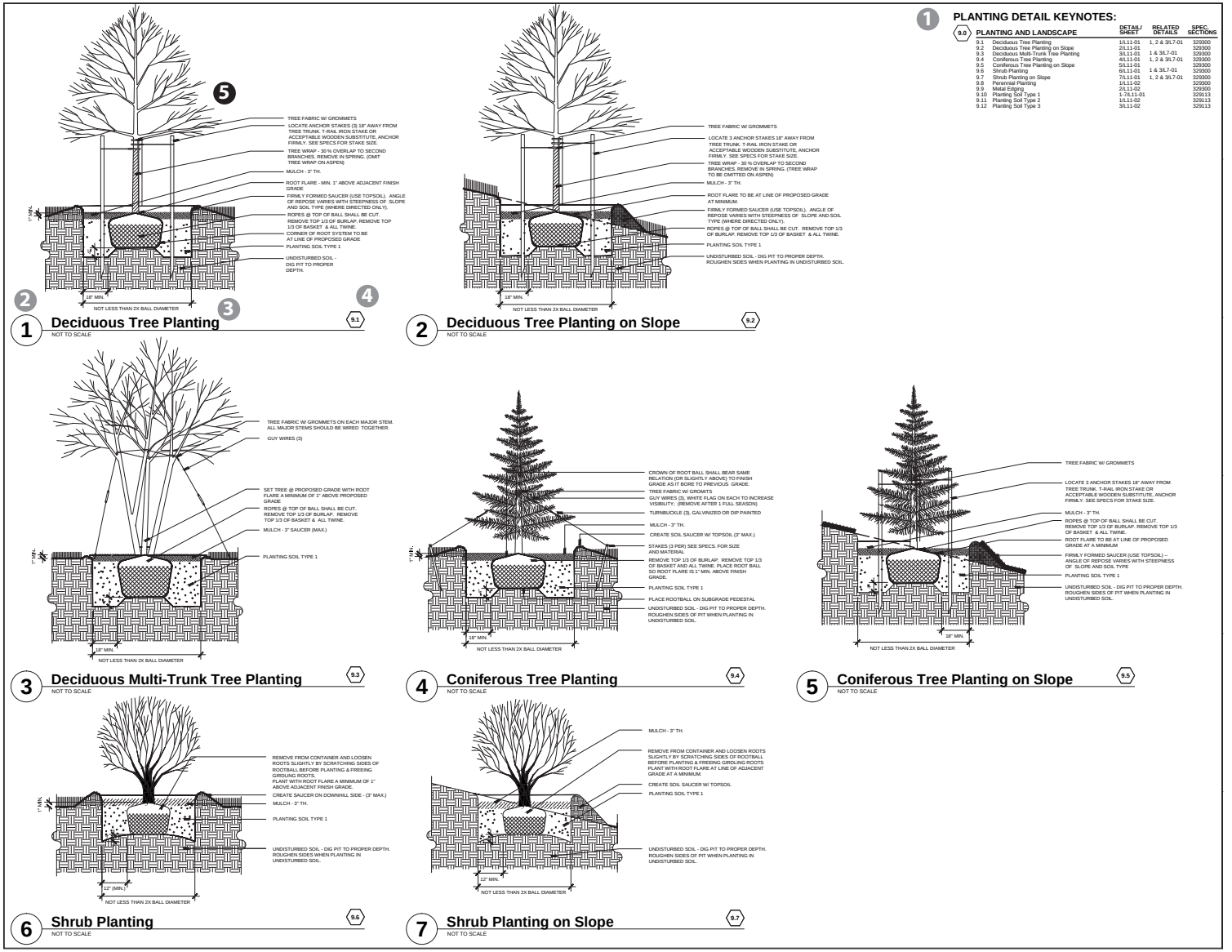
Sample Urban Tree Pit with Silva Cells Planting Detail

Example of CD Planting Details

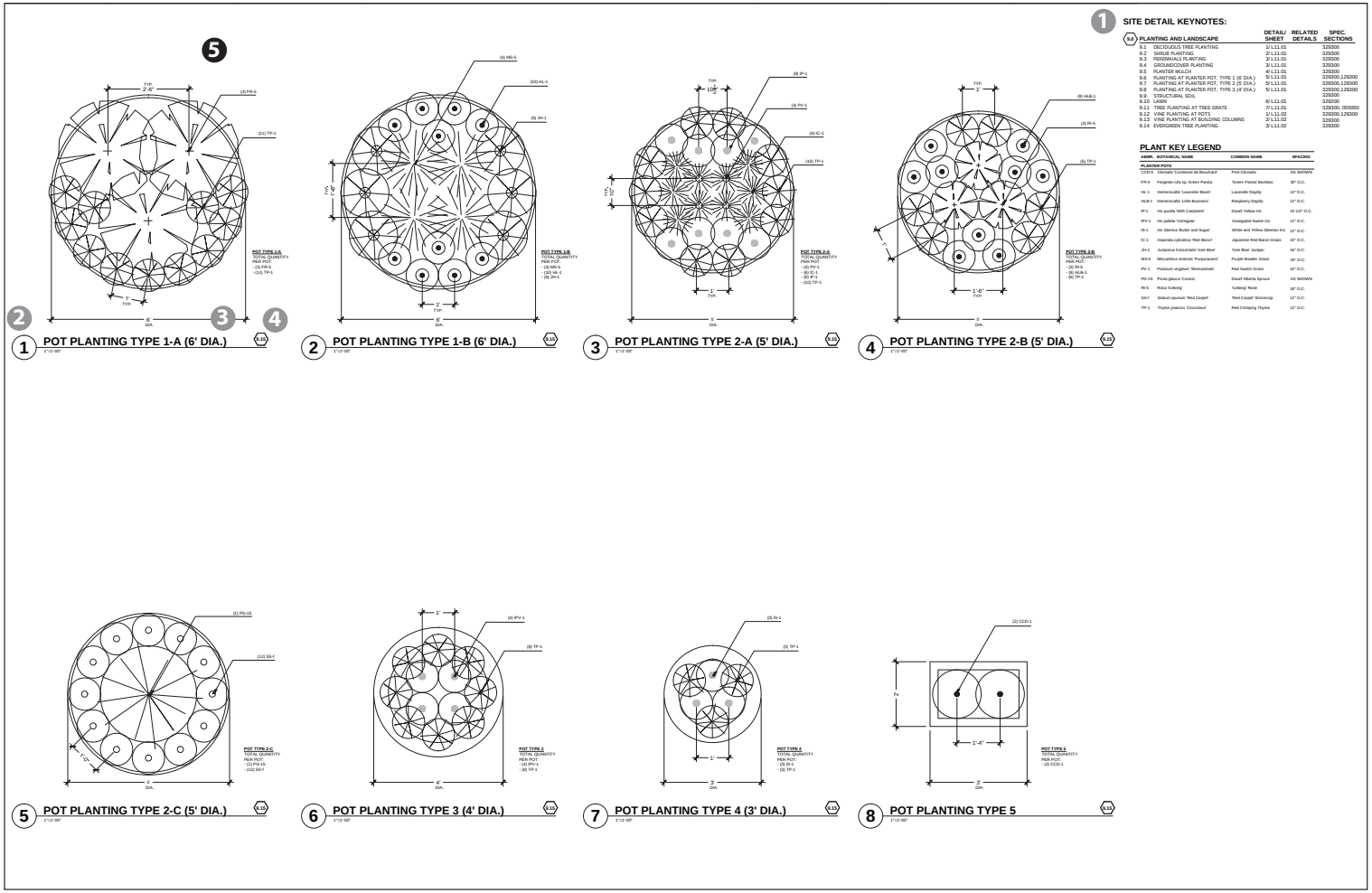
LEGEND

1. Planting Detail Keynote List
2. Detail Number
3. Detail Title
4. Planting Detail Keynote Reference
5. **Planting Detail (including final engineering)**

Note: **Boldface** items represent key distinctions between Construction Documentation documents and Design Development documents.



Example of CD Planting Details—Planter Pots



LEGEND

1. Site Detail Keynote List
2. Detail Number
3. Detail Title
4. Site Detail Keynote Reference
5. **Planting Detail (including final engineering)**

Note: **Boldface** items represent key distinctions between Construction Documentation documents and Design Development documents.

INDEX

Abbreviations, in UDS system, 59
Abstraction, 11
Accountability, in decision making, 47
American Concrete Institute (ACI), 20
American Institute of Architects (AIA), 55
  CAD Layer Guidelines, 58, 59
  and priority of references, 21
American Society for Testing and Materials (ASTM), 20
American Society of Landscape Architects, 4
American Welding Society (AWS), 20
Analogies, 11
Annotations, 63
Approval process:
  Design Development, 52
  Pre-Design, 32
Architectural coordination processes, 16
ARCOM, 61
Art Framework, 114
ASTM (American Society for Testing and Materials), 20
Autodesk Revit Architecture, 27
AWS (American Welding Society), 20

Baselines, 97
  Conceptual Design, 102–105
  Pre-Design, 99
Base Plan (Pre-Design), 32, 101
Benchmarks, 97
  Pre-Design, 99
  purpose of, 100
Best practices. See also Documentation practices
  CD Composite Reference Sections, 341–342
  CD Cover Sheet, 217
  CD General Information Sheet, 246
  CD Key Plan, 233
  CD Planting Details, 409
  CD Plant Protection and Removal Plan, 259–260
  CD Shrub and Groundcover Planting Plan, 388
  CD Site Demolition Plan, 269
  CD Site Details, 361
  CD Site Grading and Drainage Plan, 324
  CD Site Layout Plan, 300–302
  CD Site Lighting Plan, 333–334
  CD Site Materials Plan, 279
  CD Site Reference Plans, 225
  CD Tree Planting Plan, 375
  character imagery, 118
  in Conceptual Design, 117, 118, 120, 123, 125
  in Construction Documentation, 58–64
  Context Framework, 136
  cost model, 123
  DD Composite Reference Sections, 337–338
  DD Cover Sheet, 211–212
  DD General Information Sheet, 243
  DD Key Plan, 230
  DD Planting Details, 402–405
  DD Plant Protection and Removal Plan, 254–256
  DD Shrub and Groundcover Planting Plan, 384–386
  DD Site Demolition Plan, 265–267
  DD Site Details, 349–356
  DD Site Grading and Drainage Plan, 313–319
  DD Site Layout Plan, 295–296
  DD Site Lighting Plan, 329–331
  DD Site Materials Plan, 276–277
  DD Site Reference Plans, 222
  DD Site Soils Plan, 393
  DD Tree Planting Plan, 371–373
  in Design Development, 42–43
  for graphics, 62–63
  perspective renderings and illustrative drawings, 120
  phasing, 125
  in Pre-Design, 99–100
  Preliminary Project Descriptions, 195
  SD Cover Sheet, 128
  SD Estimate of Probable Construction Costs, 200
  SD illustrative sections and elevations, 184, 185
  SD illustrative visualizations, 181
  SD materials Palette, 157
  SD Site Lighting Plan, 151
  SD Site Materials Plan, 147
  SD Site Protection and Removal Plan, 144
  SD sketch details, 188–189
  Site Survey/Existing Conditions Plan, 133–134
  for specification section content, 85
  for sustainable design, 101
Bidirectional associativity, 27
"Big idea," see Parti
BIM, see Building Information Modeling
Budget:
  in Conceptual Design, 109, 123
  Construction, 13, 32, 123, 198–201
  in Design Development, 48–49
  designing to, 48–49
  internal design, 98
  landscape architecture, 123
  in Pre-Design, 13, 32
  project, 109
  in Schematic Design, 13, 198–201
Building Information Modeling (BIM), 27, 71, 193, 200

CAD layers, naming and organization of, 68–69
CAD Layer Guidelines (AIA), 58, 59
CAD Standards Manual, 66, 68–70
Carbon sequestration, 254–255
CD, see Construction Documentation
Centerlines, 81
Character imagery:
Conceptual Design, 118–119
Schematic Design, 38
"Chartjunk," 25
CLARB (Council for Landscape Architectural Registration Boards), 5
Clarity of documents, 55–56
Client interview (Pre-Design), 31
Client requirements (Schematic Design), 13
Client reviews (Design Development), 52
Client work session (Pre-Design), 94–97
Code conventions, in UDS system, 59
Code review:
Design Development, 52
Pre-Design, 32, 33
Communication Plan, 98
Community Framework (Conceptual Design), 113
Compliance:
Construction Documentation, 64
Design Development, 54
Schematic Design, 38
Compliance verification (Design Development), 52
Component mock-ups (Design Development), 46–47
Components Palette (Schematic Design), 38
Composite documentation, 22–23
Design Development, 42
Schematic Design, 38, 39
Composite patterns, see Composite documentation
Composite Reference Sections:
Construction Documentation, 340–343
Design Development, 336–339
distinctions/relationships between DD and CD, 336
Composite Sections (Design Development), 53
Concept formation (Conceptual Design), 116
Conceptual Design, 4, 30–31, 102–125
analysis/evaluation of baseline information, 102–105
Art Framework, 114
character imagery, 118–119
checklist for, 102
Community Framework, 113
components of, 34–35
concept formation, 116
construction budget, 123
construction costs estimate, 35
coordination needs, 35
cost model, 123–124
design brief, 34
design character, 35
design frameworks, 35
design intent, 34, 109–111
design models, 120, 122
design precedents, 35
design principles, 35
design studies, 35, 116–118
dilemma and thesis, 34
documentation characterization, 34
Economic Framework, 114
Environmental Framework, 113
illustrative drawings, 120
parti, 35
parti diagrams, 114–115
performance metrics, 35
perspective renderings, 120, 121
phasing plan, 35, 124–125
preliminary project program, 34
principles and typological precedents, 110, 112
project program, 105–110
purpose of, 34
site analysis and evaluation, 34
Conceptual diagramming (Schematic Design), 13
Conceptual site phasing plan, 124–125
Conditions of the Contract, 55
Conformance review (Construction Documentation), 59–60
Construction Budget, 200
Conceptual Design, 123
Pre-Design, 32
Schematic Design, 13, 198–201
Construction costs estimate:
Conceptual Design, 35
Construction Documentation, 64
Design Development, 54
Estimate of Probable Construction Costs, 198–201
Construction details (Design Development), 13
Construction Documents:
in-progress, 13
relationship between specifications and drawings, 21
Construction Documentation (CD), 4, 5, 202
AIA CAD layer guidelines, 59
best practices, 58–64
checklist for, 202
common shortcomings in, 56–57
compliance actions, 64
components of, 63–64
Composite Reference Sections, 340–343
conformance review, 59–60
construction cost estimate, 64
Cover Sheet, 63, 215–219
and critical path sequencing, 14, 15
defining the documents, 55
Design Development distinguished from, 7, 41–42
digital models in, 22

documentation characterization, 57–58
elevations, 64
Enlargement Plans, 64
final Specifications, 64
formalized drawing-specification coordination, 60–62
General Information Sheet, 63, 246–248
Grading Sections, 64
graphic diligence, 62–63
and interdisciplinary, 15
interface of Design Development and, 47–48
irrigation details, 64
Irrigation Plan, 64
Key Plan, 63, 233–236
Layout Plan, 15
Planting Details, 64, 411
Planting Plan, 64
Plant Protection and Removal Plan, 63, 258–261
purpose of, 14, 55–56, 202
questions to ask during, 12
Erosion and Sedimentation Control Plan, 64
Shrub and Groundcover Planting Plan, 64, 388–389
Site Composite Sections, 64
Site Demolition Plan, 64, 269–270
Site Details, 64, 360–364
Site Furnishings Plan, 64
Site Grading and Drainage Plan, 64, 321–325
Site Layout Plan, 64, 298–303
Site Lighting Plan, 64, 333–335
Site Materials Plan, 64, 279–281
Site Reference Plans, 63, 225–227
Site Soils Plan, 64, 395–396
standardized formatting in, 58–59
subconsultant drawings, 64
Tree Planting Plan, 64, 375–376
Unresolved issues list, 64
Construction mock-ups:
Design Development, 46–47
role of, 240–241
Construction sequence, sheets organized to coincide with, 72
Construction Specifications Institute (CSI), 21, 55, 57, 61, 191
Construction Specifications Writing (Kalin, Rosen, Weygant, and Regener), 62
Consultant roles, as Pre-Design parameter, 13
Content for documents, establishing, 7
Context Framework (Schematic Design), 37, 38, 135–137
Continuing education, 5
Contract Documents, 21
drawings and specifications in, 55
organization of, 83–84
Contracting Requirements, 55
Contractor, 55
Contractual agreement, 55
Contractual work scope, 13, 55
Coordination drawings (Design Development), 54
Coordination needs:
Conceptual Design, 35
Design Development, 40, 52–53
Pre-Design, 32–33
Schematic Design, 38, 39
Coordination processes:
architectural, 16
landscape architectural, 16
Cost, quality and, 6
Cost estimates, 123, 198–201. See also Construction costs estimate
Conceptual Design, 35
Construction Documentation, 64
Design Development, 13, 48–49, 52, 54
Schematic Design, 39, 198–201
Cost model:
Conceptual Design, 123–124
Schematic Design, 13, 38, 39, 198–201
Cost overruns, quality of documentation and, 11
Cost requirements (Schematic Design), 13
Council for Landscape Architectural Registration Boards (CLARB), 5
Cover Sheet:
Construction Documentation, 63, 215–219
Design Development, 53, 206–215
distinctions/relationships between DD and CD, 206
Schematic Design, 38, 127–129
Critical path sequences, 14–15. See also Transitional thresholds
Critical success factors, 97
of clients, identifying, 95
in Schematic Design, 138, 139
Cross-referencing, 26
on drawings, 26–27
within specifications, 27
X-refs subfolder, 67–68
CSI, see Construction Specifications Institute

Data:
hierarchical system for, 18
in Pre-Design, 31
DD, see Design Development
DD-CD continuum principle, 47–48
Decision-making accountability, in Design Development, 47
Deliverables, 98
Design:
to budget, 48–49
interdependence of documentation and, 10
Design alternatives:
Conceptual Design, 34, 116–119
Pre-Design, 30
Schematic Design, 13, 36, 38
Design and documentation process, 4–5
documentation principles, 10–17
operational principles, 18–28

phases of, 4. See also individual phases
synergies in, 10–11
training for, 8
Design brief (Conceptual Design), 34, 109–111
Design character (Conceptual Design), 35
Design Development (DD), 4, 40–54, 202
checklist for, 202
compliance actions, 54
components of, 53–54
Composite Reference Sections, 336–339
Composite Sections, 53
construction cost estimate, 54
Construction Documentation distinguished from, 7, 41–42
coordination drawings, 54
coordination needs, 52–53
Cover Sheet, 53, 206–215
and critical path sequencing, 14, 15
and DD-CD continuum principle, 47–48
decision-making accountability in, 47
designing to budget, 48–49
documentation characterization, 42–43
document review process, 50–52
document set mock-up, 44–47
elevations, 53
Enlargement Plans, 53
General Information Sheet, 53, 232, 236–245
Grading Sections, 53
and interdisciplinary, 15
interface of Construction Documentation phase and, 47–48
irrigation details, 54
Irrigation Plan, 54
Key Plan, 228–233
Landscape Grading and Drainage Plan, 53
Landscape Lighting Plan, 53
Layout Plan, 15, 53, 281–297
Lighting Plan, 15, 53
Outline Specifications, 54
Planting Details, 53, 397–407
Planting Plan, 53
Plant Protection and Removal Plan, 53, 249–257
purpose of, 13–14, 40–41, 202
quality management in, 49–50
questions to ask during, 12
Erosion and Sedimentation Control Plan, 53
sheet organization, 204–205
Shrub and Groundcover Planting Plan, 377–387
Site Demolition Plan, 7, 53, 262–268
Site Details, 53, 342, 344–359
Site Furnishings Plan, 54
Site Grading and Drainage Plan, 53, 304–320
Site Layout Plan, 53, 281–297
Site Lighting Plan, 53, 326–332
Site Materials Plan, 53, 271–278
Site Reference Plans, 53, 220–224
Site Soils Plan, 53, 390–394
subconsultant drawings and specifications, 54
three-dimensional emphasis in, 22, 46–47
title block, 203–205
Tree Planting Plan, 365–374
Unresolved issues list, 54
Design documentation, 4, 10. See also Design and documentation process
Design drawings, see Composite documentation
Design framework (Conceptual Design), 34, 35
Design intent, 109–111
Conceptual Design, 34, 35, 109–111
Design Development, 40
Schematic Design, 36
Design models (Conceptual Design), 120, 122
Design practices, elevating and upgrading, 3–4
Design precedents, 97. See also Precedential issues
Design principles:
Conceptual Design, 35
Schematic Design, 36, 38, 138, 139
Design quality, evaluating, 11–12
Design reviews, 8
Design Development, 13, 49–50, 52
Schematic Design, 13
Design studies:
Conceptual Design, 35, 116–118
Schematic Design, 36
Details. See also Site Details
Construction Documentation, 14, 42
defined, 14
Design Development, 42
Schematic Design, 186–190
Detailed work scope (Pre-Design), 31, 33
Detail reference symbol, 80
Details subfolder, 68
Detail systems:
mock-up of, 44
Schematic Design, 36
Digital models, 22
Conceptual Design, 120–122
Design Development, 46
Digital organization of documentation, 66–70
Dilemma:
in Conceptual Design, 34–35, 109
in Pre-Design, 13
project, 96, 109
in Schematic Design, 38, 138, 139
in sustainable design process, 96
Discrepancies (Construction Documentation), 56–57
Divisions, 84
Do, Ellen Yi-Luen, 10
Documentation:
composite, 22–23, 38, 39, 42
defined, 4, 8
Design Development, 52
interdependence of design and, 10
of performance metrics, 99–100

Schematic Design, 39
Documentation characterization:
Conceptual Design, 30, 34
Construction Documentation, 57–58
Design Development, 42–43
Pre-Design, 30–31
Schematic Design, 36–37
Documentation practices, 66–92. See also Best practices
composition of document set, 70–75
digital organization, 66–70
drawing-specification relationships, 82–92
elevating and upgrading, 3–4
graphic symbol system, 80–81
keynote system, 75–79
Documentation principles, 10–28
operational, 18–28
organizational, 10–17
Documentation quality:
criteria for, 12
implementation quality and, 11–12
Documentation Standards, see Documentation practices
Document reviews:
Design Development, 49–52
and responsiveness to comments, 51–52
Document set, 6–7, 70–75
Document Set Mock-Up, 7, 44–47, 72
Drafting conventions, in UDS system, 59
Drawings, 82–84
composite, 22–23
in Contract Documents, 55
cross-references on, 26–27
emotions conveyed by, 37
formalized drawing-specification coordination, 60–62
graphics focusing on purpose of, 23–24
grouping, 71
redundancy between, 19–20
redundancy between specifications and, 20
relationship between specifications and, see Drawing-specification relationships
schematic, 37
specifications distinguished from, 61
subconsultant, 54
"Drawing as a Means to Design Reasoning" (Ellen Yi-Luen Do and Mark D. Gross), 10
Drawing Coordination Checklist, 61
Drawing set organization, in UDS system, 58
Drawing-specification relationships, 21, 82–92
Construction Documentation, 14
coordination of, 60–62
divisions, 84
drawings, 82
methods of specifying, 86–87
organization of Contract Documents, 83–84
Project Manual production, 86
redundancy, 20
specification language, 87–88
specifications, 82–84
specification sections preparation, 85–86

Easement lines, 81
Economic Framework (Conceptual Design), 114
Einstein, Albert, 13
Elevations:
as composite drawings, 22–23
Construction Documentation, 64
Design Development, 52, 53
Schematic Design, 38, 39, 184–185
Elevation reference symbol, 80
Emotions, conveyed by drawings, 37
Engineering drawings, see Composite documentation
Enlarged-scale interdisciplinary documentation, 13
Enlargement Plans:
Construction Documentation, 64
cross-referencing, 26
Design Development, 53
reference symbol for, 80
Environmental Framework (Conceptual Design), 113
Errors of inconsistency, 19
Estimate of Probable Construction Costs, 198–201
Existing conditions:
on plans, 63. See also individual documents
Site Survey/Existing Conditions Plan, 132–134

Fees, preparing, 7
File-naming conventions, 68
Final Specifications (Construction Documentation), 64
Folder structure, 66–68
Full specifications, 82
Masterformat for, 82
sample, 91–92

General contractor, 55
General Information Sheet:
Construction Documentation, 63, 235, 246–248
DD–CD relationships, 236
Design Development, 53, 232, 236–245
General notes, 63
GIS (Geographic Information Systems), 100
Pre-Design data topics, 101
Site Analysis Mapping, 103
Goals:
of clients, identifying, 95
in Conceptual Design phase, 109
SMART, 99
sustainable design, 97
Grading and Drainage Plan:
Landscape, 53
Site, see Site Grading and Drainage Plan
Grading Plan:

civil and landscape, 321
Design Development, 7
subject and reference elements on, 19
Grading Sections:
Construction Documentation, 64
Design Development, 53
Graphic(s):
clarity of, 25
communication as purpose of, 25
in Conceptual Design, 106–108
establishing, 8
operational principles for, 23–25
rules of thumb for, 62–63
standards for, 82
Graphic requirements/recommendations:
CD Cover Sheet, 217
CD General Information Sheet, 246
CD Grading and Drainage Plan, 324
CD Key Plan, 233
CD Planting Details, 409
CD Plant Protection and Removal Plan, 259
CD Shrub and Groundcover Planting Plan, 388
CD Site Demolition Plan, 269
CD Site Details, 361
CD Site Layout Plan, 300
CD Site Lighting Plan, 333
CD Site Materials Plan, 279
CD Site Reference Plans, 225
CD Site Soils Plan, 395
CD Tree Planting Plan, 375
character imagery, 118
Context Framework, 136
cost model, 123
DD Composite Reference Sections, 337
DD Cover Sheet, 211
DD General Information Sheet, 241–242
DD Key Plan, 229
DD Planting Details, 399–402
DD Plant Protection and Removal Plan, 253–254
DD Shrub and Groundcover Planting Plan, 383–384
DD Site Demolition Plan, 263–264
DD Site Details, 346–349
DD Site Grading and Drainage Plan, 312–313
DD Site Layout Plan, 293–295
DD Site Lighting Plan, 328–329
DD Site Materials Plan, 273–275
DD Site Reference Plans, 221–222
DD Site Soils Plan, 392
DD Tree Planting Plan, 370–371
design alternatives, 118, 119
design precedents and principles, 112
parti plan, 115
perspective renderings and illustrative drawings, 120
phasing, 124–125
Preliminary Project Descriptions, 194–195
SD Cover Sheet, 128
SD Estimate of Probable Construction Costs, 199
SD illustrative sections and elevations, 184
SD Illustrative Site Plan, 141–143
SD illustrative visualizations, 181
SD Materials Palette, 156
SD Planting Palette, 177
SD Shrub and Groundcover Planting Plan, 172–173
SD Site Furnishings Plan, 153
SD Site Grading and Drainage Plan, 166
SD Site Lighting Plan, 151
SD Site Materials Plan, 146–148
SD Site Protection and Removal Plan, 143–144
SD sketch details, 188
SD Tree Planting Plan, 168–169
Site Survey/Existing Conditions Plan, 133, 134
Graphic scale bar, 63
Graphic symbols, 80
Graphic symbol system, 80–81
in AIA CAD Layer guidelines, 59
graphic symbols, 80
linetype symbols, 81
Gross, Mark D., 10

Hardscape Site Reference Plans:
Construction Documentation, 225, 226
Design Development, 220–221, 223
Harvard University, 4
Hierarchical data system, 18

Identification of lines/graphics, 63
Illustrative drawings:
Conceptual Design, 120
Design Development, 52
project program, 107
Schematic Design, 13, 39
Illustrative elevations (Schematic Design), 38
Illustrative graphics, 25
Illustrative Site Plan (Schematic Design), 140–143
Illustrative visualizations (Schematic Design), 181–190
Implementation contract, Construction Documentation as, 14. See also Construction Documentation (CD)
Implementation quality, documentation quality and, 11–12
Inconsistency, errors of, 19
Informational Hierarchy, 18, 24
Innovation opportunities, in Pre-Design, 32, 33
In-progress Construction Documents, 13
Intent. See also Design intent
in Construction Documentation, 55–56
defining, 13
Interdisciplinary, 8
in Construction Documentation, 14
defined, 25
in Design Development, 13, 40–41

interdisciplinary alignment, 15–16, 26, 37
interdisciplinary coordination, 25–26, 40–41
leadership by landscape architects in, 3
in Schematic Design, 13
Interference checking, 27–28
Internal design budget, 98
Internal kick-off meeting (Pre-Design), 97–98
Inventory and data collection (Pre-Design), 99, 101
Irrigation details:
Construction Documentation, 64
Design Development, 54
Irrigation Plan:
Construction Documentation, 64
Design Development, 54

Kalin, Mark, 62
Key dilemma, 13. See also Dilemma
Keynotes, 75–79, 240
cross-referencing, 26
labeling methods with, 70
on plans, 63
Site Detail Keynotes, 75–77, 240
Site Reference Notes, 77–79, 240
Key Plan:
Construction Documentation, 63, 233–236
Design Development, 228–233
distinctions/relationships between DD and CD, 228
Key questions (Pre-Design), 32
Key relationships, graphics highlighting, 24
Kick-off meetings:
Design Development, 43
to frame and prioritize metrics, 99
Pre-Design, 97–98

Labels, 63
Labeling guidelines, 69–70
Landscape architects:
as both generalists and specialists, 43
guidelines and requirements for, 5–6
as interdisciplinary leaders, 3
as subconsultants, 75
Landscape architecture, 3–4
coordination processes in, 16
defined, 4
elevating/upgrading design and documentation practices, 3–4
Landscape architecture budget, 123
Landscape architecture program, 109–110. See also Program
Landscape Architecture Registration Exam, 5
Landscape Grading and Drainage Plan (Design Development), 53
Large projects, 209
CD Cover Sheet, 219
CD General Information Sheet, 248
CD Key Plan, 234
DD Cover Sheet, 213
DD General Information Sheet, 245
DD Key Plan, 229–230, 232
defined, 209
sheet series organization for, 73–74
Layout and master drawings, see Composite documentation
LEED (Leadership in Energy and Environmental Design), 4, 200
Legends, 63
Liability, 6
Licensure, 4
Lighting Plan:
Construction Document, 15
Design Development, 15, 53
Landscape, 53
Site, see Site Lighting Plan
Limit of work line, 81
Linetype symbols, 81
Line weight hierarchy, 63
Literature reviews, 8–9

Masterformat, 82
Master project schedule, 98
Matchlines, 80
Material mock-ups (Design Development), 46–47
Materials Palette (Schematic Design), 38, 156–164
Mature tree protection zone, 249
Meason, Gilbert Laing, 4
Metrics, 36. See also Performance metrics
Mission:
of clients, identifying, 95
in Conceptual Design, 34, 109
in Schematic Design, 36
Mock-ups:
component, 46–47
construction, 46–47, 240–241
Design Development, 13, 44–47
detail systems, 44
document set, 44–47, 72
material, 46–47
on-site, 47
Pre-Design, 30
of sheets, 44
of specifications, 44
Models:
design, 120, 122
digital, 22, 46, 120–122
physical study, 120, 122
study, 38, 46
Modeling (Design Development), 13

Narrative principles, in Schematic Design, 13, 36
National CAD Standard (NCS), 58, 59
National Institute of Building Sciences, 60
North arrow, 63
Notations, in UDS system, 59
Notes, General, 63. See also Keynotes
Numbering protocols, 72

Objectives:
Conceptual Design, 34
Pre-Design, 31
Schematic Design, 36
Olmsted, Frederick Law, 4
On-site mock-ups (Design Development), 47
Operational principles, 18–28
composite documentation, 22–23
cross-referencing, 26–27
eliminating redundancy, 19–21
graphic presentation of information, 23–25
hierarchical system for data, 18
interdisciplinary coordination, 25–26
interference checking, 27–28
reference elements, 18–19
relationship between drawings and specifications, 21
resolution, 28
singular purpose of each document, 18
subject elements, 18–19
three-dimensional design and documentation, 21–22
Organization:
of Contract Documents, 83–84
digital, 66–70
of sheets in document sets, 70–75
of specifications, 82
Organizational principles, 10–17
design and documentation synergies, 10–11
interdisciplinary alignment, 15–16
purposes of each documentation phase, 12–14
quality of documentation related to implementation quality, 11–12
thresholds and critical path sequences, 14–15
Working in Context, 16–17
Organizational protocols:
in AIA CAD Layer guidelines, 59
consistent use of, 66
Organizational strategies, 17
Organizational structure, in Design Development, 43
Orientation, 5
Outline Specifications, 82
in Design Development, 14, 54
Masterformat for, 82
sample, 91
Owner-Contractor Contract, 21

Parameters, 12–13
Conceptual Design, 34
defined, 30
established in Pre-Design phase, 30–33
Parti (big idea):
in Conceptual Design, 35, 114–115
in Schematic Design, 37, 38
Performance matrix, 100
Performance metrics, 97
Conceptual Design, 34, 35, 109
Design Development, 13, 40–41, 52
Pre-Design, 99–100
quantifying, 13
Schematic Design, 13, 36, 38, 39, 138
Perspective renderings:
Conceptual Design, 120, 121
Schematic Design, 181–183
Phasing diagram (Schematic Design), 38
Phasing plan (Conceptual Design), 35, 124–125
Phrases, on plans, 63
Physical study models (Conceptual Design), 120, 122
Plans. See also individual plans
in Construction Documentation, 14
defined, 14
graphics for, 62–63
interference checking, 27–28
size and scale of, 62
Plan enlargement, cross-referencing, 26. See also Enlargement Plans
Plan interference checking, 27–28
Planting Details:
Construction Documentation, 64, 411
Design Development, 53, 397–407
distinctions/relationships between DD and CD, 398
Planting Palette (Schematic Design), 176–180
Planting Plan. See also Shrub and Groundcover Planting Plan; Tree Planting Plan
Construction Documentation, 64
Design Development, 53
subject and reference elements on, 19
Plant Protection and Removal Plan:
Construction Documentation, 63, 258–261
Design Development, 53, 249–257
distinctions/relationships between DD and CD, 250
Informational Hierarchy for, 24
Plot styles, 70
Plotting guidelines:
in CAD Standards Manual, 70
in UDS system, 59
PMP (Project Management Plan), 97–98
PPDs, see Preliminary Project Descriptions
Practices, see Best practices; Documentation practices
Precedential issues:
in Conceptual Design, 35, 110, 112
in Pre-Design, 32
in Schematic Design, 38
Precedential Issues and Objectives, 12
Precedent Imagery Board, 112
Pre-Design, 4, 30–33, 94–101
base plan, 32
best practices, 99–100
checklist for, 94
client interview, 31

client work session, 94–97
code review, 32
components of, 31–32
construction budget, 32
coordination needs, 32–33
and critical path sequencing, 15
detailed work scope, 31
documentation characterization, 30–31
GIS-based data topics, 100–101
inventory and data collection, 99, 101
key questions, 32
precedential issues and parameters, 32
preliminary program, 32
project performance metrics, 99–100
project team collaboration and coordination, 98–99
purpose of, 12–13, 30
questions to ask in, 31
research needs/opportunities to innovate, 32
review and approval processes, 32
site investigation, 32
soils and geotechnical analysis, 32
strategic kick-off meeting, 97–98
user interviews, 32
work plan, 31
Preferred plan, in Schematic Design, 38
Preliminary Design phase, 93–201. See also individual phases
components of, 93–94
Conceptual Design in, 93, 102–125
Pre-Design in, 93–101
prerequisites for, 93
Schematic Design, 93, 126–201
Preliminary program:
in Conceptual Design, 34, 35
in Pre-Design, 32, 33
Preliminary Project Descriptions (PPDs), 82
sample, 90
Schematic Design, 39, 191–197
Preliminary specifications (Design Development), 14
Primary subfolder, 67
Principles:
Conceptual Design, 34, 110, 112
design, 35, 36, 38
documentation, 10–28
narrative, 13, 36
operational, see Operational principles
organizational, see Organizational principles
Procurement Requirements, 55
Program:
of clients, identifying, 95–96
Conceptual Design, 34, 35, 105–110
Design Development, 52
Pre-Design, 32, 33
preliminary, 32–35
Schematic Design, 13, 38, 39
Program scope (Schematic Design), 36
Project budget, in Conceptual Design, 109
Project dilemma, 96, 109
Project management, 5
Project Management Plan (PMP), 97–98
Project Manual, 55
in Construction Documentation, 83
production of, 86
Project planning, 17
Project Resource Manual (CSI), 57
Project schedule, 98
Project team:
collaboration and coordination with, 98–99
organization of, 98–99
roles and responsibilities of, 98
Project thesis, 96
Project work scope, 7
Property lines, 81
Proposed construction, existing conditions vs., 63
Protection and removal plans:
plant, see Plant Protection and Removal Plan
Site, 143–145

Quality:
of built projects, 6
of documentation and implementation, 11–12
wide-ranging levels of, 4
Quality assurance, 5–6
defined, 6, 50
Design Development, 49–51
Quality-Assurance Plan, 50–51
Quality Assurance reviews, 6, 8
Quality control, 6
Construction Documentation, 14
defined, 6, 50
Design Development, 13, 51
Quality improvement, 6, 50
Quality Leader, 8
Quality management, 5–6
components of, 6, 50
defined, 49
in Pre-Design phase, 98
role of, 8

Rapid cycling, 97
Redundancy, 19–21
in Construction Documentation, 56
between drawings, 19–20
between drawings and specifications, 20
“say it once” principle, 19
in specifications, 20–21
References:
cross-referencing, 26–27, 67–68
finding, 11
on plans, 63
Reference elements, 18, 19
Refinement, of abstract notions, 11
Regulatory requirements, in Schematic Design, 13
Requests for Information (RFIs), 12
Research needs, in Pre-Design, 32, 33

Resolution, 28
in Design Development, 40, 41
in interference checking, 28
Resource drawings:
referencing of, 75
and unused series, 72
Reviews:
client, 52
code, 32, 33, 52
conformance, 59–60
design, 8, 13, 49–50, 52
document, 49–52
literature, 8–9
Quality Assurance, 6, 8
Review process, in Pre-Design, 32
Revision blocks, 217
Revision cloud and callout symbol, 80
RFIs (Requests for Information), 12
Right of way lines, 81
Risk and Change Management Plan, 98

"Say it once" principle, 19
Scalar organization (Schematic Design), 36
Schedule(s):
master project, 98
in Pre-Design, 13
project, 98
quality of documentation and delays in, 11
in UDS system, 58
Schematics, 37
Schematic Design (SD), 4, 36–39, 126–201
character images, 38
checklist for, 126
compliance issues, 38
components of, 38–39, 127
components palette, 38
composite sections, 38
Construction Budget, 198–201
construction costs estimate, 39
Context Framework, 135–137
contextual framework plan, 38
coordination needs, 38, 39
cost model, 38
Cover Sheet, 38, 127–129
and critical path sequencing, 15
design alternatives, 38
design precedents, 38
design principles, 38
dilemma and thesis, 38
documentation characterization, 36–37
Estimate of Probable Construction Costs, 198–201
flexibility during, 11
illustrative elevations, 38
Illustrative Site Plan, 140–143
illustrative visualizations, 181–190
and interdisciplinary, 15
Materials Palette, 38, 156–164
parti, 38
performance metrics, 38
perspective renderings, 181–183
phasing diagram, 38
Planting Palette, 176–180
preferred plan, 38
Preliminary Project Descriptions, 39, 191–197
program, 38
purpose of, 13, 36, 126
questions to ask during, 12
sections and elevations, 184–185
Shrub and Groundcover Planting Plan, 172–175
site assessment, 38
Site Cost Model, 198–201
Site Furnishings Plan, 153–155
Site Grading and Drainage Plan, 165–167
Site Lighting Plan, 149–152
Site Materials Plan, 146–148
Site Protection and Removal Plan, 143–145
Site Survey/Existing Conditions Plan, 132–134
sketch details, 38, 186–190
study models, 38
sustainable design process, 138–139
Table of Contents, 130–131
three-dimensional drawings, 38
Tree Planting Plan, 168–171
Scope:
program, 36
of work, see Work scope
SD, see Schematic Design
Sections:
as composite drawings, 22–23
cross-referencing, 26
Design Development, 52
Schematic Design, 38, 39, 184–185
Section reference symbol, 80
Erosion and Sedimentation Control Plan:
Construction Documentation, 64
Design Development, 53
Sheets, mock-up of, 44
Sheet composition, in AIA CAD Layer guidelines, 59
Sheet formatting, in AIA CAD Layer guidelines, 59
Sheet Index revision blocks, 217
Sheet organization, 70–75
in AIA CAD Layer guidelines, 59
Design Development, 204–205
in UDS system, 58
Sheet series:
guideline for, 72
for large projects, 73–74
for small projects, 73
unused, 72
Sheets subfolder, 67
Shrub and Groundcover Planting Plan:
Construction Documentation, 64, 388–389
Design Development, 377–387
distinctions/relationships between DD and CD, 377–378
Schematic Design, 172–175

Site Analysis and Evaluation, 103–104
in Conceptual Design, 34, 109
in Pre-Design, 33
Site assessment (Schematic Design), 38
Site Composite Sections (Construction Documentation), 64
Site Cost Model (Schematic Design), 198–201
Site Demolition Plan:
Construction Documentation, 64, 269–270
Design Development, 7, 53, 262–268
distinctions/relationships between DD and CD, 262
Site Details:
Construction Documentation, 64, 360–364
DD Composite Reference Sections, 336–339
Design Development, 53, 342, 344–359
distinctions/relationships between DD and CD, 344
Site Detail Keynotes, 75–77, 240
Site Furnishings Plan:
Construction Documentation, 64
Design Development, 54
Schematic Design, 153–155
Site Grading and Drainage Plan:
Construction Documentation, 64, 321–325
Design Development, 53, 304–320
distinctions/relationships between DD and CD, 304–305
Schematic Design, 165–167
Site Grading Plan (Design Development), 7
Site investigation (Pre-Design), 32
Site Layout Plan:
Construction Documentation, 15, 64, 298–303
Design Development, 7, 8, 15, 53, 281–297
distinctions/relationships between DD and CD, 281
Informational Hierarchy for, 24
Site Lighting Plan:
Construction Documentation, 64, 333–335
Design Development, 53, 326–332
distinctions/relationships between DD and CD, 326
Schematic Design, 149–152
Site Materials Plan:
Construction Documentation, 64, 279–281
Design Development, 7, 8, 53, 271–278
distinctions/relationships between DD and CD, 271–272
Schematic Design, 146–148
Site phasing plan, conceptual, 35, 124–125
Site Program (Conceptual Design), 105–108. See also Program
Site Protection and Removal Plan (Schematic Design), 143–145
Site Reference Notes, 77–79, 240
Site Reference Plan:
Construction Documentation, 63, 225–227
Design Development, 53, 220–224
distinctions/relationships between DD and CD, 220
Site Soils Plan:
Construction Documentation, 64, 395–396
Design Development, 53, 390–394
distinctions/relationships between DD and CD, 390
Site Survey/Existing Conditions Plan, 132–134
Sketch details (Schematic Design), 38, 186–190
SKO, see Strategic kick-off meeting
Small projects, 209
CD Cover Sheet, 218
CD General Information Sheet, 247
CD Key Plan, 234
DD Cover Sheet, 213
DD General Information Sheet, 244
DD Key Plan, 228, 231
defined, 209
sheet series organization for, 73
SMART goads, 99
Softscape Site Reference Plans:
Construction Documentation, 225, 227
Design Development, 220–223
Soils and geotechnical analysis (Pre-Design), 32
Soils plan, see Site Soils Plan
Spatial organization:
in Schematic Design, 36
in schematic studies, 13
Special Conditions Requirements:
Construction Documentation, 258
Design Development, 253
Specifications, 83–84
in Contract Documents, 55
cross-references, 27
defined, 83
in Design Development, 14
drawings distinguished from, 61
formalized drawing-specification coordination, 60–62
language for, 87–88
methods of specifying, 86–87
mock-up of, 44
organization of, 82
preparing sections, 85–86
redundancy between drawings and, 20
redundancy in, 20–21
relationship between drawings and, see Drawing-specification relationships
samples, 91–92
subconsultant, 54
Specifications Checklist, 89
Specification Coordination Checklist, 61
Specification Takeoff Form, 61
Staff roles and responsibilities, as Pre-Design parameter, 13
Standards, 20–21
CAD Standards Manual, 66, 68–70
for graphics, 82
National CAD Standard, 58, 59

Standardized formatting, in Construction Documentation, 58–59
Strategic kick-off meeting (SKO):
to frame and prioritize metrics, 99
Pre-Design, 97–98
Studies subfolder, 68
Study models:
Design Development, 46
physical, 120, 122
Schematic Design, 38
Subconsultant, landscape architect as, 75
Subconsultant drawings:
Construction Documentation, 64
Design Development, 54
ordering of, 74
and unused series, 72
Subconsultant specifications (Design Development), 54
Subject elements, 18–19, 22
Supplemental drawings:
referencing of, 75
and unused series, 72
Sustainability, 3
Sustainable design:
on DD Site Materials Plan, 276
defining process for client, 96
goals of, 97
key components of, 96–97
in Pre-Design, 101
in Schematic Design, 138–139
Sustainable Sites Initiative, 4
Symbols. See also individual documents
clarity of, 63
in UDS system, 59
Synergies, in design and documentation, 10–11

Table of Contents (Schematic Design), 130–131
Terms, in UDS system, 59
Text placement, in AIA CAD Layer guidelines, 59
Thesis:
in Conceptual Design, 34, 35, 109
in Pre-Design, 30
in Schematic Design, 13, 36, 38, 138, 139
in sustainable design process, 96
Three-dimensional character:
in Schematic Design, 39
in schematic studies, 13
Three-dimensional design and documentation, 13, 21–22
Three-dimensional design resolution (Design Development), 41
Three-dimensional drawings:
in Design Development, 52
perspective renderings, 181–183
project program, 107
in Schematic Design, 38
Three-dimensional interference checking, 28
Three-dimensional studies (Design Development), 22, 46–47
Title block (Design Development), 203–205
Topography lines, 81
Training, 8
Transitional thresholds, 14–15
Tree Planting Plan:
Construction Documentation, 64, 375–376
Design Development, 365–374
distinctions/relationships between DD and CD, 365
Schematic Design, 168–171
Tufte, Edward, 23–25

UniFormat (CSI), 82, 191–194
Uniform Drawing System (UDS), 58–59
Unresolved issues list:
Construction Documentation, 64
Design Development, 54
Unused series, handling, 72
User interviews, in Pre-Design, 32
Utility lines, 81

Value engineering, in Construction Documentation, 14
Verbosity, in Construction Documentation, 57
Vision:
articulated in kick-off meeting, 97
of clients, identifying, 95
in Conceptual Design, 34, 109
of project outcome, 30

Wall Detail, subject and reference elements on, 19
Watering, during construction period, 260
Water level lines, 81
Whole Building Design Guide (National Institute of Building Sciences), 60
Work by others, cross-referencing, 26, 27
Working in Context, 16–17
Work plan (Pre-Design), 31
Work product definition (Pre-Design), 13
Work scope, 7
contractual, 13, 55
detailed, in Pre-Design phase, 31, 33

XCONSULT subfolder, 68
X-refs subfolder, 67–68

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