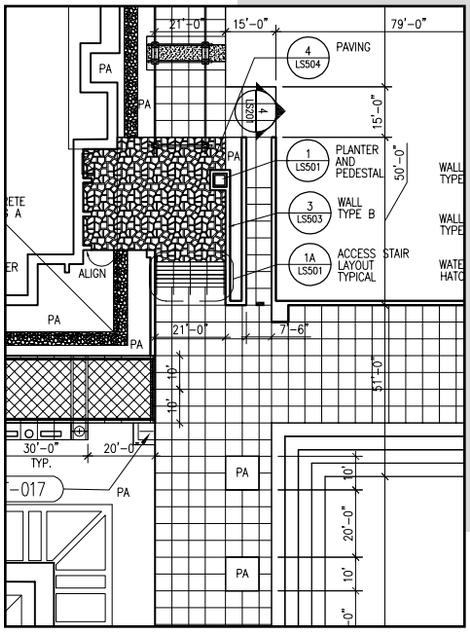


PRACTICE OF LANDSCAPE ARCHITECTURE

General

Construction Documentation

Environmental and Legal

Project Administration

Part 1

GENERAL

OVERVIEW OF THE PROFESSION

WHAT IS LANDSCAPE ARCHITECTURE?

Landscape architecture encompasses the analysis, planning, design, management, and stewardship of the natural and built environments. Types of projects include: residential, parks and recreation, monuments, urban design, streetscapes and public spaces, transportation corridors and facilities, gardens and arboreta, security design, hospitality and resorts, institutional, academic campuses, therapeutic gardens, historic preservation and restoration, reclamation, conservation, corporate and commercial, landscape art and earth sculpture, interior landscapes, and more. Landscape architects have advanced education and professional training and are licensed in 48 states (as of June 2005).

Landscape architects plan and design traditional places such as parks, residential developments, campuses, gardens, cemeteries, commercial centers, resorts, transportation facilities, corporate and institutional centers, and waterfront developments. They also design and plan the restoration of natural places disturbed by humans, such as wetlands, stream corridors, mined areas, and forested land. Having an appreciation for historic landscapes and cultural resources enables landscape architects to undertake preservation planning projects for national, regional, and local historic sites and areas.

Working with architects, city planners, civil engineers, and other professionals, landscape architects play an important role in environmental protection by designing and implementing projects that respect both the needs of people and of our environment. Professionals who can meet human needs by making wise use of our environmental resources are in demand today and will continue to be so in the future.

A wide range of opportunities are open to landscape architects today. They may work on a variety of projects, such as the development and preservation of open spaces, recreation areas, wildlife refuges, zoos, parks, golf courses, and transportation systems.

Landscape architects also may work for many types of organizations—from real estate development firms starting new projects to municipalities constructing airports or parks—and they often are involved with the development of a site from its conception. Working with architects, surveyors, and engineers, landscape architects help determine the best arrangement of roads and buildings. They also collaborate with environmental scientists, foresters, and other professionals to find the best way to conserve or restore natural resources. Once these decisions are made, landscape architects create detailed plans indicating new topography, vegetation, walkways, and other landscaping details, such as fountains and decorative features.

In planning a site, landscape architects first consider the nature and purpose of the project and the funds available. They analyze the natural elements of the site, such as the climate, soil, slope of the land, drainage, and vegetation; observe where sunlight falls on the site at different times of the day and examine the site from various angles; and assess the effect of existing buildings, roads, walkways, and utilities on the project.

After studying and analyzing the site, landscape architects prepare a preliminary design. To accommodate the needs of the client and other stakeholders in the project, as well as the conditions at the site, the design frequently evolves based on input gathered at meetings held during the design development phase. These modifications from the preliminary design lead to the approval of the final design. They also take into account any local, state, or federal regulations, such as those providing barrier-free accessibility and those protecting wetlands or historic resources.

In preparing designs, computer-aided design (CAD) has become an essential tool for most landscape architects. Many landscape architects also use video simulation to help clients envision the proposed ideas and plans. For larger-scale site planning, landscape architects also use geographic information systems (GIS) technology, a computer mapping system.

Throughout all phases of the planning and design, landscape architects consult with other professionals involved in the project. Once the design is complete, they prepare a proposal for the client. They produce detailed plans of the site, including written reports, sketches, models, photographs, land-use studies, and cost estimates, and submit them for approval by the client and by regulatory agencies. When the plans are approved, landscape architects prepare working drawings showing all existing and proposed features. They also outline in detail the methods of construction, itemize construction details, and draw up a list of necessary materials, including the written technical specifications for the project. Finally, during the construction implementation phase of the project, the landscape architect is often called upon, by the client, to monitor the installation of his or her design.

Some landscape architects work on a variety of projects, while others specialize in a particular area, such as residential development, street and highway beautification, waterfront improvement projects, parks and playgrounds, or shopping centers. Still others work in regional planning and resource management; feasibility, environmental impact, and cost studies; or site construction. Increasingly, landscape architects are becoming involved with projects in environmental remediation, such as preservation and restoration of wetlands, as well as the restoration of degraded land, such as mines or landfills. Historic landscape preservation and restoration is another important area where landscape architects are playing an increasingly important role.

The 2004 American Society for Landscape Architects (ASLA) Business Indicators Survey reveals that landscape architecture firms are growing in size, billing rates are increasing dramatically, and the client base for the profession continues to expand, most significantly in the public sector.

ASLA commissioned the first business indicators survey in 1997 and repeated it in 1999. This latest survey is based on information gathered in 2004 from more than 1,000 private sector landscape architecture firms. Indicators include market sectors; project types; client types; billing rates; contract types; design competition participation; marketing, spending and construction cost ratios; and profit margins. Of the firms and organizations responding to the survey, 80 percent are in the private sector, 16 percent are in the public sector, and 4 percent represent academic institutions. In the 2004 survey, most respondents have 21 to 25 years of experience with an average salary of $80,273. The average salary for those with 0 to 5 years of experience is $41,803. Those with 36 to 40 years of experience earn the highest average salary, at $97,564.

Demographic comparisons by gender between the 1999 and 2004 ASLA surveys indicate there has been no change in the private sector (24 percent women, 76 percent men). However, women now make up 34 percent of public practitioners and 24 percent of professionals in academia, increases of 4 percent in both sectors since 1999.

Some highlights among the other findings in the survey:

- Residential work continues to dominate the landscape architecture market, as it did in both 1997 and 1999. In 2004, commercial/industrial development was second and parks/recreation third, keeping pace with the two previous surveys.
- Landscape architecture firms with 50 or more employees now account for 16.5 percent of landscape architecture businesses, up from only 9 percent in 1999.
- The private sector constitutes 60 percent of the client base for all firms with 49 employees or fewer; although it is notable that in 2004 public sector work outpaced private sector work for large firms (50 or more employees).
- Since 1999, billing rates for firm principals for firms with more than five employees rose 28 percent, a dramatic increase over the 5 percent growth measured between 1997 and 1999. For firms with one to four employees, billing rates increased 14 percent from 1999 to 2004, up from just 5 percent between 1997 and 1999.
- Private developers continue to be the largest client group for the profession, with cities/municipalities ranking second, followed very closely by architecture firms. For small firms (four employees or fewer), private homeowners continue to make up the largest clientele.

Based on projections by the Department of Labor's Bureau of Labor and Statistics, employment of landscape architects is expected to grow faster than the average for all occupations through the year 2012. New construction is increasingly dependent upon

Leonard Hopper, FASLA and the American Society of Landscape Architects

compliance with environmental regulations, land-use zoning, and water restrictions, spurring demand for landscape architects to help plan sites and integrate man-made structures with the natural environment in the least disruptive way. Landscape architects are also becoming increasingly involved in preserving and restoring wetlands and other environmentally sensitive sites. Due to growth and geographic shifts in population, the expertise of landscape architects will be highly sought after in the planning and development of new residential, commercial, and other types of construction. For the general public, their most important issues and concerns impacting their daily lives and routines have a close relationship to a landscape architect's area of practice and responsibility. Thus, the work of landscape architects will play an increasingly important role in shaping the world's future by making a positive impact on health, economic, social, and environmental issues.

Leonard Hopper, FASLA and the American Society of Landscape Architects

HISTORY OF THE PROFESSION

A DEFINITION

Defining landscape architecture runs the risk of homogenizing a discipline that defies neat categorization, inasmuch as the contours of the profession are mutable and ever changing. For, in its brief existence landscape architecture has had a marked capacity for innovation, reinvention, and development, as well as perpetual self-critique and self-explanation.

In its most theoretical formulation, landscape architecture is the art and science of the designed mediation of the zone between Art and Nature, where Art—to paraphrase Edith Wharton—represents the human domain and Nature the "untamed" or "natural" landscape. In less abstract terms, landscape architecture is concerned with the design of the external environment from the drip-line of architecture to the project property line. It does so by manipulating the materials of the earth (vegetation, water, soil, rock) and the products of human industry (buildings, structures, infrastructure, and so on) to modify or create outdoor space. In general, but not necessarily, the aims and products of landscape architecture are concerned with the design of space for human use and occupation. For example, recent environmental applications of the profession are aimed at the delineation of spaces for purely habit conservation, preservation, and other ecological purposes, where the primary purpose of the landscape architectural brief does not concern human activity. Accordingly, while most landscape architecture is devoted to the aesthetic design and layout of external space, the expanding range of its practice impacts and necessarily changes the scope and definition of the profession itself.

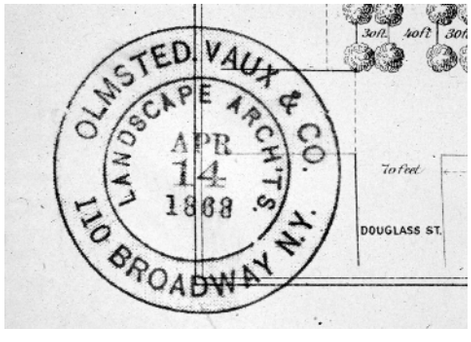
LANDSCAPE ARCHITECT/ LANDSCAPE ARCHITECTURE: A HISTORY OF TERMS

Landscape architecture originated from its sister arts, architecture and landscape gardening. The term itself was coined, in France, in 1804 as *architecte-paysagiste*, almost assuredly by the French landscape designer and civil engineer, Jean-Marie Morel (1728–1810). By mid-nineteenth century, the term acquired official currency in France as witnessed by the seal of the Parisian "Service de l'architecte-paysagiste" (Department of the Landscape Architect) appearing on a drawing for the Bois de Boulogne by Louis-Sulpice Varé (1803–1883) in 1854. Shortly thereafter it appears in texts, such as A. de Céris' *Parcs et Jardins* (*Parks and Gardens*) of 1865, in which both the "architecte-paysagiste," and his profession, "l'architecture paysagiste" (landscape architecture), are given without explanation or discussion. By the last quarter of the nineteenth century both terms are well established in France, as evidenced by Édouard André (1840–1911) calling himself a landscape architect in his monumental book, *L'Art des Jardins* (*The Art of Gardens*) of 1870, and Armand Péan's *L'Architecte-Paysagiste* (*The Landscape Architect*) of 1886, the first book title to use the term.

The English were late to use the terminology of landscape architecture. Following upon William Shenstone's coinage of "landscape gardening" in 1764, Humphry Repton (1752–1818) called himself a "landscape gardener," explaining why in his book, *Sketches and Hints on Landscape Gardening* (1795): "I have adopted the term *Landscape Gardening* as the most proper, because the art can only be advanced and perfected by united powers of the *landscape painter* and the *practical gardener*." Repton's coinage was retained and used without much competition, though it was never acceptable to Sir Uvedale Price (1747–1829), nor did John Claudius Loudon (1783–1843) much care for it, at least at first. In his book *A Treatise on Forming, Improving and Managing Country Residences* of 1806, Loudon considered "landscape gardening" a term "devoid of meaning." His preference at the time was "picturesque improvement" and "picturesque gardening." However, by the publication of his magnum opus, *An Encyclopædia of Gardening* (1822), he accepted the term. Perhaps riding on the strength of Repton and Loudon, "landscape gardening," and its derivative "landscape gardener," remained the terms of choice for landscape design in England until Patrick Geddes (1854–1932) identified himself as a "landscape architect" in the first decade of the twentieth century.

The first coupling of the two English words "landscape" and "architecture" appeared in the book title, *On the Landscape Architecture of the Great Painters of Italy*, published in 1824 by Gilbert L. Meason. The work's title refers to the architecture in Italian landscape paintings, not to any professional designation. The second occurrence of the couplet appears in Loudon's edition of the collected works of Humphry Repton, under the title, *The Landscape Gardening and Landscape Architecture of the Late Humphry Repton, Esq.*, published in 1840. As with Meason's book, Loudon's title refers exclusively to architecture suitable for landscape gardening. Indeed, the compound term does not appear in the book, nor is it discussed further.

Frederick Law Olmsted (1822–1903) and Calvert Vaux (1824–1895) are generally conceded with coining the professional title "landscape architect" in early 1860, perhaps sooner. The claim is almost certainly correct, though there is no "smoking gun" evidence to determine an exact date. It is not known how Olmsted and Vaux came upon the term, but we do know that Olmsted was in Paris in the spring of 1856, and again in the fall of 1859 when he visited the Bois de Boulogne no less than eight times. (Olmsted and Kimball, 1928). Olmsted was sent to Europe on a fact-finding mission in his capacity as architect-in-chief of New York's Central Park, which he and Vaux designed in 1858. Olmsted could have heard of the professional designation, "architecte-paysagiste," from his French colleagues, possibly from Paris parks designer Jean-Charles Adolphe Alphand (1817—1891), whose design for the Bois de Boulogne replaced that of Varé.



LANDSCAPE ARCHITECT

Despite the stature of Olmsted and Vaux, "landscape architecture" received only reluctant acceptance by the developing profession. Early on, the pioneering and underappreciated, midwestern landscape designer, H. W. S. Cleveland (1814–1900) added "landscape architect" to his name in his book, *A Few Hints on Landscape Gardening in the West* (1873), though the opening line of the book reads: "The term 'Landscape Architecture' is objectionable. . . . I make use of it under protest." German born Jacob Weidenmann (1829–1893), who established himself as the designer of parks for Hartford, Connecticut, published a book, *Beautifying Country Homes* (1870), which, despite the unassuming title, uses "landscape architecture" and "landscape architect" without explanation or discussion. As such, Weidenmann assumes popular familiarity with the terms.

The discourse on terminology took on a curious trans-Atlantic twist in October 1887 when Mrs. Schuyler van Rensselaer published an article called "Landscape Gardening" in the *American Architect and Building News* (vol. 22, no. 614). Without naming her sources she wrote, in defense of the term "landscape architect," that it comes "from the French title *architecte paysagiste*." She repeated the assertion in articles published in *Garden and Forest,* and in her bestselling book, *Art Out-of-Doors* (1893), noting that French usage supports the term, "and it is in many respects a good one." (However, she disliked "landscape architecture.") Mrs. van Rensselaer's Gallic connection made the rounds into subsequent publications, whence, William Robinson (1838–1935) dismissed the title as a "stupid term of French origin"; Stephen Child (1866–1936) credited the French origin in his article, "Landscape Architecture. A Definition and a Résume of its Past and Present" appearing in the *New England Magazine* of May 1911; (subsequently republished in the September 1929 issue of *American Landscape Architect*): Frank Waugh did similarly in his *Landscape Design Treatise on the General Principles Governing Outdoor Art* (2nd revised edition, 1915); Warren H. Manning's discussion of landscape architecture in the 1914–1917 edition of Bailey's *Standard Cyclopedia of Horticulture* simply noted that it was the French term for the profession (Robinson, 1911). Manning's entry in Bailey's expanded and revised encyclopedia replaced Bailey's own entry on "landscape gardening" in the first edition of 1900, which made no mention of a French connection.

Resistance to the term appeared even after the establishment of the American Society of Landscape Architects in 1899. One of its founding members—Beatrix Farrand (1872–1959)—made it a point to call herself a "landscape gardener," while another founding member—Ossian C. Simonds (1855–1931)—refused to use the term in his book *Landscape Gardening*, published in 1920. Warren H. Manning (1860–1938), also a

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founding member of the ASLA and an associate of Olmsted, was ambivalent on the term. Moreover, several important texts on the subject of landscape design dating from the late nineteenth century and early twentieth were titled simply "Landscape Gardening," including—in addition to Simonds'—that of Samuel Parsons, Jr. (*Landscape Gardening*, 1891), and Franck A. Waugh (*Landscape Gardening*, 1899; second edition 1915). Parsons (1844–1923) and Waugh (1869–1943) were not, so it seems, married to the older term: They subsequently published new books with titles *The Art of Landscape Architecture* (1915), and *Formal Design in Landscape Architecture* (1927), respectively. As if to hedge his bets, Parsons subtitled his 1915 book, *Its Development and Its Application to Landscape Gardening*, while Waugh's title is indicative of the connection he held between the landscape garden style and the disciplinary designation appropriate to it. Parsons had done similarly in his 1891 book: He mentions landscape architecture only with reference to the newly created landscapes of Central Park and Prospect Park. Thus, for Parsons, landscape architecture implied large-scale landscape design, while for Waugh, is suggested the design of landscapes in a more or less formal way.

Landscape architects—properly so called—were not consistent in their use of the term or their own identification with it. Waugh called himself "landscape gardener" and "landscape architect" interchangeably, while Horace Cleveland back-tracked, calling himself a "landscape architect" at the beginning of his career (1873), then changing to "landscape architect and gardener" (1885), and finally, to "landscape gardener" (1888) (Hubbard, 1930).

The terms "landscape architecture" and "landscape architect" were given recurring prominence with the publication in October 1910 of the quarterly, *Landscape Architecture*, the official organ of the American Society of Landscape Architects. It was the first appearance of the term in a journal title. As the defender of the profession, *Landscape Architecture* was the authoritative source for matters pertaining to professional practice and identity. *Landscape Architecture* remained the sole professionally oriented journal until July 1929, when the short-lived *American Landscape Architect*, began publication. It ran for seven volumes, ending in October 1932.

It appears that Parson's book of 1915 was the first English-language book with "landscape architecture" in the title as a professional designation. It is of note for its title, but not for the originality of its content, which is heavily based on nineteenth-century works, such as—and especially—Hermann Ludwig Heinrich von Pückler-Muskau's *Andentungen der landschaftsgartnerei* (*Hints on Landscape Gardening*), whose first English edition of 1917 was edited by Parsons. More instructive for an early twentieth-century eadership was Elsa Rehmann's *The Small Place: Its Landscape Architecture* published in 1918. It featured, in as many chapters, fifteen projects of landscape architects, most of whom were ASLA members. Rehmann's book was followed by the more significant *American Landscape Architecture* (1924), edited by P. H. Elwood, Jr. This large format, copiously illustrated book was primarily a vanity publication, featuring the works of 75 landscape architects, including Olmsted & Sons, Charles A. Platt (1861–1933), O. C. Simonds, George E. Kessler (1862–1923), and Jens Jensen (1860–1951). The introduction gave an excellent overview of the "youthful" profession, including a survey of educational opportunities.

> *Harvard University established the first academic program in landscape architecture in 1900. One year later, the Lowthrope School of Landscape Architecture began offering a two-year course of instruction in landscape architecure for women. Some half-dozen programs were established by the first decade of the twentieth century, including programs at Kansas (1903); Massachusetts Agricultural College (1903); Cornell (1904); Illinois (1907); Michigan Agricultural College (1907), to name but a few. Attesting to the growth and prominence of the profession, by the 1920s there were almost 40 national academic programs of landscape architecture (Pattee, 1924). The American Academy of Rome recognized the importance of the profession as an art when it inaugurated the annual Prix de Rome in Landscape Architecture in 1915.*

It is clear that the profession and its self-denomination were well established by the first quarter of the twentieth century, yet resistance to it never subsided. Indeed, it appears that some of the most recalcitrant nay-LA-sayers, were the major players in the profession. We only need note that Dan Kiley (1912–2004), arguably the most prominent landscape architect of the last half of the twentieth century, never joined the ASLA (but did join the American Institute of Architects). Moreover, J. B. Jackson's journal *Landscape*, which began publishing in 1952, had a curious, if not deliberate, policy of avoiding any mention of the term "landscape architecture"—at least in the first several years of publication. Ironically, while some of the most prominent landscape architects practicing in the twentieth century may have had difficulty with their professional designation, the public press did not. *The New York Times* obituaries for Frederick Law Olmsted, Sr., Warren H. Manning, Jens Jensen, Garrett Eckbo (1910–2000), Ian McHarg (1921–2001), and Dan Kiley, among others, appended "landscape architect" to all their names. A notable exception was J. B. Jackson (1910–1996); his *The New York Times* obituary headline read: "J. B. Jackson, Landscape Guru."

LANDSCAPE ARCHITECTURE: THE PROFESSION

Shortly before Olmsted and Vaux established landscape architecture as a viable profession, a debate had been launched in the *North American Review* (vol. 84, January 1857) over the contours and scope of the profession-in-waiting. In a book review of an otherwise forgotten tome *Village and Farm Cottages* (1856) by Henry W. Cleaveland, William Backus, and Samuel D. Backus—an anonymous reviewer devoted the overwhelming majority of his review to a discussion of "landscape gardening." The reviewer highlighted the newness of the field and the inadequacy of its name. With remarkable prescience, the reviewer understood that the artistic and practical ends of the potential of landscape design were restricted by the term "landscape gardening." The reviewer's preferred term was "landscape improvement." But he went further; he believed that a "new science" was in the process of becoming, one that was "no part of the gardening-art… not even an extension of it." In tacit recognition that the aims, purposes, methods, and products of landscape improvement were different from the former practice of landscape gardening, he emphatically removed the new (as yet unnamed) science from its historical origins. The author understood the "new science" as a field much broader and complex than landscape garden design:

> *The term landscape gardening, which is commonly applied to this science, is plainly a misnomer, and has served to confound the general improvement of nature with the operations of gardening. (NAR, January 1857)*

The author's insistence on finding a proper term, one with broad connotations, is made clear when he posits Calichtonics (from the Greek words for "beauty" and "earth") as a suitable name for the "new science," which concerns both the beautification of nature, "but likewise dendrology, architecture, road-making, geognosy, and monumental sculpture." For each of these subjects he explains its relation to the "new science." For instance, on "road-making" the author writes:

> *Road-making also forms a branch of this science,—not indeed the mechanical construction of roads, but all that relates to their courses and directions,—everything about them which can be considered as a matter of taste. It treats of the comparative beauty of the different description of roads, from the cart-path through the woods, to the highway from the city;… (NAR, January 1857)*

Noting the youth of the "new science," the reviewer frames its future course, which has yet to be given a satisfactorily form and definition. He writes, "the science of landscape is yet only in its infancy…until its aims and ends are clearly and precisely defined and its limits distinctly marked."

Implicit in the writing is a critique of the existing books on landscape gardening, whose "aims and ends" are deemed insufficient for the scope the "new science":

> *The science of landscape [should] embrace a system of rules for improving the aspect of the whole country, not merely for the laying out of estates and the erection of magnificent houses.*

With this, the reviewer voices the fundamental distinction that separates "landscape gardening" from "landscape architecture."

Only once mentioned, and at that with almost no discussion, in the *North American Review*'s review was Andrew Jackson Downing (1815–1852), the most celebrated and important American landscape gardener of the first half of the nineteenth century. His classic *Treatise on the Theory and Practice of Landscape Gardening*, first published in 1841, was an immediate and phenomenal success that went into numerous re-editions.* Although others preceded him—notably André Parmentier (1780–1830) of New York—Downing deserves the credit for initiating the discourse on the aesthetics of beauty as applied to landscape design in America; a discourse that would remain a central theme of the profession throughout the nineteenth century and well into the twentieth.

Despite his interest in the public sector—he was an early proponent for a park in New York City—and his

**The last full edition under his direction, the fourth, appeared in 1849; it received its tenth and last edition in an abridged and revised volume by Frank A. Waugh in 1921.*

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prolific writing on the beauty of nature, Downing devoted most of his professional life to private residential and estate design, as well as horticulture and pomology. Throughout his career he used "landscape gardening" without comment or discussion.

Downing's life coincided with the confluence in America of a set of social and economic factors that saw the rise of the middle-class; the growth, congestion, and industrialization of cities; the rise of suburban neighborhoods; and the proliferation of an inter-urban rail and road transportation system. These events marked the rise of America as an industrial and world power, but also precipitated a wide range of socially and economically based problems in need of design solutions.

The *North American Review* called for a new "system" of landscape design to address the demands of the rapidly changing and developing world, and Downing's "landscape gardener" was inadequate to the task. A new professional entity—a "new scientist"—was needed to fill the vacuum. It is not that landscape gardening had ignored new challenges requiring new solutions. Loudon, in his *Encyclopædia*, outlined an array of new typologies suitable for different design problems, including public parks for pleasure, for recreation, for instruction: commercial gardens, nurseries, botanical gardens, horticultural gardens, to name but a few. But the modern world needed design solutions for "improving the aspect of the whole country" (*NAR*, January 1857), beyond the horticultural, park, and garden realms.

Implicit in this discussion is the emergence of the individuation of landscape design solutions, and a concomitant transformation of the practice itself, in the face of an increasingly complex modern world. It is essential to recognize—indeed, it is at the heart of what eventually would be codified as the profession—that landscape architecture's development followed (perhaps even preceded) the design solutions it was called upon to solve. As such, landscape architecture would expand and shape its practice and design solutions in concert with new social, cultural, and environmental challenges brought on by the modern world. Unencumbered with history, landscape architecture was able to meet the challenges because it would absorb, incorporate, or in some way make use of an increasing array of other disciplines in the service of its own ends.

Olmsted, more so than anyone before—or after—best articulated the problems facing the new profession. Although he was a life-long defender of the profession he helped create and was its most ardent spokesperson, he never reconciled doubts concerning both the name he gave to the profession or the profession itself. He and Vaux had numerous discussions on the subject. In a letter to Vaux in 1865, he stressed that the "new art" (Olmsted does not use "new science") they were professing was neither gardening nor architecture: "I am all the time bothered with the miserable nomenclature of L.A. *Landscape* is not a good word, *Architecture* is not; the combination is not. *Gardening* is worse." (Ranney et al., 1990)

At issue, as Olmsted astutely recognized, was the lack of a term to call the products of their art. He wrote that "neither park, nor garden, nor street, road, avenue or drive, nor boulevard" apply to the "sylvan bordered and artistically arranged system of roads, sidewalks and public spaces" they were creating as solutions to emerging urban and suburban design problems. For example, Central Park was a park in name only; in size, aims, and design it had few precedents for comparison. Consequently, without a correct terminology for the products of the profession, a professional designation was likewise problematic. At the root of the nomenclature problem was the identification between the new design solutions (products) and the profession itself. Olmsted's belief that one's professional designation is an indicator of professional conduct and scope of practice was a lifelong preoccupation.

Olmsted accepted "landscape architecture" as the best alternative to distinguish his work from "landscape gardening." He defended the title with an essential understanding of the difference of the practice:

> *Even of landscape gardening rightly so called, the practice of most has been at best upon small grounds or upon grounds in which the convenience and probable wants of but a single family and its selected guests were to be considered, a good design for which is a very different thing from good design for grounds in which the movements of many thousands are to be provided for…I prefer it [landscape architecture] because it helps to establish the important idea of the distinction of my profession from that of gardening… ("Report to the Board of Park Commissioners").*

Yet, perhaps characteristically, he harbored lingering doubts about the profession he was instrumental in creating. In the autumn of his career, he wrote: "No comprehensive definition of the responsibility of the landscape architects has been recorded, and as to what is implied by the name of their office, different understandings are had" (Ranney et al, 1990, p. 375).

Some years later, Stephen Child summarized the evolution of the landscape architecture based on a standard model of the rise of professions. In an article in the *New England Magazine* of May 1911, he outlined the progression of professions:

> *In the process of the development of mankind there has been noticeable a constant increasing tendency toward differentiation and specialization.… In this way have come about many new forms or fields of work, each adapted more or less from others of a previous and perhaps lesser civilization. Each new profession, or branch from an older one, demanded and received a new cognomen. (Child, 1911)*

Child identified "landscape architecture" not just as a new "cognomen," but as a new professional range of expertise. Reiterating what the *North American Review* and Olmsted had voiced, Child similarly distinguished "landscape gardening" from "landscape architecture." The narrower and more specific scope of landscape gardening was fine for limited ends, but inadequate for "designing a general scheme of the development of land for any purpose."

The difficulty in categorizing landscape architecture was perhaps inevitable. Its genealogy doggedly kept it associated with the more familiar tradition of landscape gardening—one Olmsted and his professional brethren tried to rupture. Moreover, from its early days, landscape gardening itself was a potpourri of disparate trades and disciplines. For example, Repton suggested that the education and practice of the landscape gardener should include mechanics, hydraulics, botany, and architecture. It went without saying that the practitioner also needed a sensibility to good taste. Repton's inclusion of "mechanics" is noteworthy, as the relation between landscape gardening and (civil) engineering is longstanding. Several of the late-eighteenth-century designers in the English or natural garden style were civil engineers, most notably Jean-Marie Morel, the probable coiner of the French term for the profession. In as much as civil engineering in the eighteenth century was primarily a practice of manipulating the constituent parts of landscape—earth, wood, water, and rock—it can be said that everything technical necessary to know about landscape architecture is subsumed in the practice of the civil engineer.

The connection between engineering and landscape architecture strengthened during the nineteenth century as landscape architects and engineers collaborated in the laying out of public and private grounds. Reflecting the close relationship of the two professions, some landscape architects referred to themselves as "landscape engineers." In an early sign of professional turf battles, W. M. R. French—of Cleveland and French, Landscape Architects & Engineers—pled for mutual respect and reconciliation between the two professions in his notice "The Relation of Engineering to Landscape Gardening" (ca. 1870). Despite the title, French is addressing landscape architects, whom he believed should by rights work closely with engineers.

The strong interdisciplinary history of landscape architecture, in particular its relation to engineering and the natural and earth sciences, was signaled by the placement of the first university course of study in landscape architecture in Harvard's Lawrence Scientific School, and not in the fine arts or architecture departments. The program of instruction was rigorous, including—in addition to standard courses such as studio design, horticulture, botany, and art and architectural history—park and city planning, road design and engineering, advanced mathematics, geology, geography, trigonometry, agricultural chemistry, meteorology, as well as required courses in French and German.

The interdisciplinary heritage of the development of landscape architecture is still reflected in the location of landscape architecture departments in American universities today. They are housed in faculties of agriculture, natural resources, and environmental design; schools of architecture and fine arts; or in their own separate institutional department. Few professional disciplines can claim such a diverse educational pedigree.

Perhaps the clearest vision of landscape architecture and the broad and dynamic range of its scope was articulated by its official organ, *Landscape Architecture* magazine, and the short lived, *American Landscape Architect.* From its beginning, *Landscape Architecture* gave a clear and protective voice for landscape architecture. Though its inaugural issue was rather timid—the editorial stressed the "production of beauty" as the task of landscape architecture—and its physical appearance looked staid, traditional, if not conservative, it did suggest a dignified journal suitable for a profession establishing its reputation. In its second issue (January 1912), *Landscape Architecture* published an editorial stressing the same developmental history as had been expressed by Child the year before:

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When a new profession has come to be recognized, or when an old profession has been separated into several branches, the fundamental course for the subdivision of a field has always been the same—the discovery of so many new facts, or the increase in importance of so many known facts, that one man cannot master them all. Of course, with the handling of a newly segregated field of fact will come the acquisition of a new technique, the elaboration of theory in some one direction, even the growth of a new technical language.

This is what happened in the case of landscape architecture.

Reflecting the diverse background of the profession, there was nothing conservative about *Landscape Architecture*'s view of it. The quarterly added country, town, estate, and city and regional planning to its subtitle. Its range of topics was impressive. Articles in the early years covered standard topics of landscape architecture practice, such as garden and park design, planning projects, and so on; it included articles on the history of individual garden styles and garden history in general, all with an emphasis on the aesthetic aspect of the profession. Yet, it did not shy away from the technical subjects, such as infrastructure systems, roads and road maintenance, automatic lawn sprinklers and irrigation, sanitary and sanitation engineering, seaport design, to name but a few. It followed the educational offerings in the United States and wrote about foreign landscape architectural practice. Its book review section was serious, critical, and good, with a regular inclusion of an international selection of books in German, French, Italian, and even Dutch, thus suggesting an informed, cultivated, and highly educated readership.

Demonstrating a characteristic aggressiveness in claiming new territories for the profession, *Landscape Architecture* covered emerging opportunities for employment. In 1924, an informed article on "Land Reclamation in Holland" thrust the landscape architect into large, land reclamation projects of national scope and importance. Though late, in 1930 Fletcher Steele introduced European modernism in his important article, "New Pioneering in Garden Design" (Steele, 1930), which reported on the 1925 Paris Exposition Internationale des Arts Décoratifs et Industriels Modernes (International Exposition of Modern Decorative and Industrial Arts). Steele not only discussed the latest developments in European (mostly French) garden design, but also gave a mini-discourse on the modernist movement, including art, music, and literature. The article was generously illustrated with photos and plans.

Another example of *Landscape Architecture*'s editorial policy of reporting on new developments and their application to landscape architecture was Frank A. Waugh's January 1931 article, "Ecology of the Roadside," which introduced the ecological basis of landscape planting to the readers. Again, *Landscape Architecture* was somewhat late, Waugh had already broached the subject in his *The Natural Style in Landscape Gardening* of 1917, and *House Beautiful*, between June 1927 and May 1928, had serialized in two dozen articles a 1924 Garden Club of America bulletin on plant ecology written by Edith A. Roberts and Elsa Rehmann. The *House Beautiful* articles were subsequently published in a seminal book with the unthreatening title, *American Plants for American Gardens, Plant Ecology, The Study of Plants in Relation to Their Environment.* (Roberts and Rehmann, 1929). Though Waugh focused on the "roadside ecology" his message was universal, beginning his article with the statement: "Ecology is exciting a growing interest among American landscape architects." He cited the work of Roberts and Rehmann, as well as that of the German Willy Lange (1864–1941), whose *Gartengestaltung der Neuzeit* (New Garden Design) of 1907 was a pioneering work on the subject. The readership of *Landscape Architecture* would have been familiar with Lange as well as with Elsa Rehmann. In 1918 she published *The Small Place: Its Landscape Architecture.* The book featured, in as many chapters, fifteen projects of landscape architects, most of whom were ASLA members.

Less comprehensive in scope, but no less ambitious in its aims, was *American Landscape Architect.* It featured the standard array of articles on irrigation projects, zoological park designs, housing estates, road design, and the like, as well as promoting the image and scope of landscape architect to the lay public. In doing so, *American Landscape Architect* had a keen media-savvy presence. Its advertising—both for itself and for its advertisers—was graphically hip; its format was large and glossy. Moreover, it featured regular editorials charting new areas for the landscape architect to insinuate his practice. One of its preferred areas of focus was airport design, a "new opportunity" where the landscape architect could prove his or her talents (*ALA*, August 1929). In a related topic, an article discussed the application of aerial photography ("airmaps") for city and regional planning (*ALA*, December 1929). Of particular note was an article challenging the profession to use the radio for self-promotion.

As mentioned above, J. B. Jackson's *Landscape* was seemingly at odds with the term "landscape architecture"—if not the professional establishment—though the range of topics covered in his journal would be familiar to any student of the profession. Despite a reluctance to use the term (it did appear on occasion) the range of topics discussed in *Landscape* was impressive. Though primarily a cultural history and human geography journal, it was a pioneer in the discussion of topics that are areas of interest to the landscape architect, including aerial photography, the use of photography in representation, solar energy, farming, folk arts, vernacular architecture, environmental issues, lighting, oceanography, climatology—the list goes on. As impressive was the international scope and roster of authors. It included several articles on, and by members of, the former Soviet Union (and this in the 1950s). Despite a reticence in terminology, no reader of *Landscape* would have mistaken it for a journal devoted to landscape gardening.

Landscape Architecture, American Landscape Architect, and *Landscape* shared a solid professionalism that established a voice (several voices) for the landscape architecture. Perhaps because it was late to begin publication and because it avoided the term "landscape architecture" in its title, *Landscape,* ironically, was the only one of the three journals to avoid ongoing discussions over definitions of the profession. Regularly *Landscape Architecture*, and less regularly, *American Landscape Architect*, published articles defining the profession, what it is, what it is not. Many of these articles were a defense of professional territory, such as articles by Frederick Law Olmsted, Jr. (1870–1957): "Cooperation between Architecture and Landscape Architecture" (*LA,* vol. 2, n. 2, January 1912) and "What is Professional Practice in Landscape Architecture?" (*LA,* vol. 11, n. 3, April 1921). Stephen Child revisited the topic of definitions in his article, "Some Impressions of Landscape Architecture" (*LA*, vol. 3, no. 4, July 1913). Thomas H. Mawson gave a less-than-sanguine perspective on the profession in England in his article "The Retrospect and Prospect of Landscape Architecture in Britain" (*LA,* vol. 7, no. 3, April 1917). A reviewer of O. C. Simonds' *Landscape Gardening* takes Simonds to task for his uniform usage of "landscape gardening" at the expense of "landscape architecture" (*LA,* vol. 11, no. 3, April 1921). Recognizing how far landscape architecture had come in its brief life, Frank A. Waugh writes about the changes the profession has undergone and the new directions it was headed (*LA,* vol. 15, no. 3, April 1925). And in a healthy dose of self-examination, some three decades after the establishment of the ASLA, *Landscape Architecture* published a series of articles of honest critique of the state of the profession, its direction, its future, and its relevance (*LA,* vol. 22, no. 4, July 1932). Fast-forward to 2005, and *Landscape Architecture* is at it again; in April of that year it published a severe criticism of the profession by Heidi Hohmann and Joern Langhorst of Iowa State University, under the heading "Landscape Architecture: A Terminal Case?" The "apocalyptic manifesto" was rebutted by prominent landscape architects who collectively responded: "Hold that Eulogy!"

Landscape architecture, as a profession, came into its own with the design of Central Park by Olmsted and Vaux; for the remainder of the nineteenth century they and a handful of others defined the profession by what they *did.* And they did not do gardening. They designed large urban parks and park systems, regional and national parks, campus plans, suburban communities, as well as estate designs. The profession advanced with the prosperity of the nation, as well as with the problems consequent of such prosperity. The profession saw itself as instrumental in social reform, conceiving and designing clean, green, and beautiful cities and communities. It designed company towns as well as garden cities. City planning was central to landscape architecture until it became a separate discipline itself. Landscape architects were central players in the City Beautiful movement, adapting French Beaux Arts design traditions and planning principles to the American city, street, park, and garden. With changing times, the profession shifted gears. In Depression-era America, it provided the design backbone of the New Deal public works programs. Parkway design became a standard design practice. In post–World War II America, landscape architects road the tide of American prosperity in designing communities for returning veterans and their new families, and "campus" plans for American corporations. In the 1960s, landscape architects were caught up in federally sponsored, disastrous urban renewal projects of urban centers, and thus—unwittingly—became participants in the demise of the great American city.

In the 1930s, James Rose (1910–1991), Dan Kiley, and Garrett Eckbo (to name the most influential) launched a concerted effort to redirect landscape architectural practice to better accord with the social, environmental and technological developments of contemporary life. They were motivated, in part, by

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strong disagreements with the professional establishment whose tenets and practice they perceived as elitist and out of touch with the American middle class. Rejecting the profession's enslavement to Beaux-Arts orthodoxy and a blind submission to Olsmtedian picturesqueness, they integrated modernist ideas current in architecture, favored new materials, and strove to merge indoor and outdoor space in a quest to accommodate a new American domesticity. Less polemical, but no less influential, was Thomas Church (1902–1978) whose work in California found resonance with the design transformations voiced by Eckbo, Kiley, and Rose. Through their efforts, the American middle-class residence was reconceptualized and redesigned.

The appearance of Rachel Carson's *Silent Spring* (1962) was a clarion call to the dangers confronting Mother Earth due to human abuse and negligence. Carson set the stage for a broad public environmental awareness, which soon found a voice in Ian McHarg's fundamental *Design With Nature* (1969). McHarg's book became the clearest, if not most important, theoretical statement on the design and practice of landscape architecture for the next generation of educators and practitioners. His method of establishing environmental and ecological considerations became the basis of landscape architecture and remains the core of much of the professional practice today. McHarg was but the latest—albeit the most important—voice to apply an ecological sensitivity to landscape planning and design. Though he focused on landscapes much larger than the garden, his approach is part of a continuum dating to William Robinson, Willy Lange, O. C. Simonds, Jens Jensen, Wilhelm Miller (1869–1938), and Edith A. Roberts and Elsa Rehmann, among others. Pre-dating McHarg, academic scientists had incorporated ecological applications to landscape design in texts such as W. B. McDougall's *Plant Ecology* (1941) and Henry J. Oosting's *The Study of Plant Communities: An Introduction to Plant Ecology* (1948). McHarg's book reinforces the tendency of the landscape architect to quickly absorb the methods and discourses of other disciplines and apply them to landscape architectural problems.

With Bernard Tschumi's *Parc de la Villette*, landscape architecture entered the postmodern world, thus catapulting the discourse of landscape into a new realm. In the post-industrial, post-Communist and post-capitalist world (whatever that means), landscape architecture today is seldom practiced in a homogeneous space. Rather, landscape architecture, as it begins the twenty-first century, confronts a discursive field where boundaries are fluid, users differ in social status, culture, physical attributes, even religions, and sites are fragmented and indistinct and best defined by obsolescence and degradation, abandonment and ruin, toxicity and decay. They call for reinvention and renewal more so than "new design," utilizing a new set of techniques, approaches, and disciplinary methods, which are yet in the process of revealing themselves. A survey of contemporary practice would show that landscape architecture is not shying away from its historic role of confronting the challenges of the day. Today some approaches are indicated by standard words, recast in the service of landscape architecture. *Process* defines the late twentieth-century works of Hargreaves Associates; *evolutionary*, might best categorize the approach of James Corner's plan for the Fresh Kills Landfill in New York City; *sustainability*—a new buzzword that incorporates McHargian environmentalism with social responsibility—dominates housing and community design. To a certain degree these approaches subsume a scientific approach to the redesign of Mother Earth, one where an ecological basis is part and parcel to the design approach. So it should be, as science has always been a part of landscape architecture. Yet, as perhaps expressed in the contemporary works of Martha Schwartz, the presence of art is unavoidable, indeed it is vital. Thus, after two centuries of existence, Art and Science still predominate the profession that designs exterior space, and that is just as it should be.

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CONSTRUCTION DOCUMENTATION

OVERVIEW OF CONSTRUCTION DOCUMENTATION

BACKGROUND: PURPOSE

Construction documents have several purposes. They communicate technical information necessary to (1) obtain bids for construction, (2) see the project through the building permitting process, and (3) guide construction. In general, construction documents are comprised of construction drawings and specifications. The technical information communicated in the drawings indicates physical location of the improvements proposed for the project, the details of components to be built and installed, and the quantity of design elements. Specifications deal with the standards of quality expected in the construction of the improvements and the procedures to be used throughout the construction process.

LEGAL IMPLICATIONS

Construction documentation is a critical component of the construction contract process and, therefore, has legal ramification. As a matter of fact, construction documents set the scope of what is to be built, standards of quality expected and numerous parameters related to submittals, availability of materials, and timing of installation. All these matters can have far-reaching legal and financial consequences. The documents need to be meticulously and thoroughly assembled so they can prevent and/or resolve any legal disputes between the involved parties.

DESIGN INTEGRITY AND CONSISTENCY

Maintaining consistency with the original design intent is critical in the process of construction documentation. Technical issues in the design process are resolved and documented in the construction documents. During this phase, the landscape architect may lose sight of the original concept. Therefore, it is important to test details and technical solutions for their support of the original intent.

It is important to be aware that design continues through the entire construction documentation and building process. The detailing of walls, steps, planters, and structures is a critical step in the overall design process. The landscape architect needs to be vigilant to ensure that all scales and phases of the project design are internally consistent.

Design consistency also may be compromised during the construction phase of a project. For example, a program manager or subcontractor under the guise of value engineering might suggest materials that depart from the original specifications. Different building techniques or recognition of code constraints can also alter the original concept of the design. These changes need to be accepted or rejected based on how well they conform to the original design intent. The construction documents, if properly executed, will provide appropriate procedures and conditions for considering proposed substitutions.

CONSTRUCTION ADMINISTRATION VERSUS CONSTRUCTION DOCUMENTATION

To ensure design integrity, some landscape architects choose to emphasize construction administration in lieu of more thorough construction document sets. This approach has merit within certain project types and with certain clients. But in competitively bid projects, it has the potential to lead to excessive change orders, leading to excessive project cost overruns.

ROLE OF TECHNOLOGY

As in all other businesses, in landscape architecture, the World Wide Web has become integral to the rapid transfer of information, specifically construction documents. Often, the Web is used to exchange drawings and coordinate with engineers and other consultants. This is useful when design details need updating and changing. Though this is still a relatively new and different approach of interacting in the building/design process, it allows for near-instantaneous means of obtaining new information.

LEADERSHIP IN ENERGY AND ENVIRONMENTAL DESIGN (LEED) IMPLICATIONS

For projects seeking LEED certification, specific calculations and exhibits must be included in initial construction documents and follow-up documentation. For example, in order to achieve a water efficiency credit, the landscape architect has to show how captured rain or recycled site water is being used to reduce irrigation by 50 percent. With this new initiative, the landscape architect needs to document information that is not otherwise required.

CONSTRUCTION DOCUMENT ORGANIZATION

Construction documents are typically organized in two parts: the drawings (often referred to as working drawings or construction drawings) and the project manual (often referred to as just the specifications, or "specs"). The project manual has two sections, the front end documents and the technical specifications. In general, the front end documents stipulate the conditions and terms of the contract. The technical specifications complement the front end documents by establishing the quality of materials and procedures to be used in the project implementation.

ROLE OF PROJECT SCALE AND COMPLEXITY

The organization and depth of information detailed in the construction documents are dependent on the scale and complexity of the project to be built. For example, a relatively small and straightforward single-family residential landscape could be documented entirely in three drawings, without a separate specifications book. In this case, all specifications may be embedded directly in the drawings. The hardscape design could be integrated with the layout plan, and the planting plan could be combined with planting details and a plant schedule with planting notes. In contrast, a project for a major urban public park may contain a number of water features, active recreation areas, vehicle and pedestrian zones, and service areas. This would require a detailed set of drawings, which are properly indexed. In addition, a separate project manual fully detailing all aspects of the conditions of the contract, material specifications, and installation requirements would be necessary. However, regardless of project scale and complexity, the construction documents must present a complete package of the information required to bid and build the project while protecting the client's and public's interests in terms of health, safety, and welfare.

DRAWING/SPECIFICATIONS COORDINATION GUIDELINES

A primary rule to observe in coordinating drawings and specifications is to avoid duplicating information. If a material is described in the specification manual, then a notation of that same detail should not appear on the drawings. The inverse is also true: Information from drawings should not be stated in the specification manual. This is illustrated by the following example: If a project calls for 4×8 brick pavers of a particular color and manufacturer, the drawings should only state "4×8 brick paver," with no added detail. Additional information would then be referenced in the specification manual. Following this rule can avert problems during design and construction. If a change is required, the landscape architect need only alter the drawings or specifications in one place, minimizing errors and confusion. Typically, if there is a conflict in the information stated in the specifications and the drawings, the specifications will govern.

When a landscape architect works in coordination with other professionals, clarity must be maintained in the construction documents. For example, if a civil engineer is grading for drainage, the size, location, and type of drainage outlets must be consistent with the work of the landscape architect. Additionally, elements such as steepness of grades need to be carefully implemented to maintain the overall design intent of the project.

Care must also be taken within the firm or when working with other landscape architects. A typical challenge is ensuring accuracy when changing scales from working on the overall plan to the detail plan and detail section scale. Fine-tuning decisions need to be made at that point, and these can have a major impact on the final design. Therefore, the detail decisions have to be harmonious with the larger design scheme.

Leonardo Alvarez, ASLA, AIA, EDAW

QUALITY ASSURANCE

Quality assurance (QA) is a process intended to minimize errors and omissions and ensure that a project receives the highest standard of technical accuracy and thoroughness in relationship to the preparation of construction documents. This often involves a clear set of guidelines and checklists, as well as an accepted protocol for conducting the QA review. Most typically, the QA review is performed by a third party, such as an individual who is objective and has not worked on the project to be reviewed. It is highly recommended that all landscape architects institute a QA process for review of construction documents as a part of their adopted practice procedures. The preparation of a QA manual can codify these procedures and, at a minimum, should include the following:

- General protocol outline
- Timing of third-party review
- List of standards to be observed (CADD, drawings, scales, etc.)
- Contract document checklists (drawings and specifications)
- List of common problems encountered

ROLE OF SHOP DRAWINGS

Despite the thoroughness and level of detail included in a good set of construction documents, not everything can be fully detailed for implementation. Shop drawings are also usually required. Shop drawings are precisely what they imply: drawings prepared by the "shop" or manufacturer of a particular item to be installed in the project. Shop drawings are typically prepared for all manufactured items specified, such as railings, site furnishings, fountain equipment, and custom light fixtures. In preparing details in a construction document set, it is important to be aware of what should be indicated in the landscape architect's own details and what will be detailed in the shop drawings.

ROLE OF RECORD DRAWINGS

Record drawings document changes that have occurred during the construction process. These may or may not be in the scope of a typical project. The terms "record drawings" and "as-built drawings" are sometimes used interchangeably. However, the term "as-built" is being used less often in contracts due to the fact that it has been used against engineers, architects, and landscape architects in court. The legal interpretation of the term "as-built" may be taken more literally, to mean that an as-built drawing should contain absolutely everything as it was built—or exists—in the field. In contrast, a record drawing seems more likely to be interpreted as a record of all changes that occurred in the field and that are documented through change orders, addenda, or contractor/consultant drawing markups. In order to minimize exposure and liability, it is highly recommended that all landscape architects consult with an attorney on the matter of record drawings prior to executing contracts that contain either of these terms.

CONCLUSION

Construction documentation is at the core of landscape architectural practice. It is essential that construction documents be thorough and accurate, as they can determine the success or failure of a project. All changes need to be noted for future reference. And it is prudent to institute a review process for the construction document process to ensure a high-quality product.

CONSTRUCTION DRAWING LAYOUT

INTRODUCTION

The organization and format of drawing packages is a critical element in the professional preparation of construction documents. Early on, the order drawings will appear in a set of construction documents should be determined and distributed to everyone involved in the production process. Most firms have established a standard by which to sequence the documents in a package, by discipline, and then within those disciplines as well. This organization may also be mandated by certain clients, who may have a standard process and expect to see the drawings in a particular progression. The method presented in this chapter is a frequently encountered system for construction document layout.

NAMING AND NUMBERING DRAWINGS

Before the drawings can be organized, they have to be named and numbered in a logical manner. The diagram presented here shows a typical drawing-naming standard, and explains the importance of each letter and number in that name.

DRAWING ORGANIZATION

Once the drawings are named, they can be put in order. In all cases, the package setup goes from general and nonspecific information to highly detailed and specific information. A good way to approach this is to put yourself in the contractor's shoes and imagine how you would go about understanding what the project is all about. The package should start by explaining the project location, name, owner's name, and so on—all of this information can be contained on the cover page. Next, the package should explain how the documents are organized and how to read the symbols included in the package, as well as all of the general notes that apply to the entire project. When all of this information is explained, you are ready to begin documentation of the design. Once again, the information in the package should be ordered from the general (large-scale level) down to small-scale details. Starting with overall plans and working through to the individual details, the package organization should be clear and consistent. Remember, the goal is to explain the design intent as efficiently as possible.

In addition to the preceding, the organization of the package is also loosely based on the order of construction of the project. When the contractor installs the project, the hardscape elements will generally be installed first. Thus, the package should present the hardscape plans before the landscape plans. The information is easier to understand in this order—imagine how hard it would be to understand a project if the first drawings were covered with the planting graphics necessary to explain the landscape installation, ahead of the grading, layout, and hardscape information.

The index presented here is a typical representation of the order of drawings in a package.

Sheet	Contents
G-001	Cover
L-001	Sheet Index
L-002	Notes and Legends
LS101	Site Plan
LS201	Site Elevations
LS301	Site Sections
LS401	Site Plan Enlargement
LS501	Hardscape Details
LP101	Planting Plan
LP401	Planting Plan Enlargement
LP501	Planting Details
LP601	Plant Schedule

In many cases, the package will include not only the landscape architectural drawings, but also other disciplines, such as architecture; civil engineering; structural engineering; mechanical, electrical, and plumbing engineering (MEP); and so on. The presentation of this information follows the same pattern as above, general to specific, and the drawing order follows the order of construction. For example, for a project with all of the professionals listed above, the following discipline order may most efficiently explain the information:

Civil engineering
Landscape architecture
Architecture
Structural engineering
MEP

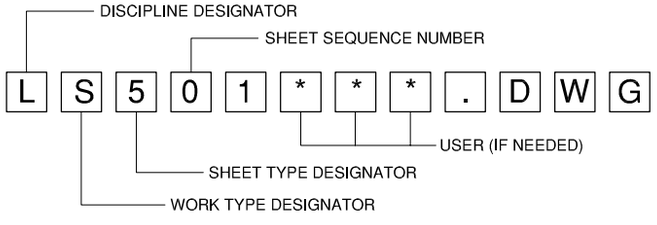
The prime consultant is responsible for establishing and distributing this information to the entire team. This should be done as early in the construction documentation process as possible.

Drawing Layout

The individual drawings in a package should always have a few basic elements that guide their interpretation, such as the title block, a scale, a north arrow, a key map (if needed), a legend, and so on. This information should be standardized for the project.

DRAWING CHECKLIST

Many firms will have established checklists to aid in the creation of construction documents. These checklists should be referenced frequently and are a great source of valuable information.



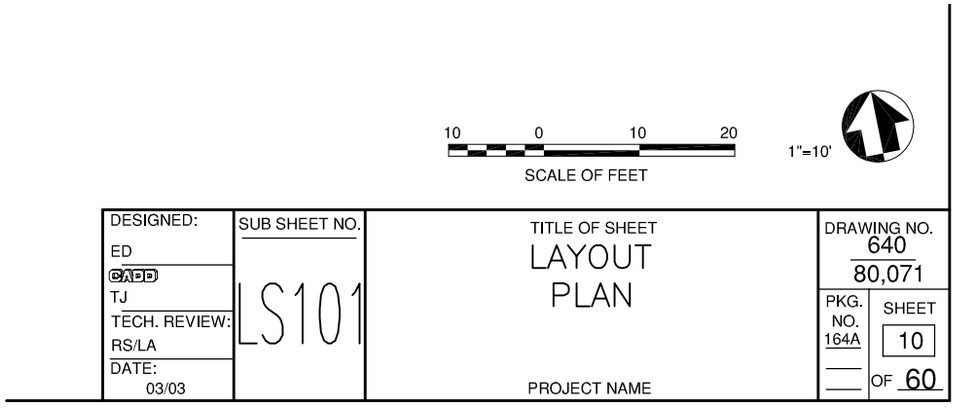
DISCIPLINE DESIGNATIONS	
G	GENERAL
H	HAZARDOUS MATERIALS
C	CIVIL
L	LANDSCAPE
S	STRUCTURAL
A	ARCHITECTURAL
I	INTERIORS
Q	EQUIPMENT
F	FIRE PROTECTION
P	PLUMBING
M	MECHANICAL
E	ELECTRICAL
T	TELECOMMUNICATIONS
R	RESOURCE
X	OTHER DISCIPLINES
Z	CONTRACT OR SHOP DRAWINGS

WORK TYPE DESIGNATIONS	
S	HARDSCAPE
I	IRRIGATION
P	PLANTING
L	LIGHTING
G	GRADING
D	DEMOLITION
R	RELOCATION

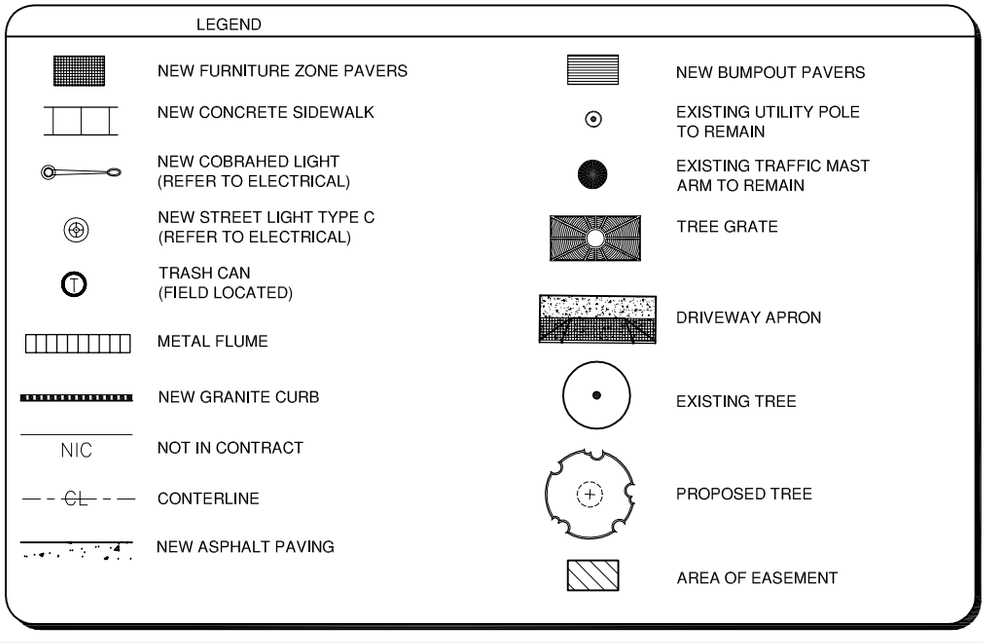
SHEET TYPE DESIGNATIONS	
0	GENERAL (SYMBOLS LEGEND, NOTES, ETC.)
1	PLANS (HORIZONTAL VIEWS)
2	ELEVATIONS (VERTICAL VIEWS)
3	SECTIONS (SECTIONAL VIEWS)
4	LARGE-SCALE VIEWS (ENLARGEMENT PLANS, ELEVATIONS OR SECTIONS THAT ARE NOT DETAILS)
5	DETAILS
6	SCHEDULES AND DIAGRAMS
7	USER-DEFINED
8	USER-DEFINED
9	3D REPRESENTATIONS (ISOMETRICS, PERSPECTIVES, PHOTOGRAPHS)

CONSTRUCTION DOCUMENT DRAWING NAMING FORMULA, FROM A TYPICAL OFFICE STANDARD

Thomas Jones, RLA, EDAW



TYPICAL CONSTRUCTION DOCUMENT TITLE BLOCK



SAMPLE CONSTRUCTION DOCUMENT LEGEND

GRAPHICS GUIDELINES

- ☐ Always draw to scale and label drawings as such.
- ☐ Use consistent scale among like details, e.g., all pavements at the same scale.
- ☐ Use common architectural scales
- ☐ Dimension on left; note on right.
- ☐ Use standard material designations; bleed judiciously.
- ☐ Use bold outlines around object in section.
- ☐ Draw object lines medium lineweight; dimension, extension, notation leaders fine lineweight.
- ☐ Align details vertically, including dimensions, object, and notes.
- ☐ Align details horizontally where possible.
- ☐ Keep details, detail enlargements, etc., of a given object or element on the same sheet when possible. This is especially important for a unique element that may be a subcontract, e.g., a garden structure.
- ☐ Always draw typical details first; when drawing unique details, refer back to typical detail note or callout. Do not redraw details.
- ☐ Use standard orthographic projection standards for three-dimensional details with plan on top, section under; elevation to the right. (A detail such as this is considered one detail—not three—in terms of callout designation.)
- ☐ For symmetrical structures, use half-plans and half-garden sections for economy and clarity. For example, on a garden structure, the left half may show the framing plan of the roof, while the right side may show the paving pattern on the floor.

TYPICAL CONSTRUCTION DOCUMENT GRAPHICS CHECKLIST

OVERALL DRAWING GUIDELINES

- ☐ Show only what you have to show to build your designs—nothing more, nothing less.
- ☐ Draw all plans at the same scale and orientation.
- ☐ Show the correct information the least number of times. Once is best.
- ☐ Don't draw any other discipline's work except to reference it.
- ☐ Use consistent terminology through the drawings and specifications.
- ☐ Don't draw at large scale what you can draw at a small scale.
- ☐ Don't draw at all what you can note, e.g., catalog items.
- ☐ Don't note what you can spec.
- ☐ Don't label what you can symbolize.
- ☐ Where possible, combine elements, e.g., layout, grading to minimize sheet count.
- ☐ Always proceed from general to specific, large to small, plan to elevation to section.
- ☐ Minimize the use of match lines.
- ☐ Maximize the use of enlargements.
- ☐ Only enlarge if enlargement is two to three times as big as original. Make sure that the enlargement area carries all the content, so that it is not repeated at the smaller scale.
- ☐ Coordinate with utility locations and actual sizes of utility appurtenances.

TYPICAL DRAWING CHECKLIST FOR CONSTRUCTION DOCUMENTS

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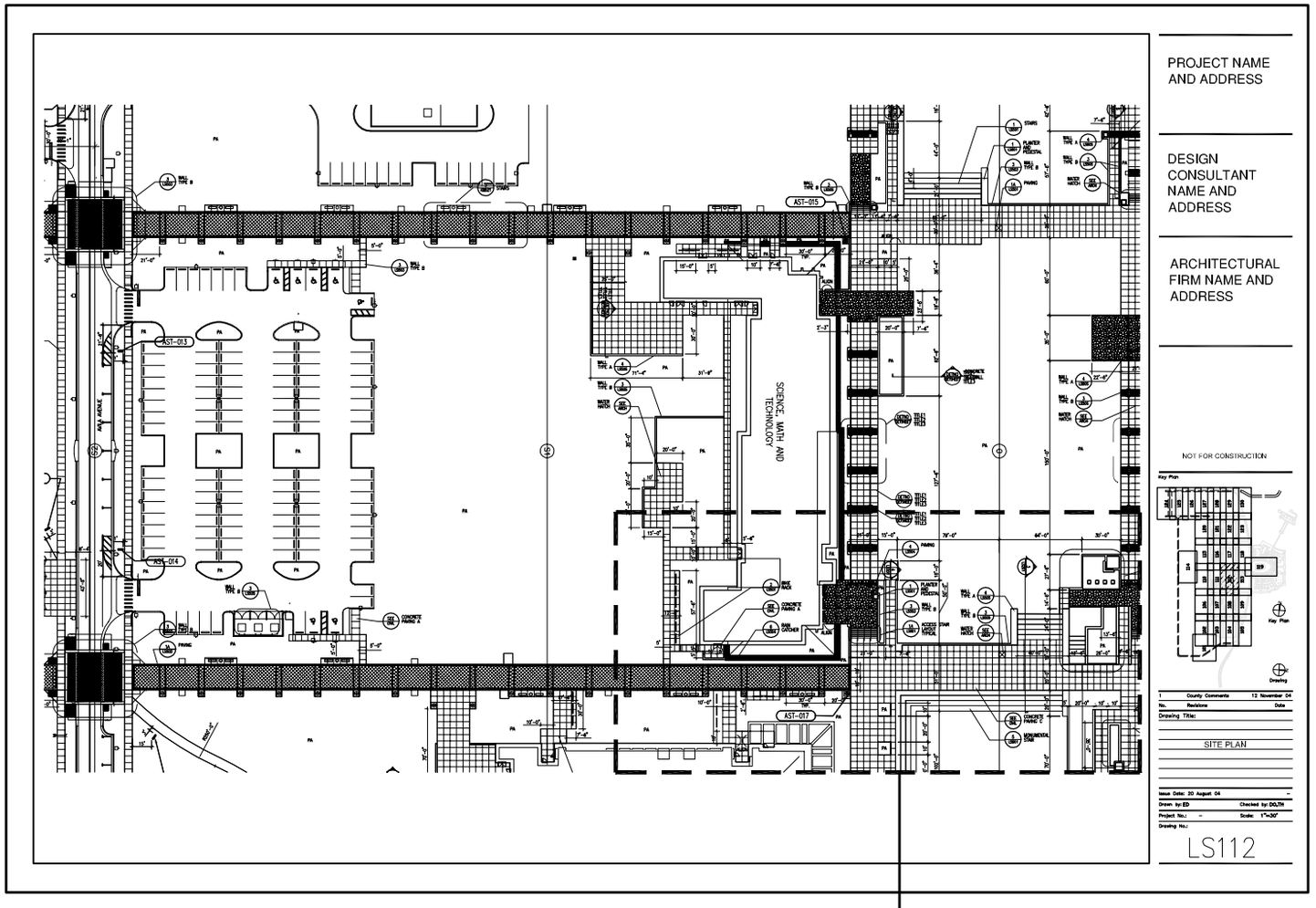
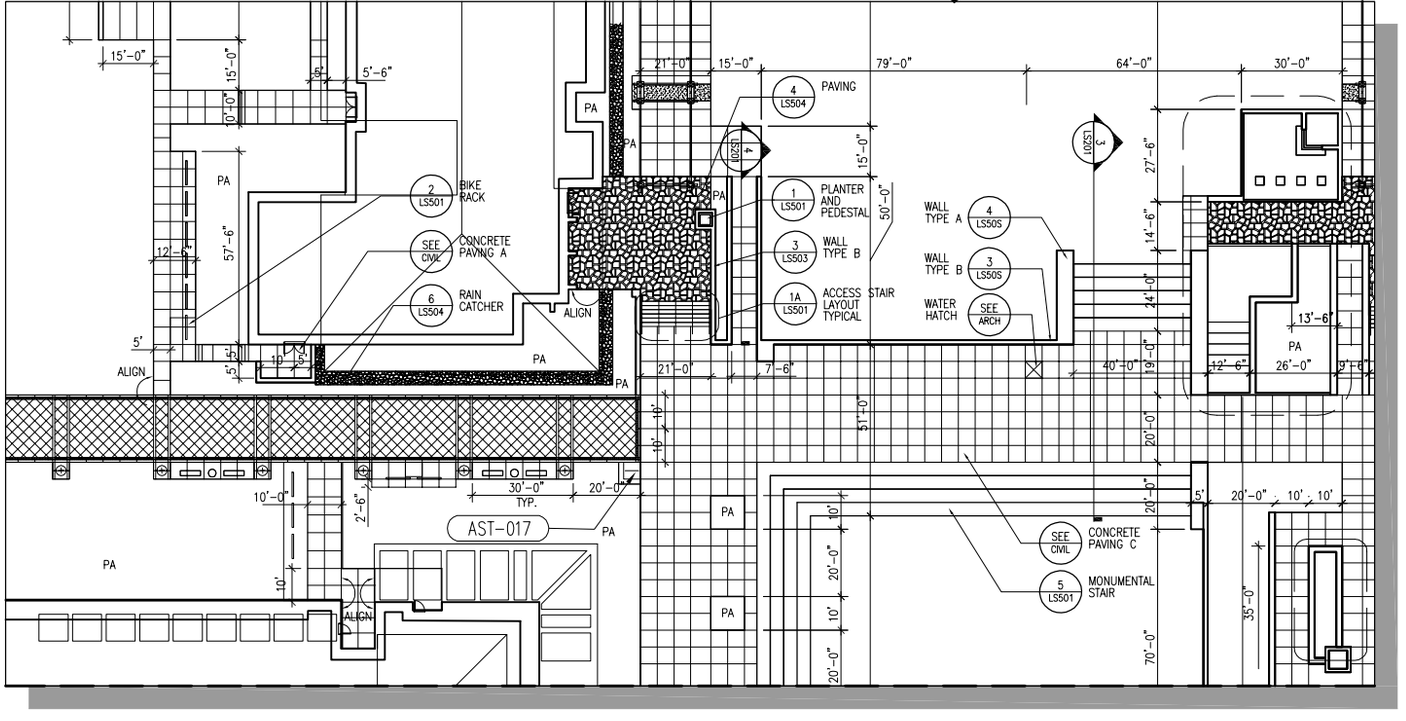
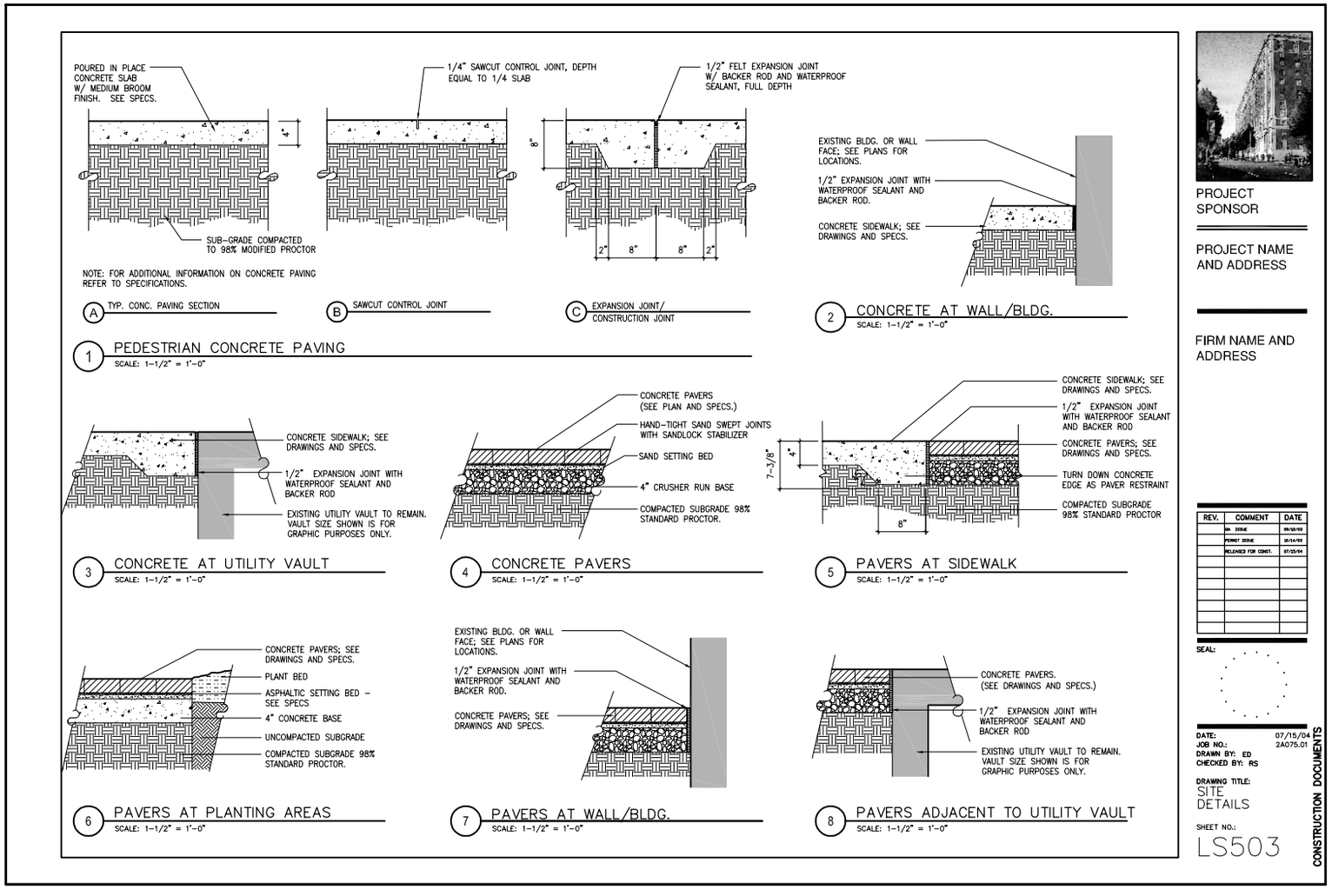




TYPICAL CONSTRUCTION DOCUMENT SITE PLAN

Thomas Jones, RLA, EDAW

PART I PRACTICE OF LANDSCAPE ARCHITECTURE



TYPICAL CONSTRUCTION DOCUMENT DETAIL SHEET

STANDARD ABBREVIATIONS

The list presented here represents most of the typically encountered abbreviations used in a set of construction documents. All of the abbreviations used in documenting a project should be listed with their meanings at or near the beginning of the package.

Standard Abbreviations

A

- Alum = Aluminum
- Ac. = Acres
- A.C.C.M.P. = Asphalt-coated corrugated metal pipe
- A.C.P. = Asbestos cement pipe
- Approx = Approximate

B

- B&B = Balled and burlapped
- B.C. = Bottom of curb
- Bit. = Bituminous
- B.M. = Benchmark
- Bldg. = Building
- B.S. = Bottom of slope
- B.V.C. = Beginning of vertical curve
- B.W. = Both ways

C

- Cal. = Caliper
- C.B. = Catch basin
- C.I. = Cast iron
- Cir. = Circular
- CL = Centerline
- C.L.F. = Chain-link fence
- C.O. = Cleanout
- Cm = Centimeter
- C.M.P. = Corrugated metal pipe
- Col. = Column
- Conc. = Concrete
- Cont'r = Contractor
- Cor. = Corner
- C/S = Cross slope
- C.F. = Cubic feet
- C.Y. = Cubic yard

D

- D = Degree of curvature
- Det'l = Detail
- D.M.H. = Drop manhole
- D.F. = Drinking fountain
- Dim. = Dimension
- Dia. = Diameter
- Dwg. = Drawing
- Dep. = Departure
- Dir. = Directed

E

- —E— = Electrical
- E = East
- Ea = Each
- E.C. = Electrical contractor
- El. = Elevation
- E.A.P. = Exposed aggregate paving
- E.V.C. = End of vertical curve
- Engr. = Engineer
- Exist. = Existing
- Exp. = Expansion
- E.W. = End Wall
- E.S. = End Section

F

- F.F. = Finished floor elevation
- F.G. = Finished grade
- Fin. = Finish

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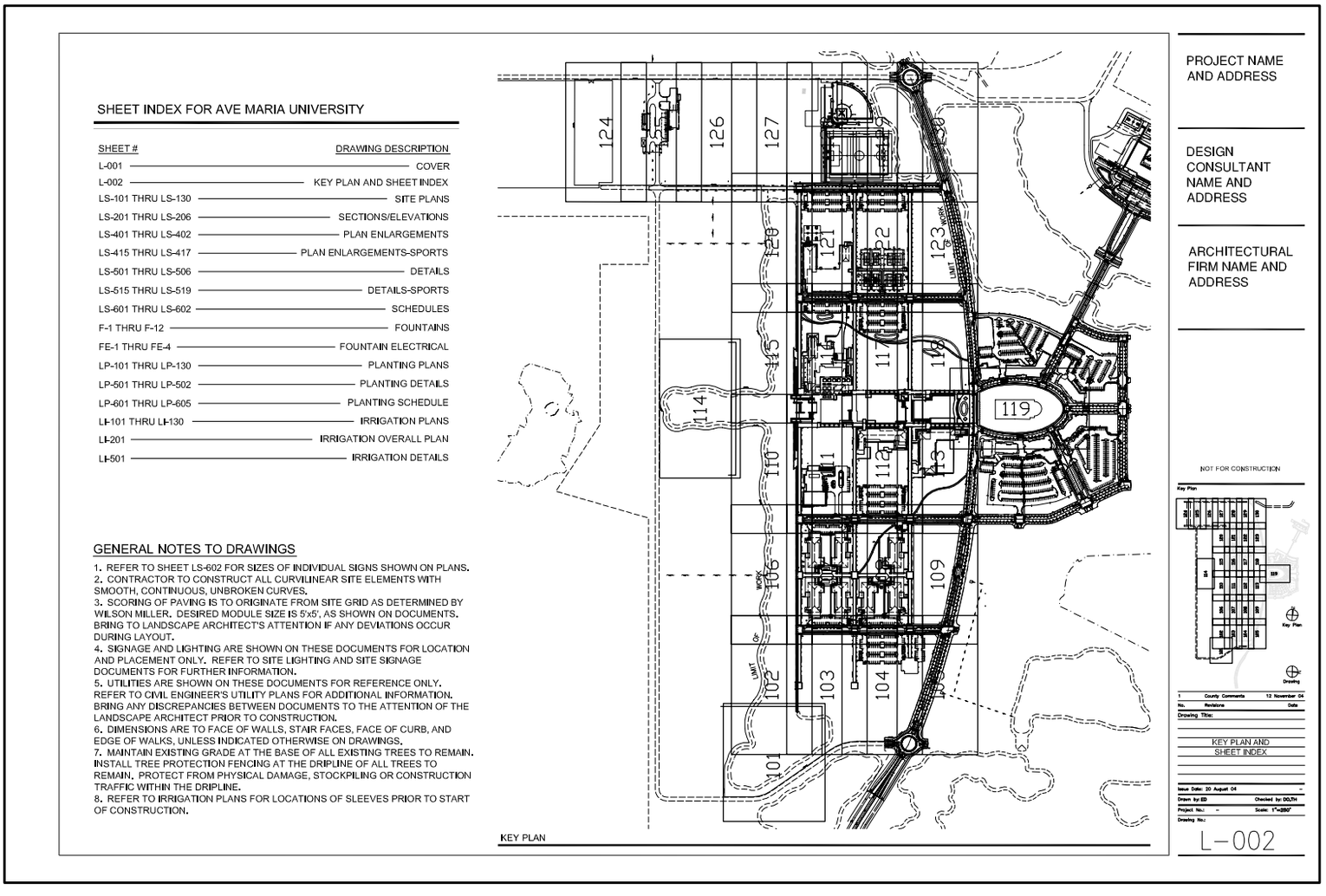


TYPICAL CONSTRUCTION DOCUMENT SHEET INDEX AND SHEET LOCATOR KEY MAP

Fl. = Floor
F.H. = Fire hydrant
F.L. = Flow line
F.S.D. = Full-sized detail
Ftg. = Footing
FT. = Foot or feet

G

Ga. = Gauge
—G— = Gas
Gal. = Gallon
Galv. = Galvanized
G.C. = General contractor
G.R. = Guard rail
Gd. = Grade
G.V. = Gas valve

H

HB = Hose bib
HW = Head wall
H.P. = High point
Ht. = Height
Hor. = Horizontal
Hwy. = Highway

I

I.D. = Inside diameter
In. = Inch
Inl. = Inlet
Inv. = Invert

J

J.B. = Junction box

L

L = Length of curve
Lat = Latitude
L.P. = Low point
Lt. = Left
Lin. = Liner
L.F. = Linear feet
L.C. = Landscape contractor
L.A. = Landscape architect

M

M = Meter
Max. = Maximum
M.H. = Manhole
Min. = Minimum
Misc. = Miscellaneous
Mon. = Monument

N

N = North
N.I.C. = Not in contract
N.T.S. = Not to scale
No. = Number
Nom. = Nominal dimension

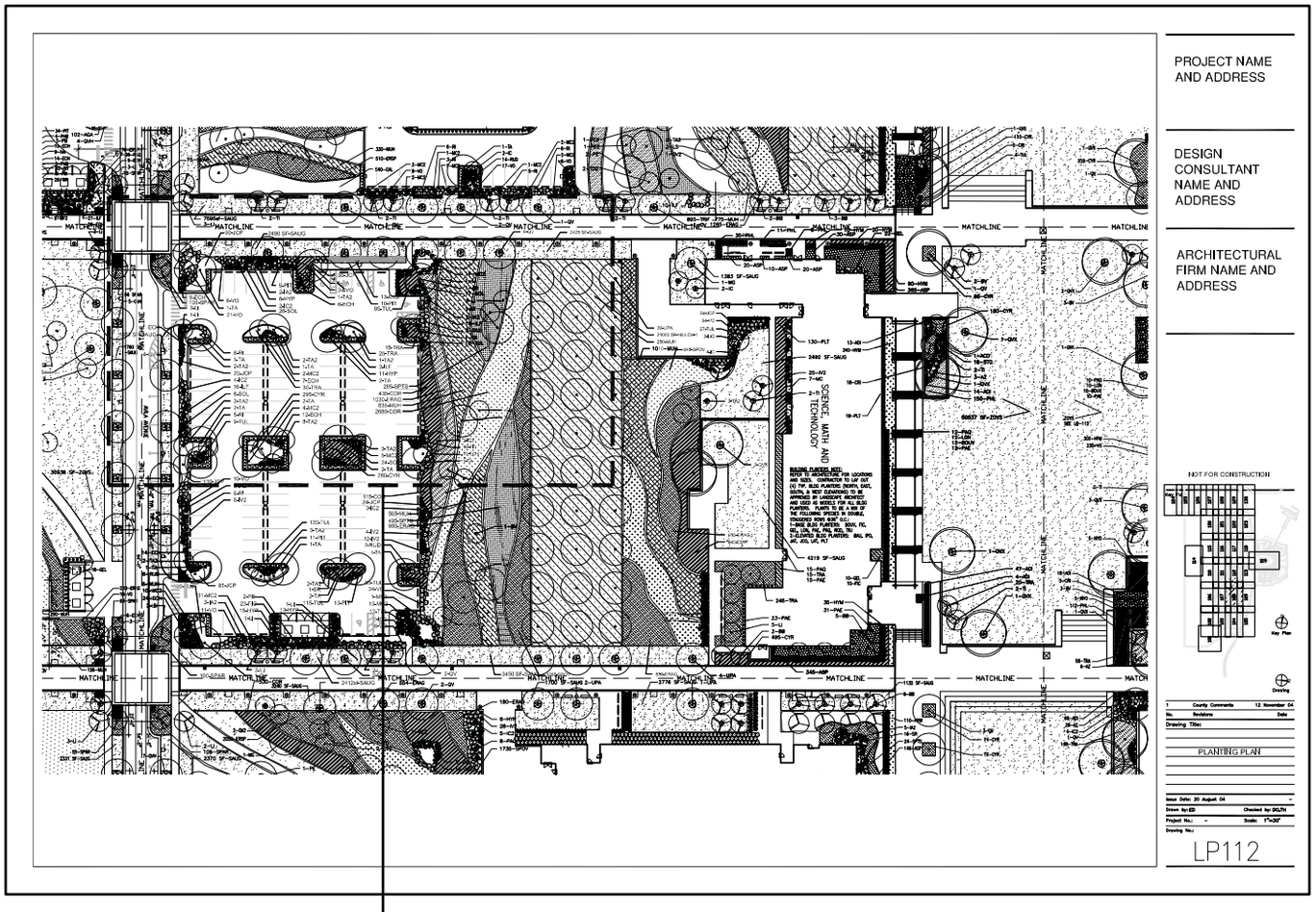
O

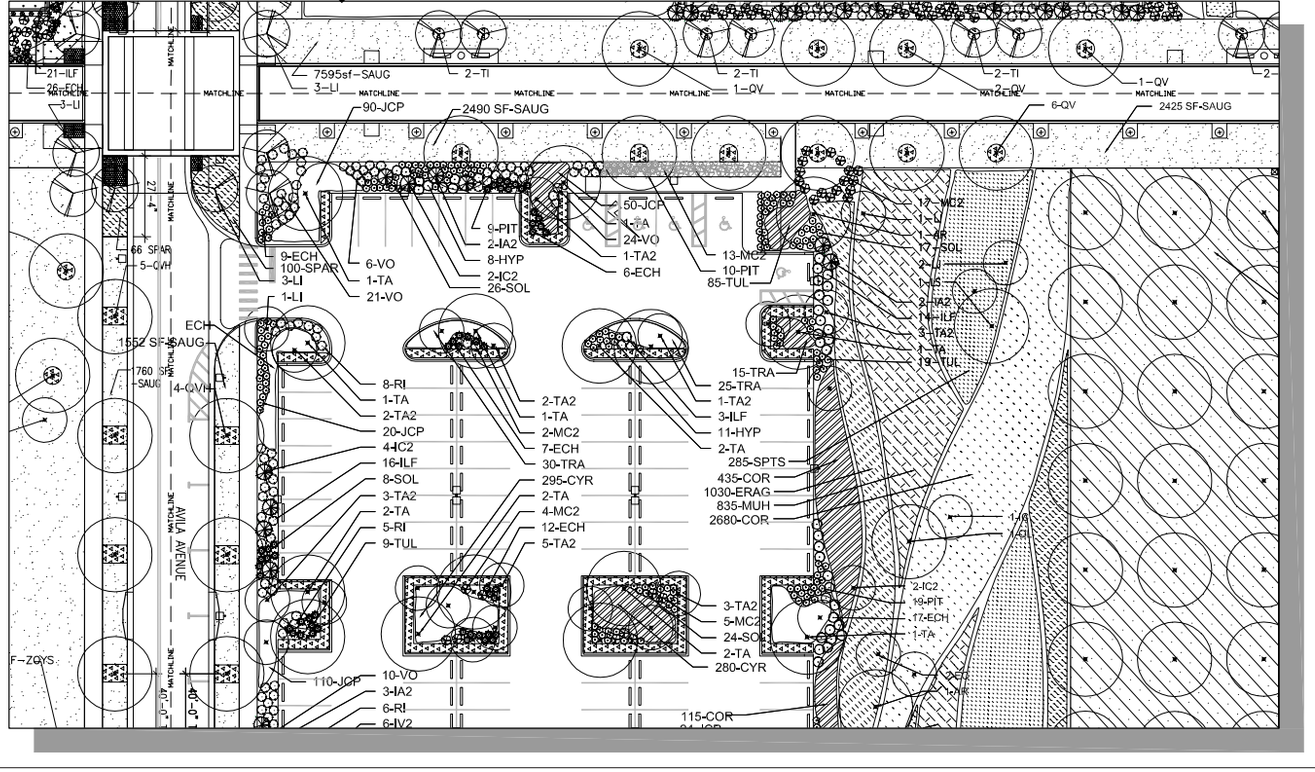
O.C. = On center
O.D. = Outside diameter

P

P.A. = Planting area
P.C.P. = Porous concrete pipe
P.V.C. = Polyvinyl chloride pipe
Pc. = Piece
P.C. = Point of curvature
P.C.C. = Point of compound curvature
PL = Property line
P.V.C. = Point of vertical curvature
P.V.T. = Point of vertical tangent
PT = Point of tangent

Thomas Jones, RLA, EDAW





TYPICAL CONSTRUCTION DOCUMENT PLANTING PLAN

Thomas Jones, RLA, EDAW

R

R = Radius
R.C.P. = Reinforced concrete pipe
R.O.W. = Right of way
Rt. = Right
Req'd = Required
Rev. = Revision
Reinf. = Reinforcing

S

San. = Sanitary
Sect. = Section
Sh. = Sheet
S = South
S.I. = Storm inlet
—ST— = Storm sewer
—SAN— = Sanitary sewer
Spec. = Specifications or Specified
St'l = Steel
Sq = Square
S.F. = Square foot
S.Y. = Square yard
Sta. = Station
S/S = Stainless steel

T

—T— = Telephone
T = Tangent
T.C. = Top of curb
T.E. = Tapered end
T.C.P. = Terra-cotta pipe
T.&G. = Tongue and groove
T.W. = Top of wall
T.S. = Top of slope
Twp. = Township
Typ. = Typical

U

U.D. = Underdrain
U.S.G.S. = U.S. Geological Survey

V

V.C. = Vertical curve
Var. = Varies, variable
Vert. = Vertical
V.C.P. = Vitrified clay pipe

W

—W— = Water
W = West
W/ = With
W/O = Without
W.W.M. = Woven wire mesh
W.V. = Water valve

XYZ

Y.D. = Yard drain

Miscellaneous

■ = Square
Ø = Round diameter
@ = At
′ = Feet
″ = Inches
#1 = Number
1# = Pound

SYMBOLS

INTRODUCTION

The goal of a set of construction documents is a successfully built project. One of the steps toward reaching this goal is the production of clear, efficient drawings that communicate the design intent and construction detailing of the various elements of the project. These drawings will always be more meaningful and more easily understood when symbols are carefully chosen and placed.

STANDARDS

Most users will follow industry standard materials symbols in the creation of their drawings, such as the stipple-and-triangle pattern that is known universally as concrete. There are also standard construction document package symbols, such as the detail reference symbol. These standard symbols form the basis for any discussion of this type and should always be kept accessible, either in the form of a drafting manual or an office graphics standard.

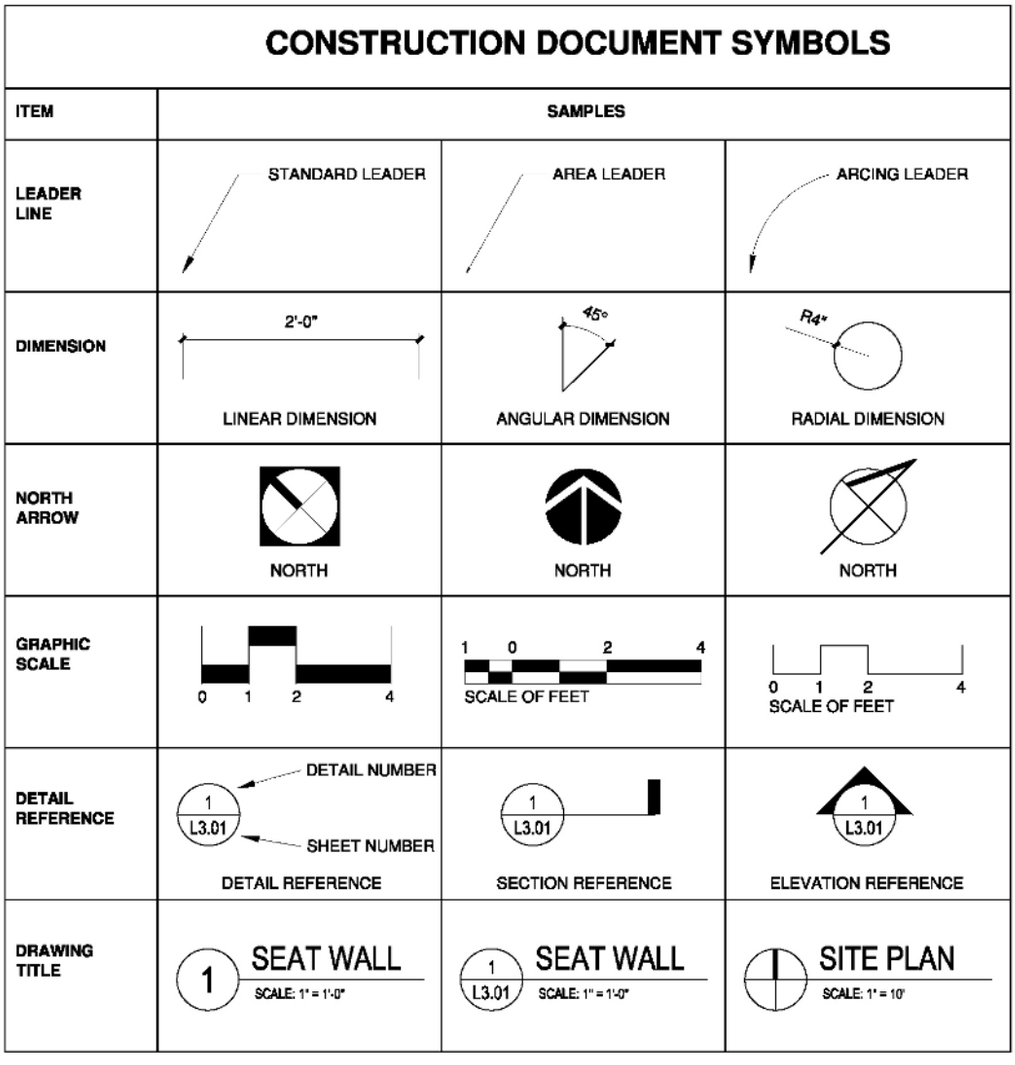
COMMON PROBLEMS

Some common problems and solutions to be aware of when working with symbols are presented here:

1. Always be aware of the scale of the drawing, and use this to test symbols for clarity. For example, if the drawing being produced is at a scale of 1/4″ = 1′-0″, a pattern that represents brick pavers can be drawn at their actual size, whereas at 1″ = 50′ that same pattern would be a solid, meaningless block on the drawing.
2. Always visually test symbols with each other at the scale of the drawing. For example, a tree symbol that worked on a rendered plan may be far too detailed to use alongside less detailed construction document symbols. Adjust the symbol, or use another, more appropriate one.
3. When creating plant symbols, be aware of the size and spacing of the plant. For example, a tree symbol in plan and section/elevation should be shown at two-thirds of its mature size, whereas a shrub symbol for equally spaced shrub planting should be drawn at a size that equals the installed spacing of the shrubs.
4. Remember that clarity is the key to symbol effectiveness, and the goal is to communicate the design intent, not to draft the most elaborate symbols. Include only enough detail to relay the necessary information.
5. Consider the stage of the project when choosing and/or creating symbols. For example, a symbol used in the schematic design phase may or may not be appropriate for the construction documents.

CONSTRUCTION DOCUMENT, HARDSCAPE MATERIALS, AND LANDSCAPE MATERIALS SYMBOLS

The figures “Construction Document Symbols,” “Hardscape Materials Symbols,” and “Landscape Materials Symbols” contain sample symbols for construction documents packages and hardscape and landscape elements. These lists are by no means exhaustive; rather, it is intended to show some possibilities and provide some guidelines for users to create their own library.



CONSTRUCTION DOCUMENT SYMBOLS

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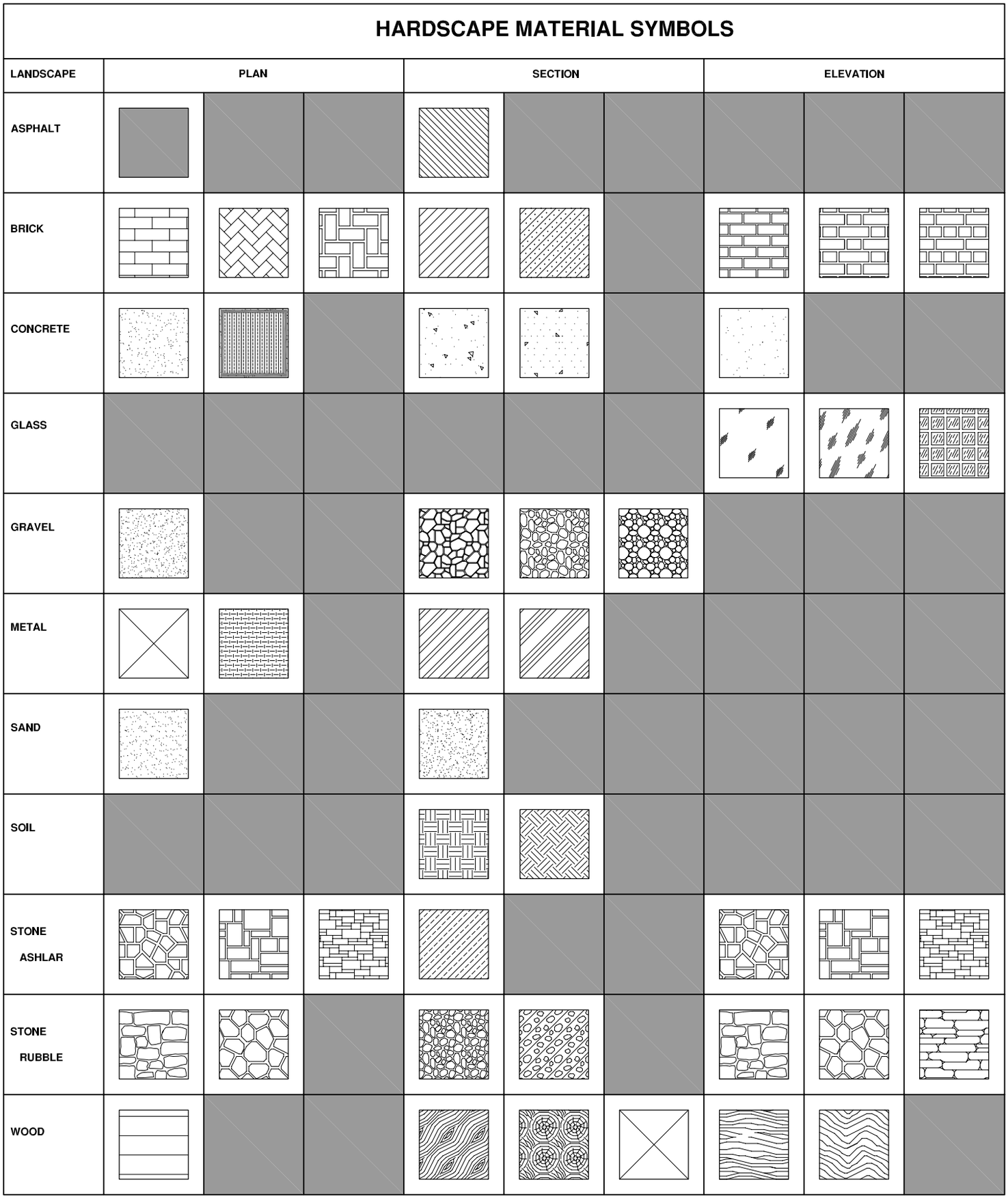
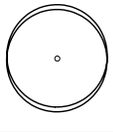
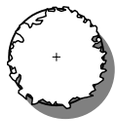
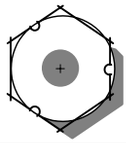
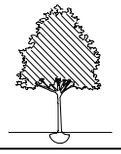
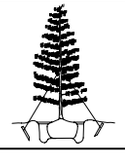
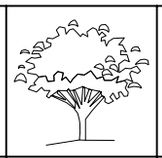
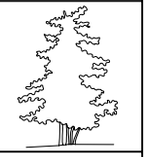
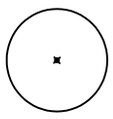
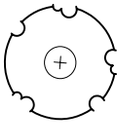
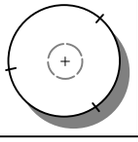
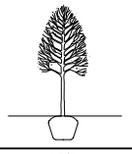
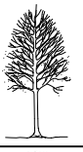
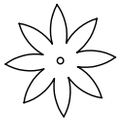
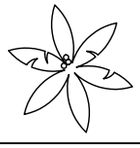
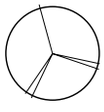
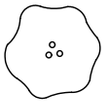
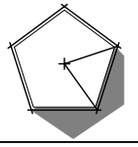
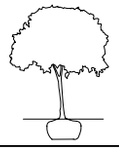
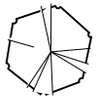
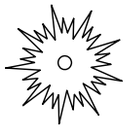


HARDSCAPE MATERIAL SYMBOLS

Thomas Jones, RLA, EDAW; Leonardo Alvarez, ASLA, AIA, EDAW; Cladie Washburn, ASLA, EDAW

LANDSCAPE MATERIAL SYMBOLS

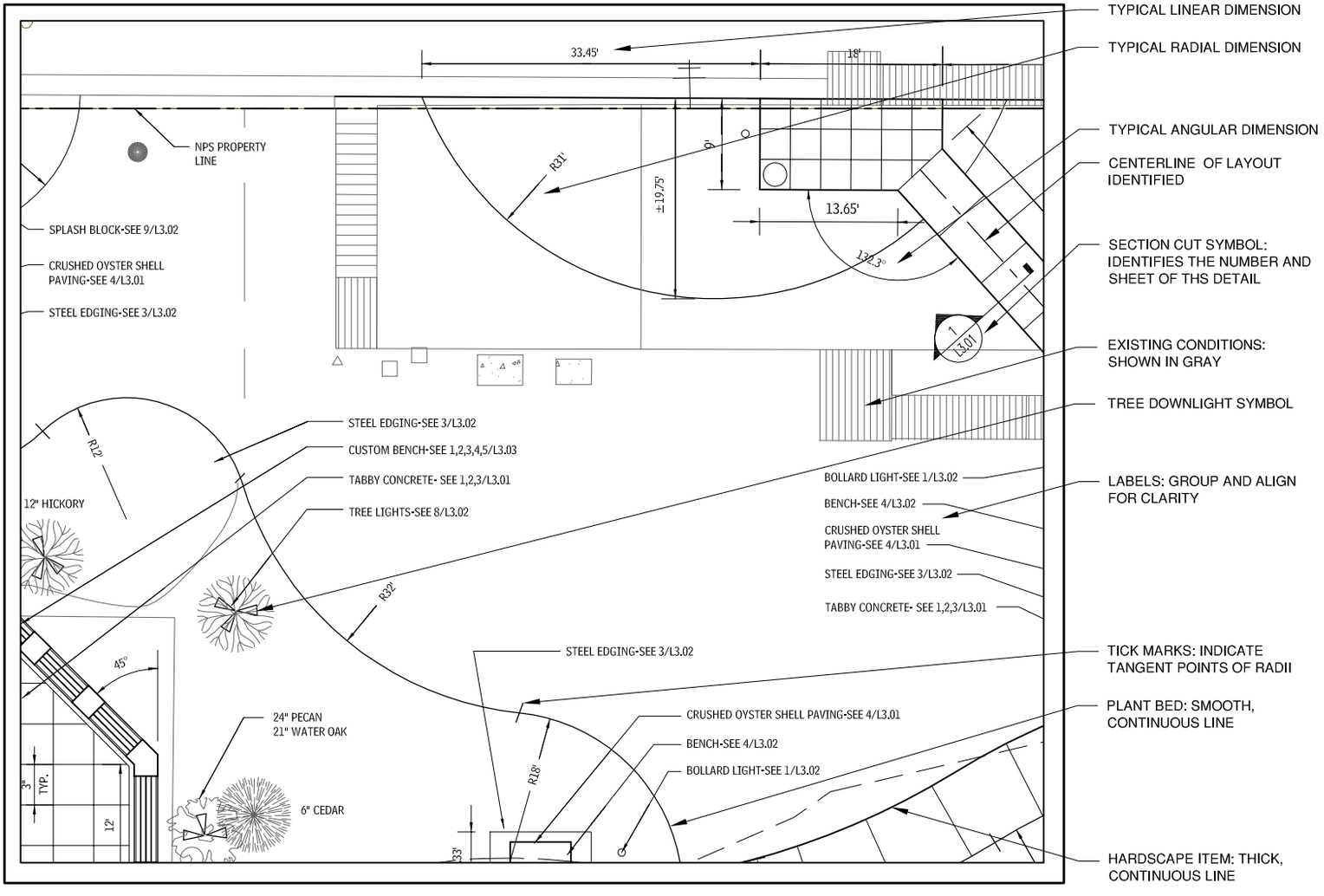
LANDSCAPE	PLAN			SECTION			ELEVATION		
TREE SPECIMEN									
TREE CANOPY									
TREE PALM									
TREE FLOWERING/ MULTI-TRUNK									
SHRUB EVERGREEN									
SHRUB DECIDUOUS									
SHRUB MASS									
ORNAMENTAL GRASS									
GROUNDCOVER BED									
TURF									
WATER									

LANDSCAPE MATERIAL SYMBOLS

Thomas Jones, RLA, EDAW; Leonardo Alvarez, ASLA, AIA, EDAW; Cladie Washburn, ASLA, EDAW

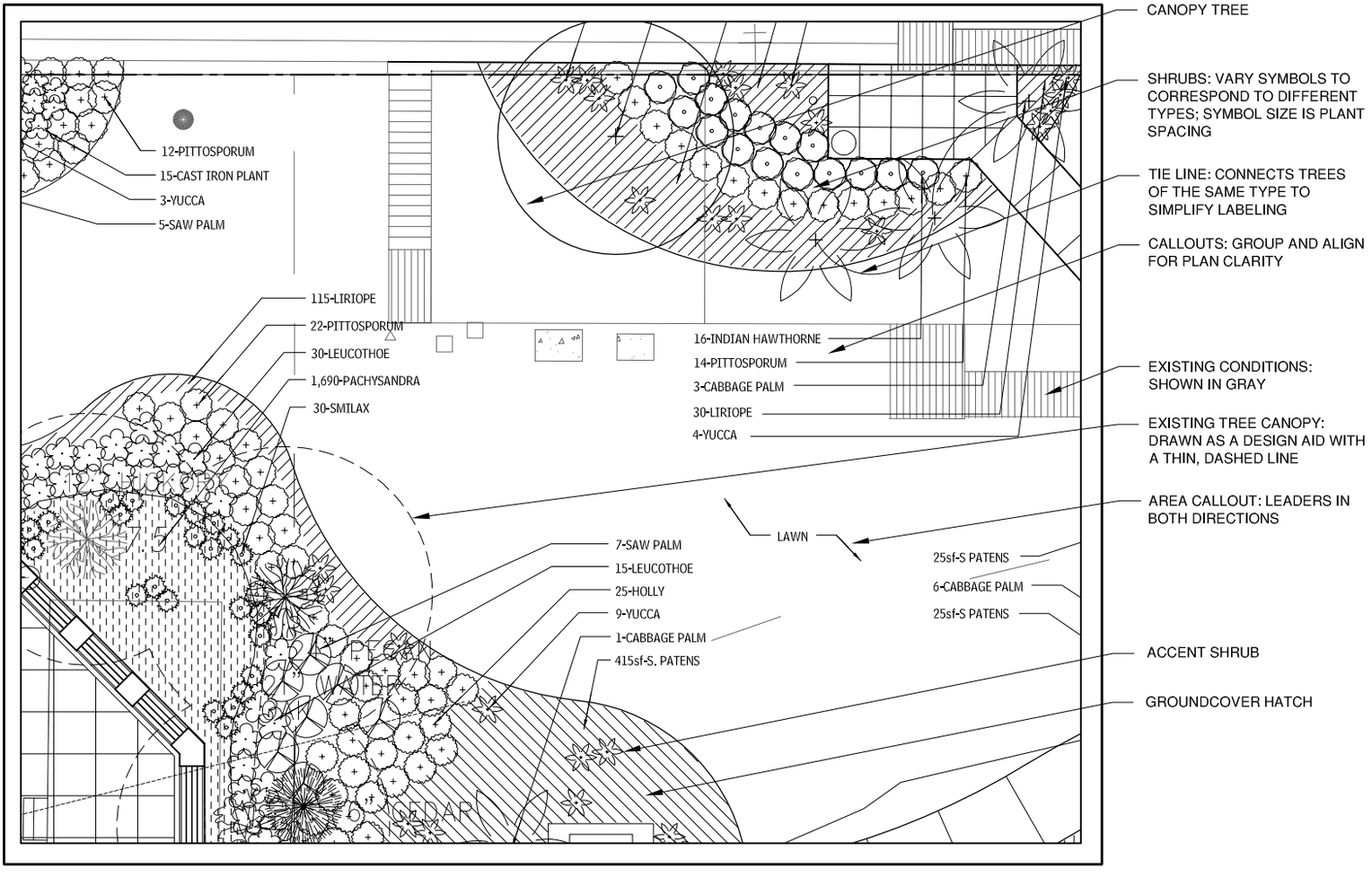
SAMPLES

The following drawing samples are provided to illustrate symbol usage in construction documents.

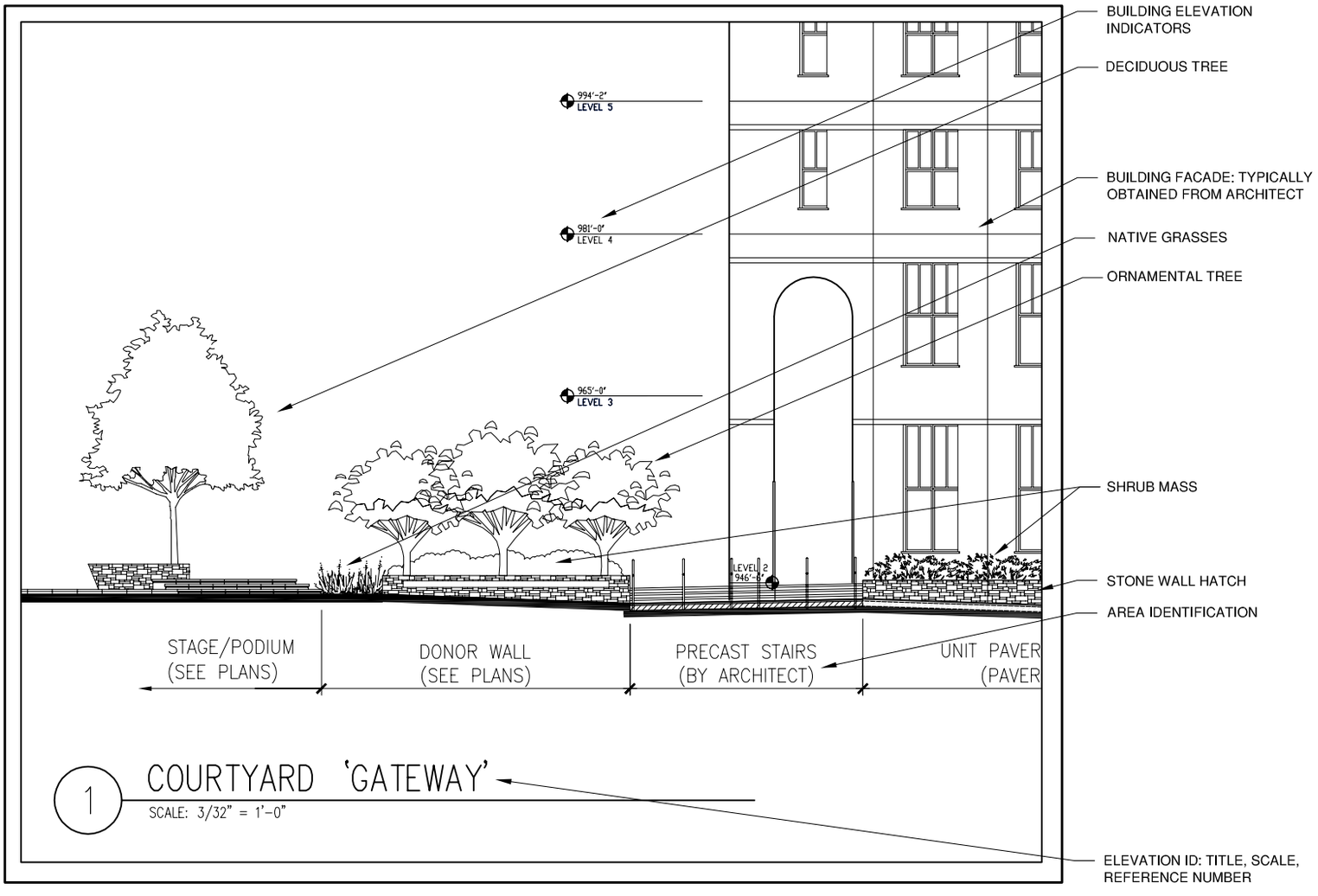


TYPICAL HARDSCAPE PLAN SYMBOLS

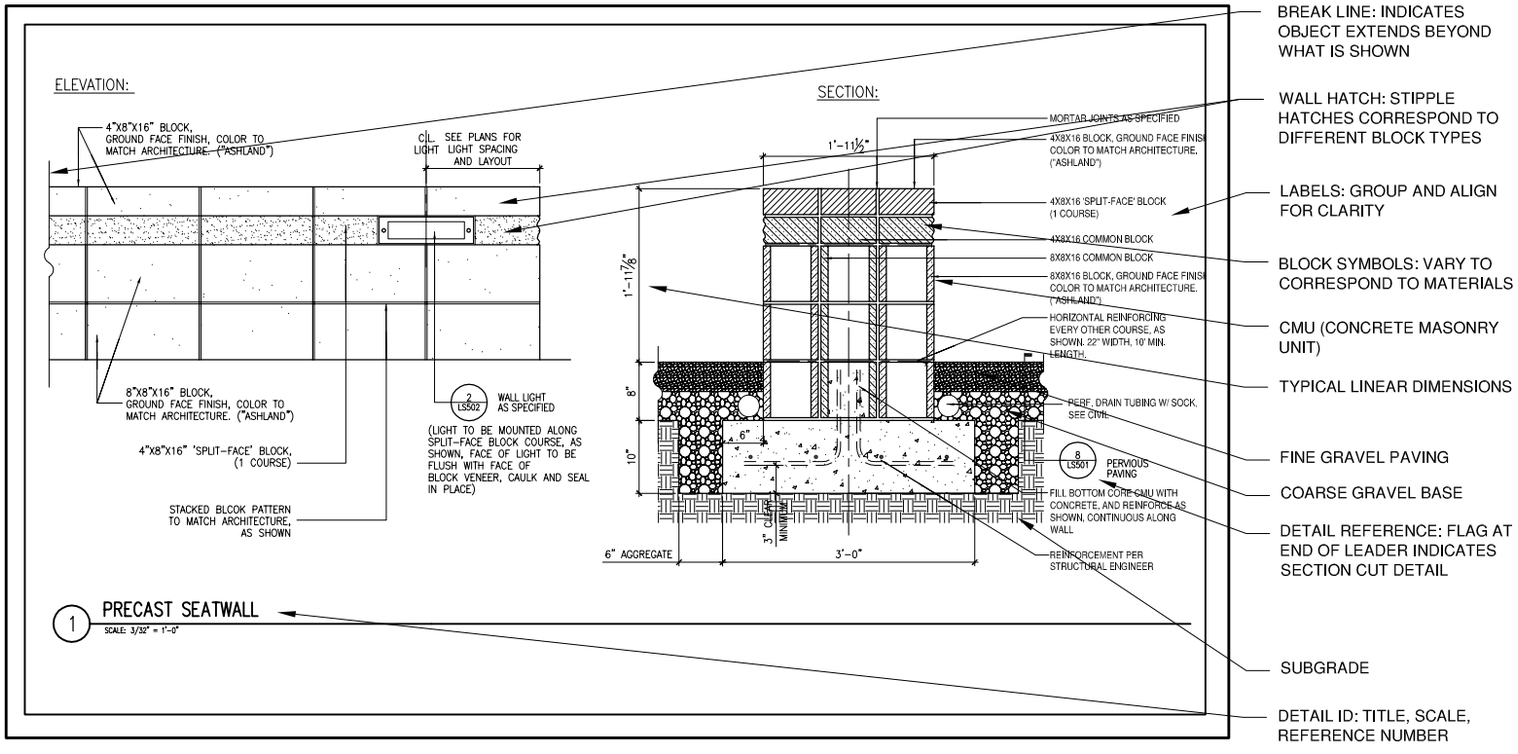
TYPICAL HARDSCAPE PLAN SYMBOLS



TYPICAL PLANTING PLAN SYMBOLS



TYPICAL SECTION ELEVATION SYMBOLS



TYPICAL DETAIL SYMBOLS

DIMENSIONING

Plan Dimensioning

The layout/site plan is concerned with the detailed location of various objects to be built on the construction site, such as, roads, walkways, walls, plant material, and site amenities. The three basic means of locating an object on a layout plan are (a) survey lines and bearings (road centerlines and property lines); (b) coordinates for buildings; and (c) dimensioning for walk widths, location of site amenities, and paving patterns. The two types of dimensioning are (a) layout plan dimensioning and (b) construction detail dimensioning.

The layout plan must be clear, consistent, and concise.

Priority of Locating Site Elements on the Layout Plan

1. Fixed elements must be positioned exactly on the site, such as property lines, road centerlines, and structures using survey lines, bearings, and/or coordinates.
2. Semifixed elements have a direct and dependent layout relationship to a fixed element such as a building setback, road width, walkway, or street right-of way.
3. Adjustive elements require near accuracy, not exact accuracy. These floating dimensions may be adjusted to the situation as long as the overall effect is maintained. Some examples of adjustive elements are planting borders, meandering walkways, or walks that are between two fixed objects. Nondetermined elements, such as plant material, are located in an approximate location with the final location determined on-site.

Types of Plan Dimensioning Systems

Reference line: Used for locating semifixed objects; also known as a baseline.

Running system: Used for locating semifixed and adjustive objects. It should be avoided because of the high probability of layout error.

Modular system: Used for repetitive objects such as paving patterns.

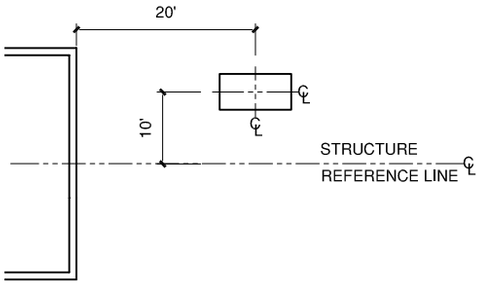
Angular system: Used to locate baselines, centerlines of roads and walks; expressed in degrees.

Grid system: Used for location of adjustive objects, especially free-form lines. The smaller the grid, the greater the accuracy.

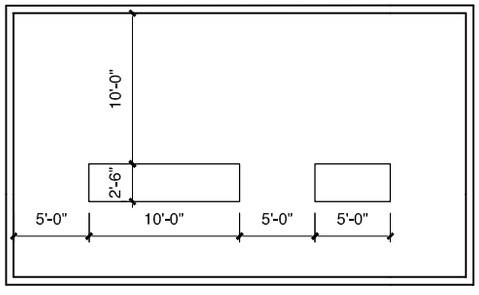
Offset system: A combination of reference lines and running systems. It is used for the location of adjustive objects such as an irregular planting border.

It is common to use a combination of dimension systems in a layout plan.

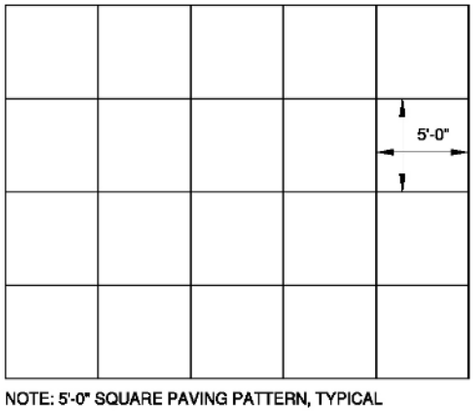
All dimensioning must start from a known reference point that is not being disturbed or removed during construction (such as structure corner or centerline, a walk intersection, etc.) or an imaginery point or line that can be easily located in the field by survey data (such as property line, property corner, a road centerline, etc.).



REFERENCE LINE

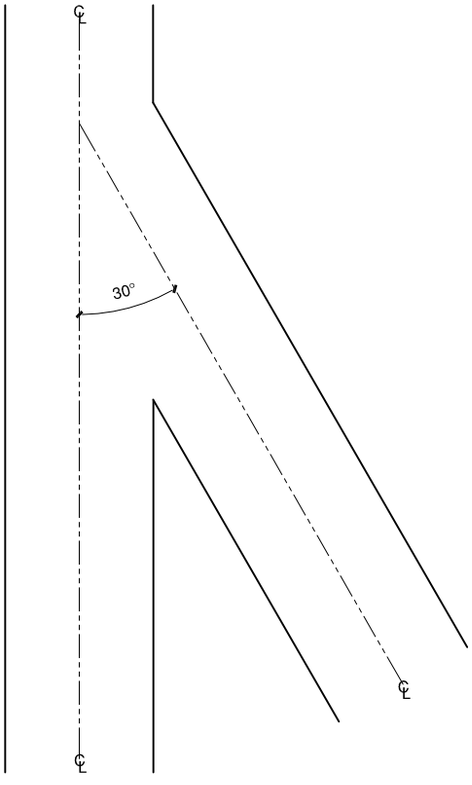


RUNNING

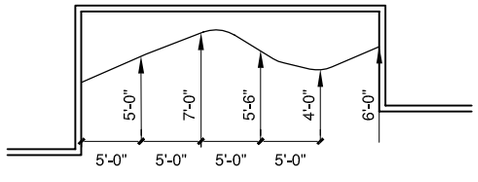


NOTE: 5'-0" SQUARE PAVING PATTERN, TYPICAL

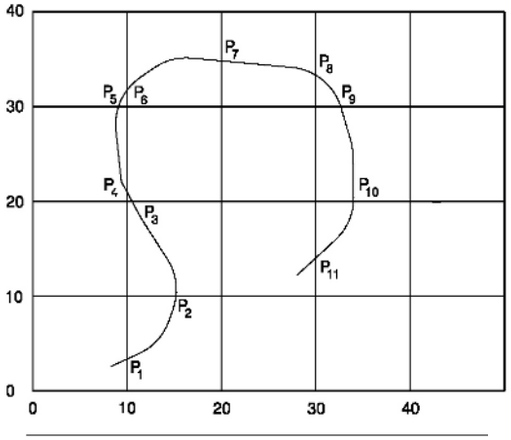
MODULAR



ANGULAR



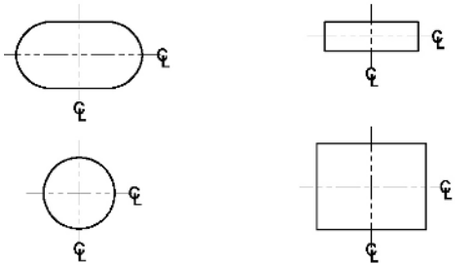
OFFSET



GRID

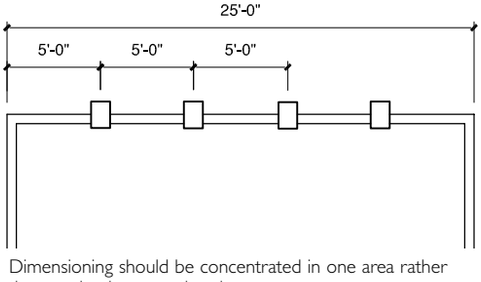
Rules of Dimensioning

There are general rules of dimensioning that need to be followed in the preparation of clear and unambiguous contract drawings. A consistency in the placement of dimension lines and figures is required. Extension lines are preferable to inside dimensioning and dimensions should never be placed in shaded or crossed hatched areas. The following are examples of other rules to adhere to while dimensioning contract drawings.



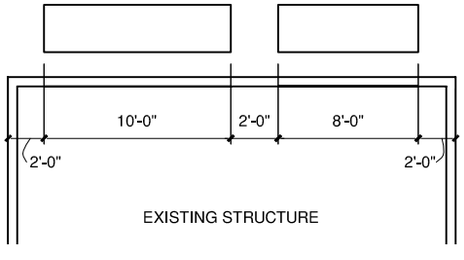
The most efficient method of locating objects is by center point or centerline, because it reduces the number of dimensions required, reduces the chance of cumulative error, allows for clearer graphic representation, and takes into account priorities of dimension lines and construction phases.

LOCATION BY CENTERLINE



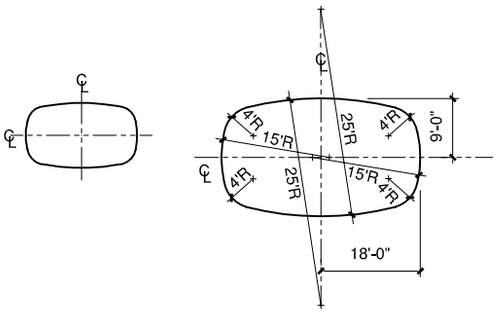
Dimensioning should be concentrated in one area rather than randomly across the plan.

CONCENTRATE DIMENSIONS



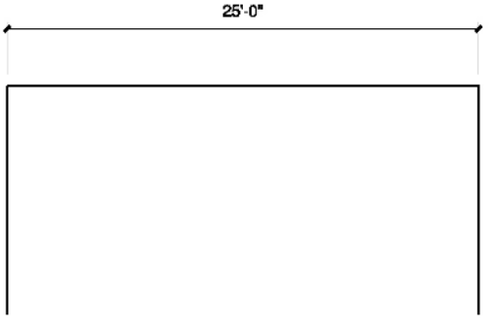
Dimensions should never be inside a structure. Never dimension an existing structure with running dimensions. This creates the potential for conflict. In this example, removing any one of the 2′–0″ dimensions would eliminate the potential of a conflict (the dimension left out shold be one that coupld vary without effecting the design intent).

WRONG



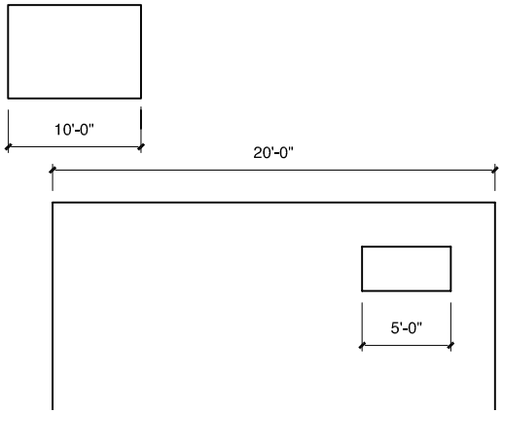
Use an enlargement when dimensioning an object that is complex and confusing.

LAYOUT PLAN ENLARGEMENT



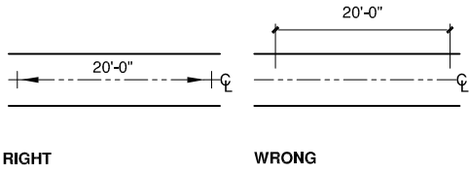
Line weights and graphics should indicate dimension priorities.

LINE WEIGHT PRIORITIES



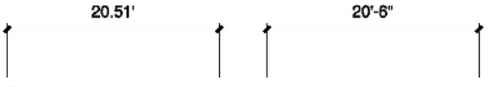
Dimension lines and extensions should never cross. When unavoidable, break the least important line.

DIMENSION LINES AND EXTENSIONS



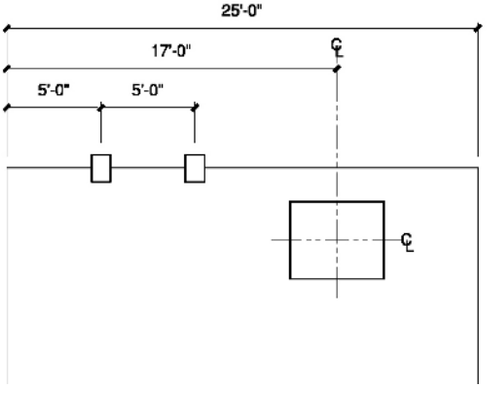
Baselines, baseline dimensions, and baseline symbols should be given graphic priority. Baseline dimensions should be placed adjacent to the baseline.

BASELINES, BASELINE DIMENSIONS, AND BASELINE SYMBOLS



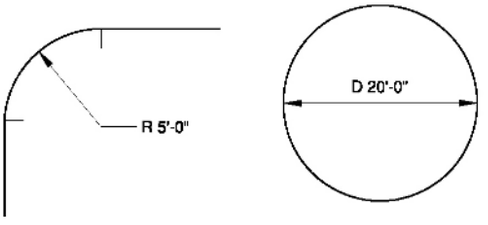
Emphasize decimal points as well as inch and foot symbols. Numbers should be small, but neat and clear.

EMPHASIZED DECIMALS AND INCH AND FOOT SYMBOLS



Dimensions should be in near proximity of the dimensioned object. Parallel dimensions should be spaced equally with the subdimensions nearest the object.

DIMENSIONS



A radius is indicated with an R, and a diameter is indicated with a D, along with the dimension figure. A tick mark can be used to indicate the end of the radius.

RADIUS

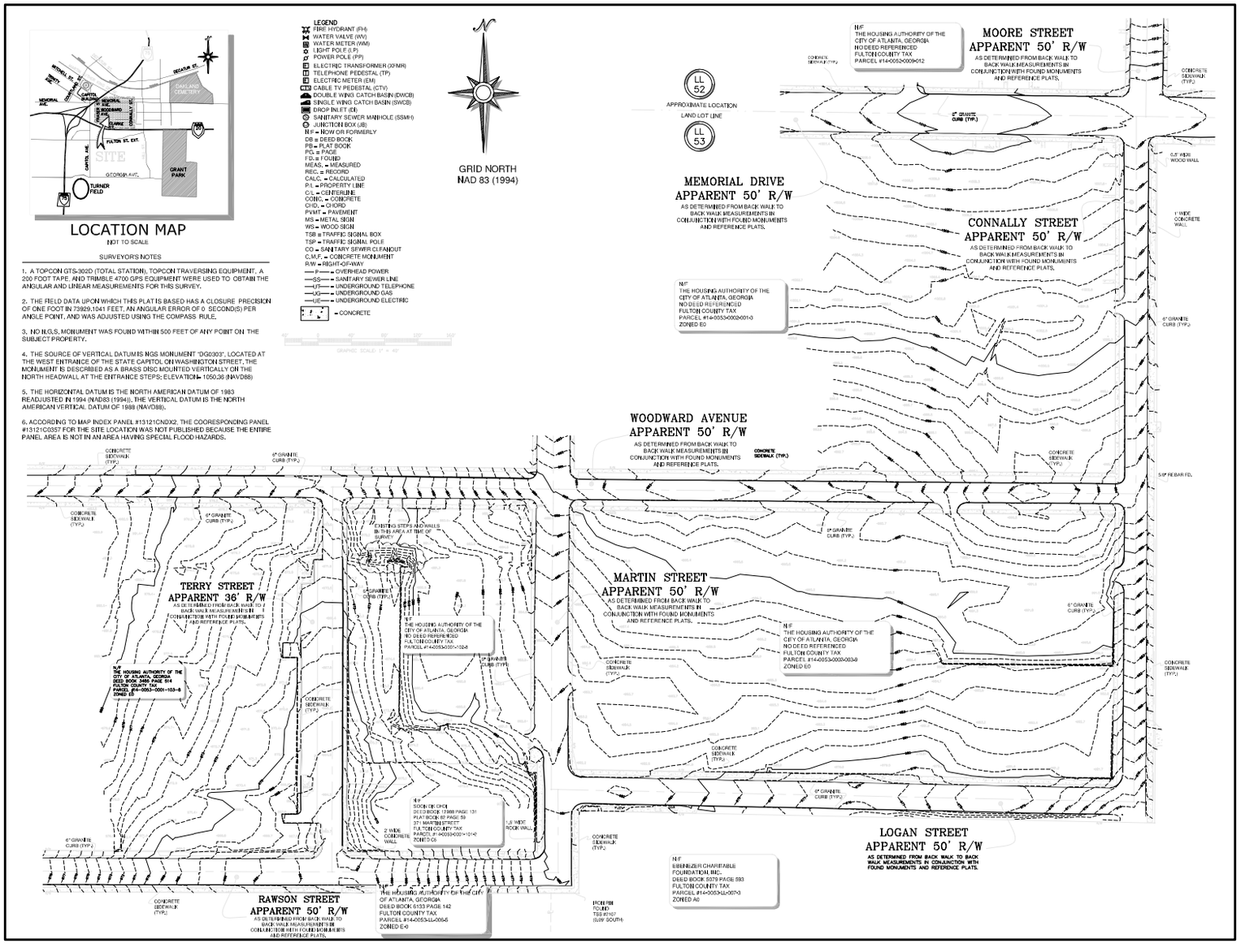
LANDSCAPE SURVEYS

Before proceeding with any landscape architecture design, planning, or construction documentation project, it is best to have adequate base data collected, at a detailed level suitable for the specific task. Depending on the specific design task, an aerial photograph or geographic information system (GIS) database may be adequate for initial planning purposes. However, once the decision has been made to move forward with implementation of a project, and construction documents will be required, it is best to initiate the services of a registered land surveyor for a detailed landscape survey.

A landscape survey documents many of the pertinent existing conditions (topography, vegetation, buildings, structures, and utilities) that a landscape architect would have to take into consideration before initiating any design or proposed improvements on any given site. Many factors determine the exact scope and detail requested for each landscape survey, so it is important that the landscape architect carefully match the requested level of detail and pertinent information collected to the type of site and specific type of project.

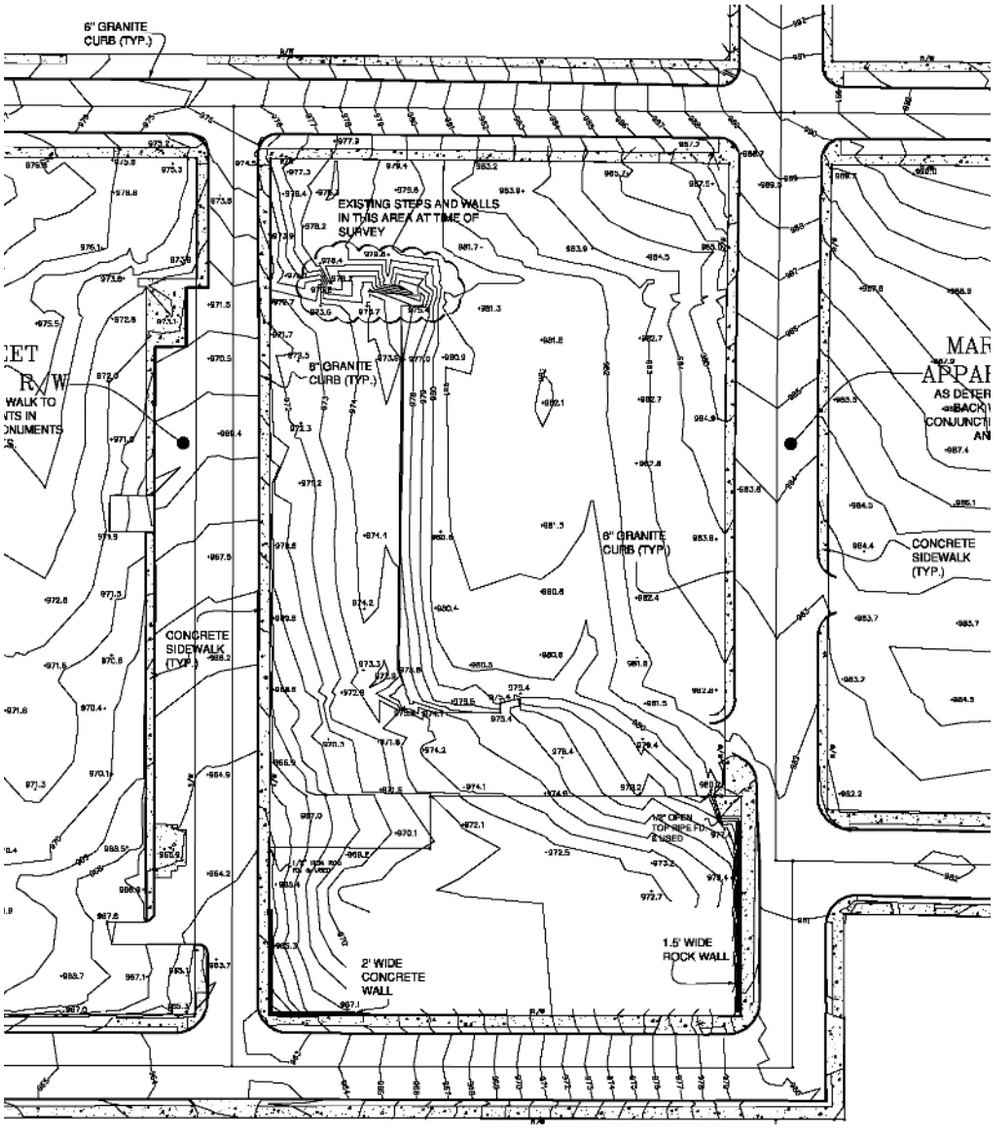
As an example, a new suburban project on an undeveloped piece of property may not require the same level of detail that an urban in-fill or streetscape project in an existing city block would require. Property size also has a lot to do with the amount of information requested. On a heavily wooded site of a thousand acres, it may not be practical to locate and identify each and every tree. In this case, it would be more practical to request the surveyor to provide the outline of the massing of the existing vegetation and, generally, the mix of species present. In contrast, on a one-half acre site for a playground, the landscape architect would want every tree, trunk diameter, and canopy size delineated for incorporation into the final design and construction documents.

The same issue holds true for the amount and detail of topographic information collected. On very large sites, it is not uncommon to request that topographic information be recorded in either 10- or 5-foot increments; whereas on a small site, it is more common to request a 2-foot contour interval or even a 1-foot contour interval. The landscape architect should match the amount and type of topographic information requested with the detailed nature of the proposed project.



SAMPLE LANDSCAPE SURVEY BY KEITH SEILER & ASSOCIATES

Ray Strychalski, ASLA, EDAW



ENLARGED DETAIL OF SAMPLE LANDSCAPE SURVEY BY KEITH SEILER & ASSOCIATES

An accurate survey is essential to the success of the project. It is, in effect, the foundation on which the project is built. For this reason, it is important that the survey be complete and read well graphically. It is also important that the surveyor provide the base information using industry standard layers and line weights. Most surveyors provide the base survey information both in hard copy and electronic format. Therefore, it should be noted ahead of time at what scale the drawings will be displayed so that the surveyor can make sure that all of the text is legible and of the right size and that the line weights and various symbols are displayed properly.

Ray Strychalski, ASLA, EDAW

LANDSCAPE PLANNING

INTRODUCTION

Planning is the use of scientific, technical, and other organized information to provide choices for decision making, as well as a process for considering and reaching consensus on a range of options. A landscape is all the natural and cultural features such as settlements, fields, hills, buildings, deserts, forests, and water bodies that distinguish one part of the surface of the earth from another part. Landscape planning, then, is the process of using natural and cultural knowledge to guide action over a relatively large area. The process results in a landscape plan, which is a written and a graphic documentation of a community or agency's goal, the strategies to achieve those goals, and the spatial consequences of the implementation strategies.

STEPS IN LANDSCAPE PLANNING

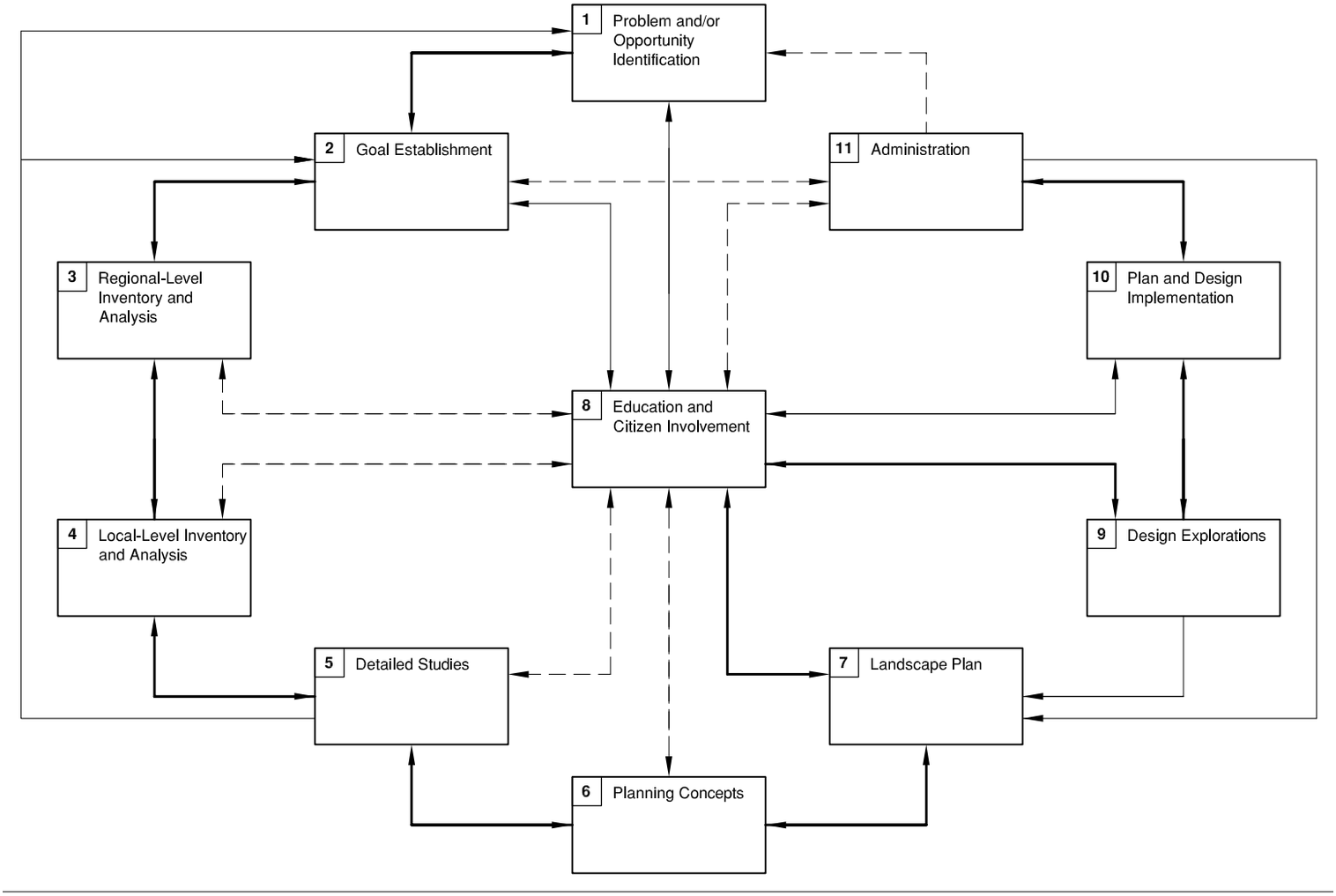
As presented in the diagram, there are 11 interacting steps in landscape planning. An issue or group of related issues is identified by an agency or by a community—that is, some collection of people—in step 1. These issues are problematic or present an opportunity to the people or the environment of an area. A goal or goals is/are then established in step 2 to address the problem(s). Next, in steps 3 and 4, inventories and analyses of biophysical and sociocultural processes are conducted, first at a larger level, such as a river drainage basin or an appropriate regional unit of government, and second at a more specific level, such as a small watershed or a local government.

In step 5, detailed studies are made to link the inventory and analysis information to the problem(s) and goal(s). Suitability analyses are one such type of detailed study. Step 6 involves the development of concepts and options. A landscape plan is then derived from these concepts in step 7. Throughout the process, a systematic educational and citizen involvement effort occurs. Such involvement is important in each step but especially so in step 8, when the plan is explained to the affected public. In step 9, detailed designs are explored that are specific at the individual land-user or site level. These designs and the plan are implemented in step 10. In step 11, the plan is administered.

The heavier arrows in the diagram indicate the flow from step 1 to step 11. The lighter arrows between each step suggest a feedback system whereby each step can modify the previous step and, in turn, change from the subsequent step. The dashed arrows also indicate other possible modifications through the process. For instance, detailed studies of a planning area (step 5) may lead to the identification of new problems or opportunities or the amendment of goals (steps 1 and 2). Design explorations (step 9) may change the landscape plan, and so on. Once the process is complete and the plan is being administered and monitored (step 11), the view of the problems and opportunities facing the region, and the goals to address these problems and opportunities may be altered, as indicated by the dashed lines in the diagram.

Step 1: Identification of Planning Problems and Opportunities

Human societies face many social, economic, political, and environmental problems and opportunities. A landscape is the interface between social and envi-



STEPS IN LANDSCAPE PLANNING

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ronmental processes, thus landscape planning addresses those issues that concern the interrelationship between people and nature. The planet presents many opportunities for people, and there is no shortage of environmental problems.

Problems and opportunities lead to specific planning issues. For instance, suburban development often occurs on prime agricultural land, a circumstance that local officials tend to view as a problem. A number of issues arise involving land-use conflicts between the new suburban residents and the farmers—such as who will pay the costs of public services for the newly developed areas. Another example is an area, such as an ocean beach or mountain town, that presents the opportunity for new development because of its scenic beauty and recreational amenities. A key challenge would be to accommodate the new growth while protecting the natural resources that attract people to the area in the first place.

Step 2: Establishment of Planning Goals

In a democracy, the people of a region establish goals through the political process. Elected representatives will identify a particular issue affecting their region—for example, a steel plant is closing, suburban sprawl threatens agricultural land, or a new manufacturing plant is creating a housing boom. After issues have been identified, goals are established to address the problem. Such goals should provide the basis for the planning process.

Goals articulate an idealized future situation. In the context of landscape planning, it is assumed that once goals have been established, there will be a commitment by some group to address the problem or opportunity identified in step 1. Problems and opportunities can be identified at various levels. Local people may recognize a problem or opportunity and then set a goal to address it; or issues may be national, international, or global in scope. Problem solving, of which goal setting is a part, may occur at many levels or combinations of levels. Although goal setting is obviously dependent on the cultural-political system, the people affected by a goal should be involved in its establishment.

Step 3: Landscape Analysis, Regional Level

This step and the next one involve interrelated scale levels. The method addresses three scale levels: region, locality, and specific site (with an emphasis on the local). The use of different scales is consistent with the concept of levels-of-organization used by ecologists. According to this concept, each level of organization has special properties. Watersheds have been identified as one level of organization to provide boundaries for landscape and ecosystem analysis. Drainage basins and watersheds have often been advocated as useful levels of analysis for landscape planning and natural resource management.

Essentially, drainage basins and watersheds are the same thing (catchment areas), but in practical use, especially in the United States, the term "drainage basin" is generally used to refer to a larger region, and the term "watersheds" to a more specific area. Drainage basins cover a river and all of its tributaries, while watersheds generally encompass a single river or stream. The analysis at the regional drainage-basin level provides insight into how the landscape functions at the more specific local scale. Geographic information systems, called GIS, often are employed in this step and the next two.

Step 4: Landscape Analysis, Local Level

During step 4, processes taking place in the more specific planning area are studied. The major aim of local-level analysis is to obtain insight about the natural processes and human plans and activities. Such processes can be viewed as the elements of a system, with the landscape a visual expression of the system.

This step in the landscape planning process, like the previous one, involves the collection of information concerning the appropriate physical, biological, and social elements that constitute the planning area. Since cost and time are important factors in many planning processes, existing published and mapped information is the easiest and fastest to gather. If budget and time allow, the inventory and analysis step may be best accomplished by an interdisciplinary team collecting new information. In either case, this step is an interdisciplinary collection effort that involves search, accumulation, field checking, and mapping of data.

Step 5: Detailed Studies

Detailed studies link the inventory and analysis information to the problem(s) and goal(s). Suitability analyses can be used to determine the fitness of a specific place for a variety of land uses based on thorough ecological inventories and on the values of land users. The basic purpose of the detailed studies is to gain an understanding about the complex relationships between human values, environmental opportunities and constraints, and the issues being addressed. To accomplish this, it is crucial to link the studies to the local situation. As a result, a variety of scales may be used to explore linkages.

Ian McHarg popularized the "overlay technique." This technique involves maps of inventory information superimposed on one another to identify areas that provide, first, opportunities for particular land uses and, second, constraints.

Although there has been a general tendency away from hand-drawn overlays, there are still occasions when they may be useful. For instance, they may be helpful for small study sites within a larger region or for certain scales of project planning. That said, it is important to realize the limitations of hand-drawn overlays. As an example, after more than three or four overlays, they may become opaque; there are the accuracy problems that become especially acute with hand-drawn maps; and there are limitations for weighting various values represented by map units. GIS technology can help to overcome these limitations, and, frequently, these systems are used instead of hand-drawn overlays.

Step 6: Planning Area Concepts, Options, and Choices

This step involves the development of concepts and visions for the planning area. These concepts can be viewed as options for the future, based on the suitability of the use(s), which give a general conceptual model or scenario illustrating how problems may be solved. This model should be presented in such a way that the goals will be achieved. Often, more than one scenario has to be made. These concepts are based on a logical and imaginative combination of the information gathered through the inventory and analysis steps. The conceptual model shows allocations of uses and actions. The scenarios set possible directions for future management of the area and, therefore, should be viewed as a basis for discussion where choices are made by the community about its future.

Choices should be based on the goals of the planning effort. For example, if it is the goal to protect agricultural land, yet allow some low-density housing to develop, different organizations of the landscape for those two land uses should be developed. Different schemes for realizing the desired preferences also need to be explored.

Various options for implementation also need to be examined, and these must relate to the goal of the planning effort. If, for example, the planning is being conducted for a jurisdiction trying to protect its agricultural land resources, then it is necessary not only to identify lands that should be protected but also the implementation options that might be employed to achieve the farmland protection goal.

Step 7: Landscape Plan

The preferred concepts and options are brought together in a landscape plan. The plan identifies a strategy for development at the local scale. The plan also provides flexible guidelines for policymakers, land managers, and land users on how to conserve, rehabilitate, or develop an area. In such a plan, enough freedom should be left so that local officials and land users can adjust their practices to new economic demands or social changes.

This step represents a key decision-making point in the planning process. Responsible officials, such as county commissioners or city council members, are often required by law to adopt a plan. The rules for adoption and forms that the plans may take vary widely. Commonly in the United States, planning commissions recommend a plan for adoption to the legislative body after a series of public hearings. Such plans are called *comprehensive plans* in much of the United States, but are referred to as *general plans* in Arizona, California, and Utah. In some states (like Oregon), there are specific, detailed elements that local governments are required to include in such plans. Other states give local officials great flexibility as to the contents of these plans. On public lands, various federal agencies, including the U.S. Forest Service, the U.S. National Park Service, and the U.S. Bureau of Land Management, have specific statutory requirements for land management plans.

Landscape plans should incorporate natural and social considerations. A landscape plan is more than a land-use plan because it addresses the overlap and integration of land uses. A landscape plan may involve the formal recognition of previous elements in the planning process, such as the adoption of policy goals. The plan should include written statements about policies and implementation strategies, as well as a map showing the spatial organization of the landscape.

Step 8: Continued Citizen Involvement and Community Education

In step 8, the plan is explained to the affected public through education and information dissemination. Actually, such interaction occurs throughout the planning process, beginning with the identification of issues. Public involvement is especially critical as the landscape plan is developed, because it is important

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to ensure that the goals established by the community will be achieved in the plan.

The success of a plan depends largely on how involved affected people have been in its determination. There are numerous examples of both government agencies and private businesses suddenly announcing a plan for a project that will dramatically impact people, without having consulted those individuals first. The result is predictable: The people will rise in opposition against the project. The alternative is to involve people in the planning process, soliciting their ideas and incorporating those ideas into the plan. Doing so may require a longer time to develop a plan, but local citizens will be more likely to support it than to oppose it and will often monitor its execution.

Step 9: Design Explorations

To design is to give form and to arrange elements spatially. By making specific designs based on the landscape plan, planners can help decision makers visualize the consequences of their policies. Carrying policies through to arranging the physical environment gives meaning to the process by actually conceiving change in the spatial organization of a place. Designs represent a synthesis of all the previous planning studies. During the design step, the short-term benefits for the land users or individual citizen have to be combined with the long-term economic and ecological goals for the whole area.

While some designers and planners might object to the placement of design within the planning process, in an ecological perspective, such placement helps to connect design with more comprehensive social actions and policies.

Step 10: Plan and Design Implementation

Implementation is the employment of various strategies, tactics, and procedures to realize the goals and policies adopted in the landscape plan. On the local level, several different mechanisms have been developed to control the use of land and other resources. These techniques include voluntary covenants, easements, land purchase, transfer of development rights, zoning, utility extension policies, and performance standards. The preference selected should be appropriate for the region.

One implementation technique especially well suited for landscape planning is the use of performance standards. Like many other planning implementation measures, "performance standards" is a general term that has been defined and applied in several different ways. Basically, performance standards, or criteria, are established and must be met before a certain use will be permitted. These criteria usually involve a combination of economic, environmental, and social factors. This technique lends itself to landscape ecological planning, because criteria for specific land uses can be based on suitability analysis.

Step 11: Administration

In this final step, the plan is administered. Administration involves monitoring and evaluating, on an ongoing basis, how the plan is implemented. Amendments or adjustments to the plan will no doubt be necessary because of changing conditions or new information. To achieve the goals established for the process, plan administrators should pay special attention to the design of regulation review procedures and of the management of the decision-making process.

RESOURCES

McHarg, Ian. 1969. *Design with Nature*. Garden City, NY: Natural History Press/Doubleday.

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LANDSCAPE MODELING

INTRODUCTION

Representing the landscape is a necessary step in designing on the land. It is important to devise techniques to miniaturize and simplify vast quantities of landscape data in order to appraise existing conditions, study design alternatives, evaluate the finished solution, and communicate all that information to the client and/or community group.

In order to understand particular components of the landscape, certain elements need to be isolated and modeled. Each project type has its own specific requirements. An urban-scale project may require a massing model, whereas a golf course would need a topographic model. This type of model, without vegetation, would afford designers the ability to quickly study the slope in order to determine drainage and buildability.

In order to represent the landscape, the designer can work with a built model, a 2-D drawing, or computer modeling systems. Each tool has its benefits and limits. Geographic information systems (GIS) and computer-aided design (CAD) programs are two such tools that are often used in representation and analysis. These topics are addressed elsewhere in this text, so they will not be discussed in this section. Instead, this section will focus on landscape digital 3-D modeling and animation.

INTRODUCTION TO COMPUTER GENERATED MODELS

Digital models can produce an image that is superrealistic. Different landscape concepts can easily be manipulated and tested, ranging in scale from large earth-moving issues to decisions about construction material.

Another benefit of digital modeling is the heightened realism due to the designer's ability to program movement. This ability assists the design process, as change can be programmed into the model. For example, plant growth models can be created to show transformation, and digital water can spout (in the case of a fountain), wave (in the case of the ocean), or simply remain still and reflective (in the case of a quiet mountain lake). Atmosphere, such as fog or rain, can be added to enhance the effect of the design. *Fly-through* experiences can also be generated, giving an additional design tool to the landscape architect and client.

TECHNIQUES OF 3-D COMPUTER MODELING

The creation of computer-generated imagery (CGI) is a process that can generally be broken down into the following stages:

1. Modeling
2. Texturing
3. Lighting
4. Animation
5. Effects
6. Output

Modeling

Most advanced computer animation programs take a generalist approach to the creation of models and animation. Digital models are primarily produced in three ways:

1. Direct modeling in the computer
2. Mathematical algorithms
3. Scanning

Direct modeling is the more common method, but it requires a highly skilled technician. Plants, trees, and foliage are efficiently modeled using mathematical means. Optically scanning clay sculptures and actual life-size objects also form the basis for computer models. The data is converted to a rough mesh form recognizable to an animation program.

Many modeling systems include the capability to mathematically model plants. These generalist programs provide one or more of the following programs for direct object construction: polygon modeling, *nonuniform rational B-spline* (NURBS) surface modeling, or *subdivision surface modeling.* Polygons are flat facets with surfaces that can be textured. These polygon surfaces are connected together and comprise *polymeshes* that form the object shape. Sharp edges can be visible on rounded surfaces when poly-models are viewed in close-up; this phenomenon is called *faceting.* It is a result of individual flat polygons. Close-up shots require small polygons in a dense mesh to achieve an effect of a smooth surface. The tradeoff is decreasing computer calculation response time.

Texturing

Planning for the texturing stage early in the modeling process helps determine the most efficient approach to adding object detail. Three basic texture types—*image maps*, *procedurals,* and *gradients*—control color, diffusion, reflection, transparency, translucency, and bump (taking an image and making it appear to have surface deformation). By combining each of these together on a single surface, a wide range of object properties can be achieved. For example a simple rectangular object can become a brick wall, a smooth cylinder can become fluted, or a rectangular polygon can become a realistic leaf. Many times it is efficient and desirable to use image maps made from photographs as a starting point. These can immediately add a high degree of realism. However, the photographs usually require manipulation in a 2-D paint program before they are usable in a 3-D program.

A typical image such as a leaf texture begins with a photograph of a single leaf. A photo editor and paint program is used to create or extract a color layer and gray-scale channel (called an *alpha channel*) for matte purposes. Specularity (highlights), reflectancy (reflective quality), transparency, translucency (penetrating light, revealing texture and shadow), and bump channels (texture) are also assessed and replicated. The original photo is averaged so that its various channels carry the appearance of an even light. This allows the 3-D program to properly relight the subject. (For an example of texturing, see Color Plate 1.)

Lighting

In order for a rendered scene to reveal all the intricate texturing and modeling, lights are added that match the properties of real-world lighting. Directional lights produce parallel rays of light similar to the sun, while point lights work like a standard lightbulb radiating in all directions. Spotlights behave like those in the theatre, illuminating in a conical shape. Tube lights mimic fluorescent light tubes, and area lights create a soft fill light. Two types of shadows are available to most of these light types: *ray-traced* and *shadow-mapped.* Ray-traced shadows produce hard boundary edges much like bright daytime sun. Shadow maps, a form of depth map, can do the same but have the ability to create softer edges. The designer must set a large shadow map memory, otherwise unnatural jagged edges appear at shadow boundaries. Large map sizes take more time and memory to render. (For an example of shadowing, see Color Plate 2.)

In the real world, light bounces around from object to object. For realistic rendering, bounced light is often simulated. For example, as the sun illuminates a gravel path, light is reflected off the path and back up to the underside of surrounding plants. The sun's light would be indicated by a directional light and bounce light simulated by a number of lights angled upward from the path, adding a slight amount of light to the overall scene. Excellent results can be achieved using this method. *Radiosity* is a form of lighting that takes *bounce light* into consideration during the rendering process. It requires very intense calculations as a ray of light is traced from a source to all objects in the image. Limits can be applied to the number of bounce calculations. Radiosity is not often used for animations because of the very long rendering times associated with this process.

Animation

Landscape architects design with living material that grows and changes. Computer simulation offers a tool to study a landscape project during all stages of growth. The landscape architect and client can examine the design at first installation, in five years, and perhaps in thirty years. It assists the designer in making specific plant choices and can show the client the benefit of planning landscapes for long-term growth.

Plant Growth

Plants are difficult to create and render as individual models using standard modeling techniques. They are often created using specialized programs or plug-ins to programs that create the structure and leaf systems mathematically. Such programs allow the designer to adjust large numbers of plants, trees, and foliage and make each unique. Moreover, it is possible to animate the growth of each plant over time, with each stage of growth appearing in a realistic manner. Dedicated programs can readily create entire

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landscapes as well as provide means to animate plant growth, movement, and environmental interaction over time. (For an example of plant growth animation, see Color Plate 3.)

The "Fly-Through"

The plant growth study can be coupled with the "fly-through." Manipulating a variety of views, and simulating the actual experience of moving through the site can be a powerful design tool. This can assist the client, designer, and community to truly "enter" the site and experience its sequentially changing views. The predigital equivalent that attempted to reproduce this same experience is the work of people like Gordon Cullen, whose book *The Concise Townscape* introduced a notion of serial vision (Cullen, 1961). To achieve serial vision, he coupled a plan drawing with a sequence of hand-rendered graphic images. Each type of rendering has its merits and limitations. The digital experience is more fluid and seemingly more realistic. Sketches offer artistic interpretation. However, the sequence of drawings shows a limited number of views, in which the observer is expected to extrapolate the entire place. Used together, they can form a more complete and complex replication of place. (See Color Plate 4.)

The landscape architect that chooses to use a 3-D computer animated fly-through should take into consideration ideas about film directing. The client, in effect, becomes the audience. Particularly crucial is the importance of kinetics in the production of the rendered animation. More than anything else, the direction of the movement of the camera is important. This is the final task that can make or break the animated sequence. Skilled editing often determines its success. It is not necessary to simulate a continuous single movement of the camera through the landscape. In fact, changes in the *point of view* (POV) can effectively be manipulated in accordance with physical and psychological justification. Maintaining clear orientation in the site takes careful planning by the animator. Changes in direction of the view must have an obvious motivation, such as a curve in the road or a tree the virtual tour is circumnavigating. If spatial confusion does occur, the landscape architect may have introduced a doubt about the validity of the design, resulting in perceptions of mediocrity in what would otherwise be an excellent project.

Effects

Digital modeling can add a multisensory aspect to the representational process. Wind may rustle through trees and foliage or water movement simulated. A pond, for example, can be built out of a single polygonal plane. Texture maps alone can create very realistic water surfaces. For example, special effects come into play when a fountain is introduced spraying water into the pond. The use of particle effects also works well. Particles can be made to behave in a manner similar to flowing water. A particle is a point in space that originates and ejects from an emitter of some sort: a cube, a sphere, a cone, or an advanced object. These particle systems can be influenced by gravity, collisions, friction, and wind. Sound can also be introduced to enhance the experience.

Output

Output can be created in many different forms from image stills on paper prints to broadcast-level video. At this point, all errors made in the previous steps become glaringly obvious. The final output still image is often rendered directly, while fully animated output is rarely produced as a first step at this stage. A low-resolution movie is typically rendered. Sometimes it is represented in wire-frame imagery, but more often it is portrayed as a flat-shaded render. They both render reasonably quickly.

If necessary, adjustments can be made to optimize rendering time. For example, if one side of a building is never seen, then that side and all its component parts is "turned off." This can give the computer a slight speed gain since it no longer stores information about that side of the building. Any textures that can be eliminated or flattened into single images can help. Lights are adjusted and objects are visually illuminated from as few lights as possible. This applies to shadows as well. Shadows cost a great deal of render time. If an object doesn't need to cast a shadow, its shadow casting capability is removed. This stage of the process takes a while to complete. However, time invested in this task can allow for a quicker overall render. A movie that might take 60 minutes a frame to render might be tweaked to render in 15 minutes. This time savings will prove worthwhile on a tight deadline.

BENEFITS

Digital landscape modeling can offer huge benefits to the landscape architect and client. It provides a way to represent large quantities of landscape information. It can be manipulated to allow examination of the ever-present issue of landscape change, growth, and transformation. Sound can be introduced to offer a more real experience of place.

Traditional graphic and 3-D representation should not be completely negated. Work that is not in digital space is easier for many laypeople and community groups to access. And the traditional sketch and hand rendering offers a more sensitive and interpretive approach through its use of line weight and subtle shades. Models are equally useful in emphasizing certain design issues to consider.

All forms of modeling should be considered when designing and when representing a design solution for clients to review. Each one offers particular strengths and opportunities in truly explaining and experiencing the landscape.

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COMPUTER-AIDED DESIGN (CAD)

HISTORY

Computer-aided design (CAD), in its most basic form, has been around since the mid-1960s, but it did not become accessible to the typical user until the early 1980s, with the widespread availability of personal computers. Since that time, CAD software has evolved to take advantage of the advances in computing technology and has become more user-friendly and much more powerful. While the CAD user of the early 1980s may have been concerned only with accurately describing a construction detail through dimensioning, that same user today may be describing that construction detail in three dimensions, linking it to a database containing costs of materials, inserting a graphic Web link to the manufacturer of some of the elements of that detail, and updating the detail in real time with the facilities maintenance department, while automatically updating every change in all instances of that detail in the site drawings. CAD is continually being transformed through the increasing power of computer technology as it leads to new ways to automate the construction industry. This trend will continue.

HARDWARE

The components of a CAD workstation are no longer unique to the drafting world. A computer monitor, central processing unit (CPU), mouse, and keyboard are the standard tools of the CAD user, just as they are for the writer, accountant, doctor, or schoolteacher. The difference is in the speed and size of the components. Whereas the off-the-shelf computer is capable of handling the tasks of the average user, the typical CAD user will soon find that being productive means upgrading key components of the computer. The three main areas for upgrade are the memory (RAM), graphics processing (video card), and the display (monitor).

When these three components are discussed by CAD managers, the phrase repeated throughout the conversation is "the more the better." The level of computer needs can be determined by the specific landscape architectural uses. But, in general, the CAD user will work more efficiently by having access to high-quality hardware in these three areas. And efficiency is cost effective—it leads to higher office productivity.

PRINTING

The printed page that is given to a contractor is the ultimate product of CAD. The ultimate goal of the CAD user is to ensure that this document legibly relays design thought and intent. The printer, or output device, is the physical tool employed to achieve this goal. Many choices are available to the CAD user for producing hard copies of the digital information. Large-format inkjet plotters are one of the most popular machines, along with large- and small-format laser printing devices. Large-format laser printers are the choice for high-volume construction document printing, although large-format inkjet plotters have been, and continue to be, an inexpensive and reliable printing solution for large documents as well. While many other printing options exist, these two are the most widely used and most applicable to landscape architecture.

CAD STANDARDS

The use of CAD has greatly aided the collaboration among design disciplines. The ability to transfer information that is instantly usable by other professionals is the greatest benefit of using CAD. To aid in the ease of understanding this information, a national CAD standard has been created. The CAD standard is a document that outlines the rules for drafting. It identifies for the user how to organize, and in many cases, how to graphically display, the information that is being documented. A CAD standard is typically broken into several sections, as described here:

File organization and naming: The standard gives the user a set of rules for creating and saving files. The folder structure and file-naming conventions are established as a minimum, with other information being specified as the company desires.

Layer-naming conventions: The primary method of controlling drawing information is through layering. A typical CAD standard sets up the layer-naming conventions and establishes a list of standard layers to be used in the CAD file. All possible scenarios cannot be accounted for in a standard, but most of the layers a user will need should be provided in a CAD standard.

Line weights: Another area for standardization is line weights. With possibilities for line thickness settings being almost unlimited, a good time-saving device is the establishment of a company-approved schedule for describing the thickness of common drawing elements.

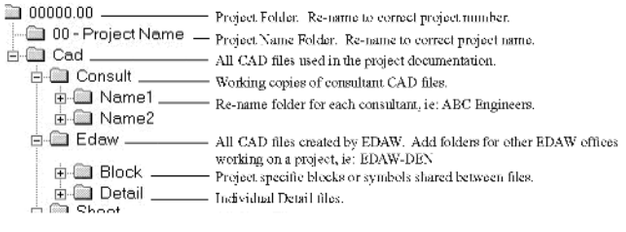
Practices and common pitfalls: This section is generally flexible and may include any information the company believes is necessary for CAD users to reliably and efficiently produce drawings. Approved procedures, such as the handling and distribution of incoming CAD files could be discussed here, as well as other general information, such as the use and location of company standard CAD elements.

LAYERING

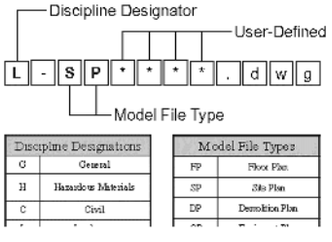
Layers are the primary organizational elements in a CAD drawing. A layer is most easily visualized by imagining a clear sheet of drafting film. The CAD user can stack as many of these sheets of film as necessary into a file and put separate pieces of information onto each one as desired. They can be used in the file or have their display "turned off" for clarity, particularly if that information is not necessary in the drawing being produced. An individual layer may contain a broad range of drawing elements or a few very specific items, depending on the work type and the CAD standards established by the company. A typical arrangement could have the user placing all walkways on a layer, and all landscape materials on another, for example. A more complex project could break down these categories to only have concrete walkways on a layer, brick paver walkways on another, and all of the trees on a layer separate from the rest of the landscape planting. The layering scheme can be as simple or complex as the project or company demands, but should always be based on defined organizing principles, such as a CAD standard.

COMPUTER-AIDED ANALYSIS AND VISUALIZATION

The design process can be aided by the use of visualization software. A visualization package will typically allow the user to, at a minimum, create a three-dimensional model for simple volumetric stud-



EXAMPLE FILE ORGANIZATION DIAGRAM FROM A TYPICAL CAD STANDARD



EXAMPLE FILE-NAMING FORMULA FROM A TYPICAL CAD STANDARD

Thomas Jones, RLA, and Leonardo Alvarez, ASLA, AIA, EDAW

L-SP.dwg Layers (Site Plan)							
LAYER NAME					COLOR	LINETYPE	DESCRIPTION
L-	PVMT-	BRCK			3	Continuous	Brick pavement edge
L-	PVMT-	CONC			3	Continuous	Concrete pavement edge
L-	PVMT-	CONC-	AGGR		3	Continuous	Concrete with exposed aggregate
L-	PVMT-	GRAV			3	Continuous	Gravel
L-	PVMT-	JNTC			8	Continuous	Control joint
L-	PVMT-	JNTE			1	Continuous	Expansion joint
L-	PVMT-	PATT			1	Continuous	Pavement patterning, texture, hatch
L-	PVMT-	PAVR			2	Continuous	Unit pavers

EXAMPLE LAYER-NAMING DIAGRAM FROM A TYPICAL CAD STANDARD

CAD Pen Standard		
Color #	Pen Plotter Width (mm)	Plot Color
1	0.18	Black
2	0.25	Black
3	0.35	Black
4	0.35	Black

EXAMPLE LINE WEIGHT DIAGRAM FROM A TYPICAL CAD STANDARD

COMMON PRACTICES AND PITFALLS CHART FROM A TYPICAL CAD STANDARD

1. All Model Files shall be created at real-scale in model space from a standard template.
2. All title blocks shall be externally referenced (not inserted) in paper space at 1:1 scale 1, at 0,0,0.
3. All references (xref) drawings shall be placed at coordinates 0,0,0 on layer 0.
4. All colors, layer names, and drawing names used in drawing files shall comply with the pen/color configuration set forth in the CAD standard.
5. All CAD entities shall be color and linetype "Bylayer."
6. All block entities shall be created on layer "0" and "Bylayer."
7. All CAD drawings shall contain a path name, filename, and date located within the plot sheet border (suggested location: sheet lower left, vertical orientation).
8. No changes or additions shall be made to the consultant files (other than layer controls) unless authorized by the project manager.
9. Never manually override dimensions.
10. Plot sheet shall be created as an individual CAD file using external references. A single sheet file containing multiple plot sheet layouts is not acceptable.
11. Consultant files shall be assembled using external references only (they are never inserted as blocks).
12. Use OSNAPS and offsets to assure lines and arcs are tangent, perpendicular, parallel, etc. Always use dimensionally and geometrically accurate drawing procedures.
13. Use rectilinear matchlines whenever possible.
14. Create legends in each base file. Then, create a viewport in paperspace for that legend.
15. Create details in architectural units (1 unit = 1 inch).
16. Do not change any CAD configurations.
17. Visretain shall be set at "1" in all model files and plot sheets.
18. Audit files frequently.
19. Create outlines for hatch patterns on the G-ANNO-NPLT layer. All hatch shall be associative.
20. Never, ever, explode hatch patterns, ever!

ies. More powerful software packages exist that allow for more in-depth study of the design model, such as by applying custom lighting, applying the design model to a rendered background representing its conditions, or even incorporating actual site photographs as the setting for the model (see section "Landscape Modeling" for more information). All of these software packages are intended to allow for more in-depth analysis of the visual components of the design than is possible with a CAD file.

Still other software is available that allows for analysis of the nonvisual components of a design, such as sun angle and prevailing winds calculations, among others. These applications are typically more specialized and are used less frequently, but the average CAD user should be aware of the interface between two-dimensional CAD and three-dimensional analysis and visualization tools.

Combining Multiple Programs

Computer-aided design today is not limited to the CAD software alone. Many different programs make up the CAD user's toolbox, including photo-editing software, page layout software, a multitude of analysis programs, and three-dimensional visualization software. The savvy user will realize that almost every project has tasks for which a non-CAD software package is more efficient. An example of this type of work is the visualization shown in Color Plate 5. The basic model is drawn in two dimensions and extruded into three dimensions in CAD (see Color Plate 6). The aerial photograph was manipulated in a photo-editing package to work for this area, and inserted in CAD (see Color Plate 7). The entire model, including the photo, was then transferred into a three-dimensional visualization package for materials, lights, and rendering. The final rendering was placed into presentation software for the meeting with the client, and a short animation was generated and saved as a stand-alone file for distribution to the client. The entire process took approximately three days on an average desktop computer.

GEOGRAPHIC INFORMATION SYSTEMS (GIS)

WHAT IS A GEOGRAPHIC INFORMATION SYSTEM?

This section will describe the uses of geographic information systems, or GIS, as well as provide illustrations of various kinds of maps and analyses that can be produced using GIS.

Many people think of GIS as electronic mapping. While GIS *is* a tool for acquiring data about a site or area and preparing maps, its full potential is realized as an instrument for analyzing, storing, and modeling geographic information.

A Way to Reference and Organize Data

One of the most important advantages of GIS is that all information is *georeferenced*; that is, the information is coded with locational information such as latitude and longitude, state plane coordinates, or metes and bounds. This is a way of locating the site and map in the larger world context and making sure that all data is consistently "registered" according to the same georeferencing system. Manual mapping can result in an information translation problem: Sometimes the "layers" of information are derived from different locational information and thus cannot be easily collated. This problem is eliminated by the use of GIS.

Databases

GIS is a digital map but it is also a digital database. "Behind" the map, generally, are tables of information that are translated into the graphic display of the map. Characteristics of places can be stored in the database for display at the convenience of the landscape architect. For example, the map can be set up so that when the landscape architect "points" to a place, tabular information such as geographic size, population characteristics, and other data can be displayed. This can have applications for land-use and tourism planning.

Layers

GIS is similar to CAD in that it is developed in layers of information. The various features of the map can be displayed ("turned on") or hidden ("turned off") as the landscape architect wishes, depending on the circumstance. For example, the landscape architect may wish to display political boundaries (such as city council districts) on some maps, but not on others. GIS makes it possible to easily control the type and appearance of the information displayed (see Color Plate 8).

DIGITAL MAPPING

The most basic use of GIS is to prepare maps for displaying spatial information in reports and at meetings. As with manual mapping, the first step in preparing a GIS map is to develop a base map. As described below, inexpensive base data is readily available from various sources in the United States. Base maps generally display major roads; lakes, rivers, and streams; major political boundaries, such as state boundaries or city limits; and labels (words) identifying these features. Sometimes, other salient physical features, such as topography, are displayed on base maps.

Thematic Maps

One of the most interesting ways to display information is with thematic maps. Thematic maps translate information into easily understandable graphic displays. One of the most common thematic maps is a slope map (see Color Plate 9). Using elevation information, GIS can calculate slopes and create a map that shows the viewer, at a glance, where the steepest or flattest areas are. Similarly, demographic information can be easily calculated and displayed, so that viewers can readily see where the highest- and lowest-income neighborhoods are, for example, or where the population in a city is densest.

GIS AS ANALYSIS TOOL

While GIS is a useful mapping tool, its real power is in analyzing geographic information for use in making decisions about design, locating facilities, and addressing other public policies. Unlike paper maps, landscape architects using GIS can easily change and experiment with criteria to readily project a variety of informational scenarios on a site to evaluate the different impacts and effects they may have. Brief descriptions of GIS analysis types are given below.

McHargian Analysis

Ian McHarg was a pioneer in overlay mapping analysis, so the spatial analysis technique described in his landmark book, *Design with Nature* (Wiley, 1969), is particularly well suited for GIS. McHarg's thesis was that the environment played a small role in physical planning and design because there was no clear way to quantify and display the various components of the natural and built environment as crisply as a cost benefit balance sheet. Through the use of overlay maps, McHarg demonstrated a large amount of spatial data in a meaningful way; allowing for environmental and spatial consideration to be more fully integrated into analysis. He very specifically organized the mapped layers in a way that he referred to as the "layer cake model" (also see sections "Landscape Planning" and "Resource Inventory and Conservation"). The layer cake was sequentially ordered with the older more fixed phenomena, like geology, at the foundation of the cake and more mobile elements, like wildlife, toward the top. The layer cake was a representation of his observation that geology influenced hydrology, which in turn with relief, influenced soil formation, which set the stage for plants, and so on. With the advancement of computing power and software and more available data since 1969, these overlay maps became more easily produced, thus speeding up the process of both analysis and display.

Layering of constraint information can be done easily with GIS. The landscape architect can manipulate the criteria so as to study their effects in the outcome of the analysis. For example, if a transmission line needs to be sited between two points, the landscape architect enters into the system a multitude of constraints. These may include elements such as the location of houses, churches, and schools; known locations of rare, threatened, or endangered species; steep slopes; protected areas such as parks or wildlife refuges; and bodies of water. The GIS program easily combines all this information, draws buffers around features such as houses or parks and indicates the areas where the fewest constraints exist so that analysts can begin to draw potential routes between the two points. GIS allows the landscape architect to make numerous changes in the size of buffers and how the criteria are weighted, providing for quick and easy iterations of the analysis.

Visual Analysis

Using topographic and vegetation data, GIS allows landscape architects to define "viewsheds" and understand the potential visual impacts of a proposed action. For example, in the transmission line siting exercise, the GIS program can tell the landscape architect whether a proposed transmission line in a specific location can be seen from a specific house, or how many houses will have a view of the proposed line in a specific location.

Statistical Analysis

In addition to displaying information spatially, GIS can provide statistical information related to a specific analysis. For the aforementioned transmission line, GIS will tell the landscape architect how many houses are within 300 feet of the proposed line, how long the line is, how many streams it crosses, and many other statistics.

WHEN TO USE GIS

Landscape architects can use GIS for almost any planning task that requires the display and analysis of mapping information. Some of the advantages of GIS are summarized here:

- *Need to relate to other sites (georeferencing).* When it is important to understand how a site or area relates to the rest of the world, it is advisable to use GIS. Unlike paper or digital nongeoreferenced data and maps, GIS maps are "smart" maps: They are tied to a specific spot on the Earth, and any data entered is registered in the same geographic system. This allows the landscape architect to be more efficient when combining mapping data from different sources, since all sources will reference some geographic referencing system and all data should "register" without difficulty.
- *Need to combine/store/analyze large datasets.* The days of renting hotel ballrooms to have enough room to arrange paper maps for display and analysis are over. Handling large amounts of data manually can be difficult; in contrast, GIS allows for the collection, compilation, and storage of large amounts of data in a relatively small physical space.
- *Need to illustrate analysis.* GIS maps, because of their graphic nature, can be very powerful in reports or at public meetings. The information presented on the maps is based on reliable data sources, and the maps are generally easily understood. As such, they are powerful public presentation tools and generally inspire credibility among otherwise skeptical citizens.
- *Need for iterative analyses.* With paper maps, changing criteria or assumptions can be laborious

Ellen Heath, AICP, EDAW

and expensive. When maps and data are digital, changing assumptions or criteria is relatively easy; analysts can run many what-if scenarios in little time and at little expense.

HOW TO USE GIS

Most GIS software in use in the country today is a product of ESRI, based in Redlands, California. ARCGIS, the most recent package of software, contains mapping, display, database, modeling, and analysis components. Information on this software can be found at www.esri.com. There are other software systems (Intergraph—www.intergraph.com; MapInfo—www.mapinfo.com; and Autodesk—www.autodesk.com; all offer popular GIS programs), and new ones are being developed constantly.

Data Sources

Satellite imagery, images taken from outer space, is a major source of information used in GIS databases; likewise, aerial photographs can also be valuable information sources. High-resolution images can be imported into GIS and serve as a base for mapping.

Other sources of digital mapping data include the U.S. Geological Survey (USGS), which offers digital elevation models (DEM); digital line graphics (DLG), which contain most of the information on USGS quadrangle maps; and other data. Most states in the country also have data clearinghouses that can provide base mapping information for the states. The U.S. Census Bureau also provides digital mapping of demographic statistics, which can be easily imported into GIS systems.

GRAPHIC STANDARDS

The general standards that govern the graphic display of any information govern the creation of maps for display in GIS. In general, GIS maps should be:

- *Easy to understand.* The value of GIS is that it enables the landscape architect to display information in a way that is easy for the general public to understand. Simple, clear graphics are best for communicating information and analyses.
- *Aesthetically pleasing.* In general, the viewer should be able to understand at a glance the data presented. A range of values in one color family is preferable to communicate low to high values; maps with numerous bright colors tend to be jarring to the viewer and confusing in terms of communicating high and low values thematically. Labels should be legible at the report-graphic size, as well as on large display maps.

BENEFITS AND CAUTIONS

The benefits of GIS are clear: GIS is a powerful tool for landscape architects to gather, analyze, store, and display large amounts of spatial information. That said, GIS should be viewed not as an end in itself. It is a powerful tool for supporting sound analytical and ethical evaluations and display of land-based data, but the analysis must be conducted by a knowledgeable practitioner skilled in the evaluation of physical features of the land.

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ENVIRONMENTAL AND LEGAL

ENVIRONMENTAL REVIEW

INTRODUCTION AND BACKGROUND

The purpose of this section is to help landscape architects navigate the environmental review process as specified in the National Environmental Policy Act (NEPA). Some landscape architects may never encounter NEPA, but those firms whose work is predominately in the public sector may interact with it on a regular basis.

NEPA was established in 1969 as part of the ecological movement and in response to environmental degradation and a lack of community input in development decisions. The goals for the creation of the policy are stated in Section 2 of the act:

> *To declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality. Sec. 2 [42 USC § 4321].*

The federal government established this act to raise environmental awareness and provide oversight of federal actions. Much like other major legislative initiatives (voting rights, equal protection under the law, etc.), the federal government set high standards to protect the national interest and set an example for local actions. The most significant benefit of environmental review is that it serves as a strong deterrent to the most inappropriate and degrading actions. For example, the original plan to drain the Everglades would not have been acceptable under NEPA and few decision-makers would consider proposing such an idea today.

NEPA is a procedural law requiring a project to undertake specific steps in order to gain approval. NEPA requires the consideration of environmental concerns and mandates opportunities for community input before final decisions can be made. Public disclosure requirements include publishing a public notice informing the public of the project and the availability of the report. This is followed by a review period, which includes a specified time for public comment.

The report produced is a comprehensive technical document covering a multidisciplinary range of manmade and natural resources. Four parts are involved:

1. Description of the project, including its justification
2. Project alternatives that must be considered
3. An assessment of existing conditions
4. An evaluation of potential impacts, with corresponding mitigation measures

Projects typically require a federal review if they are involved with federal construction, federal lands, or federal funds. Some examples include projects affecting wetlands, national parks, airports, interstate highways, federal courthouses, and federal agency headquarters. The following table contains a listing of types of projects.

Sometimes, municipal or private projects also require review. Approval of the project can be contingent on the applicant (owner/developer) completing an environmental review document for the federal agency. The contractor is required to pay for the study, but the scope of work, content, and schedule are subject to federal direction.

Some state and local governments have environmental review requirements: These are commonly referred to as "Little NEPA" laws. If the project meets federal guidelines, then a federal study typically will satisfy the local requirements as well. There are exceptions to this rule. For example, California's comparable law, California Environmental Quality Act (CEQA) has some guidelines that are more stringent than NEPA.

THE NEPA PROCESS

If a project is subject to NEPA, the first decision is to determine the level of analysis. There are primarily two types of documents that are prepared to satisfy NEPA requirements, an Environmental Assessment (EA) and an Environmental Impact Statement (EIS). An EA is a more concise product of an accelerated and streamlined process. An EIS is an extremely detailed and scientific examination of issues. The entire EA process typically takes 6 to 12 months, depending on the level of complexity. An EIS often takes from one to two years. Both types of NEPA documents follow a standard process and have a specific format, detailed below; and the following table contains a sample table of contents.

Description of the Project and Determination of Scope: The first chapter in an EA or EIS is a description of the proposed action, including the purpose and need for the project. Based on the project description, the next step is to conduct a scoping effort to determine the key issues surrounding the project with resource agencies and interested parties, even though the design has not been completed. The potential impact areas and specific issues of importance would be identified and explored. Conducting thorough scoping can avoid costly delays and problems later in the process.

Development of Project Alternatives: An important component of an EA or EIS is an analysis of alternative approaches to the project.

LISTING OF PROJECTS

TRANSPORTATION	INFRASTRUCTURE	BUILDINGS AND STRUCTURES	PARKS AND RECREATION	MILITARY	CIVIC PROJECTS	EDUCATION
Highways	Power Stations	Offices	Marinas/Docks	Military Base Plans	Memorials and Museums	Campus Master Plans
Roads	Utility Lines	Hotels	Zoos	Military Base Closure	Courthouses	Schools
Bridges	Landfills	Homes	Golf Courses	Military Housing	Prisons	Dormitories
Parking Garages	Dams and Reservoirs	Theaters	Parks/Recreation Facilities	Weapon Ranges	Hospitals	Laboratories
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NATURAL RESOURCES			MANMADE RESOURCES			
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Water Resources	Woodlands/Timber	Ambient Noise and Air Levels	Economics/Employment	Cultural Resources	Mass Transit	Public Infrastructure
Floodplain	Wetlands		Community Facilities	Views of Significance	Pedestrian/Bicycle	Hazardous Material

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Usually two to three alternatives are considered. They need to answer two questions: "Where else could the project be located?" and "How else could the project needs be met?" The analysis of project alternatives provides critical comparisons to the preferred alternative.

Documentation of the Affected Environment: The first technical component of the document is the affected environment. This section describes the baseline conditions for the project site and surrounding context for each of the resource disciplines.

Evaluation of Environmental Consequences: The potential consequences of the project on the site and surrounding area are then identified, including short- and long-term impacts. The former refers to the ways the construction process itself alters the site and surrounding areas. The latter addresses the impacts attributable to operations once the project is complete.

The effects of a project can be viewed as having either direct or indirect affects on a site. For example, if a straightforward action occurs, such as physically removing a house, this is considered a direct impact. Less apparent are the indirect impacts, which create a situation for changes to occur off-site or later in time. For instance, a project could encourage the redevelopment of an area and ultimately result in the removal of the house, which would be considered an indirect impact.

The cumulative impacts of a proposed project and other existing and potential projects also need to be considered. This is particularly important when a new project is proposed in an area that already contains similar facilities, or may be the location of another proposed facility with adverse impacts. A single facility may not be problematic on its own; however, if additional facilities are built, the combined effect could be substantial.

Development of Mitigation Measures: The environmental review process also includes recommendations to reduce or offset the adverse impacts of the project. For example, a new amphitheater proposed in a park might raise some environmental concerns, such as greater stormwater runoff due to increased impervious surfaces, loss of open space, and additional traffic on the site. A project solution could include stormwater retention measures to minimize soil erosion and limits to vehicular access. These measures would then become conditions for project approval.

Circulation of Documents for Review: The various chapters of narrative and graphic information are compiled into a report. Once the lead federal agency and the project team approve it, the report is presented to the public for review. Typically, an EA is under review for 30 days and an EIS is given 45 days. For an EIS, a public meeting is typically required to allow everyone a chance for input. The report is also placed on the Internet, and some agencies are presented with hard copies. The public and other agencies have the opportunity to write letters in response to the report.

Completion of the Environmental Review Process: Following the public review period, all the comments are compiled and addressed, at which point the project can either be approved, change direction, or be dropped altogether. At the end of the EA process, if a project does not have significant environmental impacts, a Finding of No Significant Impact (FONSI) is prepared and signed by the appropriate federal agency, becoming the final environmental documentation for approval. If significant impacts are determined, the preparation of an EIS is required. For an EIS, the completion of the environmental review process is the Record of Decision (ROD), which documents the agency's process and findings.

RELATED STATUTES AND REQUIREMENTS

The following statutes are considered when developing an EA or EIS. The team needs to coordinate with these acts and regulations:

National Historic Preservation Act (Section 106) (NHPA)

Endangered Species Act (Sections 7 and 10) (ESA)

Clean Water Act (Section 404) (CWA)

Rivers and Harbors Act (Section 10) (COE)

Clean Air Act (Conformity Requirements) (EPA)

Other federal regulations that may apply, depending on the federal agency involved

POTENTIAL LEGAL CHALLENGES

The studies produced in accordance with NEPA are legal documents and are subject to public scrutiny. As such, there is a real potential for legal challenges. Great care must be taken in document preparation to ensure accuracy and prevent needless legal expenses. Legal challenges, if they persist, can actually derail a project due to the length and cost of legal action—even if the charges are not valid. For projects that result in judicial involvement, the judge will be most concerned with fulfillment of the procedures of the NEPA process rather than technical findings.

LEGAL: PERMITS AND REGULATIONS

PROFESSIONAL LICENSURE OF LANDSCAPE ARCHITECTURE

Professional licensure is permissible constitutionally under the "police power" of the states. Legislation under the police power is permissible so long as the legislation is geared toward protecting the health, safety, and welfare of the citizenry. Professional licensure clearly falls within this requirement. Landscape architecture is a relatively recent newcomer to professional licensure, in comparison to its "sister" professions of architecture and civil engineering. For example, architecture was regulated in California pursuant to statute in 1901. In contrast, the amendment to the California Business and Professions Code that regulated the practice of landscape architecture was not enacted until 1953. This was the first such regulation in the United States. In the State of New York, architecture was regulated a bit later, in 1929; landscape architecture was not regulated there until 1961.

Notwithstanding its relatively recent status as a licensed profession, the history of landscape architecture is ancient and diverse. From the gardens of imperial Rome to the medieval mazes of early Christendom, landscape architecture has historic roots. The use of the professional title "landscape architect" dates from the mid-1800s, and the American Society of Landscape Architects (ASLA), the professional society for landscape architecture in the United States, was formed in 1899. It was not until a half-century later that licensure came into effect.

History of Licensure

The New York case of *Paterson v. University of the State of New York*[1] provides an interesting snapshot of the history of licensure of landscape architecture when one compares the lower court opinion (which overturned the licensure statute) with the appellate court opinion (which overturned the lower court decision and upheld the statute). The lower court expressed the concern that the definition of "landscape architecture" was unconstitutionally vague and required the exclusion of gardening, landscape contracting, horticulture, and the practice of arborists, among other services. By extension, the lower court argued that the practice of landscape architecture could not possibly imperil the health, safety, and welfare of the public if so many other quite similar (but unlicensed) services did not require licensure. As such, the lower court reasoned, it was nearly impossible to determine which services could be subject to criminal sanction and which could not. The appellate court reversed this, citing evidence that the health, safety, and welfare of the public could be imperiled by the practice of unlearned practitioners. The appellate court also referred to the then 17 degree programs providing higher degrees in landscape architecture, which demonstrated the professional nature of the practice.

Interestingly, the American Society for Landscape Architects (ASLA) continues to make many of the same arguments in its continuing efforts to pass legislation in the remaining three states (Colorado, Vermont, and New Hampshire) that still do not regulate the profession of landscape architecture. The efforts to promote regulation of the profession have borne significant fruit over the years, resulting in 9 that regulate only the use of the title "landscape architect," and 38 states that regulate the "practice" of landscape architecture.

"Title" Statute and "Practice" Statute

There is a fundamental difference between a "title" statute and a "practice" statute in landscape architectural practice. A jurisdiction that regulates only the use of the title "landscape architect" may have unlicensed practitioners performing services that constitute landscape architecture, but who are not in violation of the statute so long as they do not advertise themselves as landscape architects. In addition to regulating the use of the title, a jurisdiction that regulates the practice of landscape architecture defines which professional activities qualify as the practice of landscape architecture and then criminalizes the performance of those services by any unlicensed practitioner. The ASLA strongly supports the passage of "practice act" statutes in all the 50 states and continues to work toward that end. (A link to title and practice jurisdictions can be found at www.asla.org.)

About half of the states that require licensure of landscape architects individually also require licensure of any business entity that performs landscape architectural services within the state. Many such laws require that an officer or owner of the business entity be a licensed professional in the state in order for the business entity to qualify for licensure.

As noted above, landscape architectural practice overlaps with the practice of its sister design professions of architecture and civil engineering. In some jurisdictions, this overlap has been used by professional societies of civil engineers and architects as a purported justification for rejecting the licensure of landscape architects. However, overlap in professional services promotes competition and so long as the professional licensure reflects shared technical capacities, the safety of the public can be assured. In addition to overlap, of course, there are complementary skills as well. For example, surface grading and drainage may be an area where landscape architects are uniquely able to combine aesthetic and functional concerns, whereas subsurface storm drain collection and drainage may be an area where civil engineers are best able to bring their expertise to solve a site problem. Ultimately, of course, the client is probably best served by having professionally trained and licensed practitioners with diverse skills and abilities from which to choose.

CERTIFICATION BY PROFESSIONAL SOCIETIES

In addition to licensure by a state jurisdiction, certifications by professional societies or industry groups are available in related practices. Although not subject to professional licensure, these professional certifications may help to ensure quality services. However, the absence of state licensure means that the performance of services without certification is not illegal, although an action for false advertising or negligent misrepresentation may exist where providers hold themselves out as "certified" when they are not.

The International Society of Arborists offers certification in the field of arboriculture upon completion of educational requirements, practical experience, and a standardized examination. The American Society of Consulting Arborists offers additional certification as a Registered Consulting Arborist upon completion of its certification process. Certification by these professional societies establishes a level of professional knowledge and skill that the public may consider in selecting tree care services and consultants. In addition, the Pennsylvania Landscape and Nursery Association offers certification as a Pennsylvania Certified Horticulturalist, again upon fulfillment of educational, practical, and examination requirements. Other horticultural certifications also exist. Both certifications require continuing education requirements so certified individuals continue to develop skills and knowledge appropriate to the certification.

More recently, the U.S. Green Building Council, an industry group dedicated to the promotion of environmentally and ecologically sensitive building techniques and materials, has sponsored Leadership in Energy and Environmental Design (LEED) certification. LEED certification is offered to qualified individuals in the building industries or facilities management who pass a four-part examination demonstrating knowledge of building practices and design theory that furthers the expressed goals of the council.

REGULATION RELATED TO THE PRACTICE OF LANDSCAPE ARCHITECTURE

In addition to the direct regulation of the practice of landscape architecture through professional licensure, there is a whole body of regulations that affect how landscape architects render professional services. This can affect the design and planning recommendations made by landscape architects. In summary, these regulations consider the public interest in ways that include, but are not limited to:

- Land use, preservation, or development
- Protection of threatened resources and plant and animal species
- Impact on environmental change
- Preservation of historical or archeological assets
- Economic stimulation, maintenance, or restriction.

There are also other substantial bodies of related law that also apply to landscape architectural practice. For example, water law is a highly complex body of law that derives from property rights, common law, mining law, and state and local regulation.

Land-use regulation can pit the interests of individual landowners against the interests of the public, and may be limited by an analysis of whether or not regulation of private property is so extensive or comprehensive as to constitute a taking of private property without just compensation by the state. Generally the courts give the state broad discretion, and most regulations are generally upheld.

ZONING AND ENTITLEMENTS

Landscape architects must make themselves aware of any applicable zoning or entitlements, and the implications of such regulations on the professional

[1] *14 N.Y. 2nd 432 (1964).*

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practices they seek to render to private as well as public clients.

Many states have laws that specifically require the preparation of planning documents at the state and local level. These documents typically codify zoning regulations. Often, these require the consideration of factors such as noise, traffic, and pollution in assessing future land uses. As a consequence, zoning regulations can be quite complex, and address a number of factors.

Land Development and Growth Management Regulations

State and local regulations can also take the form of land development and growth management regulations. For example, a subdivision map act may regulate the division of large parcels of land into smaller units. These regulations may address the obligations imposed upon developers of land to provide for infrastructure necessary to support the intended uses of the land being developed, as well as the process by which private property or infrastructure can be "dedicated" to public use. In some cases, county or local government may place a moratorium or significant restrictions on water or sewer hookups, effectively prohibiting new development.

Some regulations require that large-scale developments perform an analysis of the Development of Regional Impacts (DRI). This is usually a stand-alone process applying specifically to projects of a certain size and scope.

Design Review

City and local regulations may include the requirement that projects be approved by a design review board, especially where either a particular architectural theme predominates or it holds historic significance. For example, the City of Santa Fe, New Mexico extensively regulates architectural design features, as well as plant selection, in its local ordinances to maintain its historic character.

Development Covenant and Restrictions

In addition to state and local regulation, many large developments contractually or by title to property bind landowners within a particular development to covenants and restrictions running with the land that restrict the ability of future landowners to develop their property. An early example of this strategy was implemented in the "Sea Ranch" development in Northern California to maintain design consistency and view corridors. Landscape architects must be aware of these "private" regulations as well.

Environment-Related Regulations

Environmental sensitivity is one of the benchmarks of good landscape architectural practice. Commonly today, training for the design professions includes study in environmental impacts and sensitivity to those impacts. This is also true for landscape architectural training. In some ways, of course, it is expected that a practice focused on living materials would be especially sensitive to environmental impacts. In practice, however, that is not always the case.

The state is also interested in environmental and ecological preservation, and numerous federal, state, and local regulations exist that are targeted toward that goal. Examples of such regulations include, but are limited to:

- *Water usage regulations mandating water conservation measures and use of xeriscape-appropriate plant species.* For example, the California Water Conservation in Landscaping Act, and municipal code sections that implement its requirements such as the City of Palm Desert Water Efficient Landscape Code, provide for maximum annual water usage as well as design review for appropriate species.
- *Invasive species regulations, including noxious weed laws, seed laws, invasive species councils and their recommendations, and aquatic plant permits and regulations.* Certain municipalities have regulations that mandate the use of native species as part of overall design guidelines, or as a specific requirement.
- *Design regulations that mandate LEED certification for projects, project elements, and/or materials.* Many municipalities, including the City of Houston, Texas, now require LEED certification of new city projects.
- *Harmful pest regulations.* These regulations require nursery practices intended to reduce or eliminate the spread of insect and other pests to noninfected areas within the state. They do not directly affect landscape architectural practice, but usually a reference is required in construction specifications, which in turn affects the nursery industry.
- *Tree preservation regulations.* This may include a prohibition against damaging or removing trees above a certain caliper diameter and are sometimes enforced by the building department or permitting authorities, as well as a planning department.

Historic Preservation

Governments have a rational basis for regulations that seek to maintain and preserve structures and sites that have historical and cultural value: They need to be preserved for future study and inspiration. Under the National Historic Preservation Act (NHPA) of 1966, and related state laws, demolition or renovation of historic structures must consider the preservation and/or documentation of the historic value of that structure. In addition, landscape-specific projects, such as the Historic American Landscapes Survey (HALS), conducted under the auspices of the National Park Service, seek to record and preserve historically significant American landscapes.

Landscape architects called upon to provide professional services related to a historic or potentially historic site should consult whether there are any applicable federal, state, or local laws that may impact the performance of those services.

REGULATION OF LANDSCAPE DESIGN AND CONSTRUCTION

The design and construction of landscape improvements, including irrigation systems, is also subject to regulation by state and local government building codes. In addition, federal law such as the Americans with Disabilities Act (ADA), and its associated design guidelines (ADAAG), may also apply.

Permitting

Most municipalities require some form of construction permitting for significant landscape construction or for construction that includes structural, electrical, or architectural improvements. Although not all landscape projects require construction permits, this is typically the hurdle (or hurdles, depending on the project) that most projects must surmount in order for a municipality in question to approve a certificate of occupancy, permitting public or private use. Regulations that are typically reviewed in conjunction with permitting include:

- Building codes, which may also include fire codes, plumbing codes, and electrical codes that apply to the proposed construction. In certain cases, specific irrigation codes that regulate the construction of irrigation systems and components must also consulted and followed.
- Federal and state regulations dealing with handicap access must frequently be followed in new construction or renovation projects. These regulations apply to path of travel, stairs, ramps, obstructions, and site amenities. In addition, small structures that are part of the landscape must also meet handicap and ADA accessibility standards.

MISCELLANEOUS MUNICIPAL REQUIREMENTS

There are a number of miscellaneous regulations that may apply to landscape design and construction projects undertaken in particular jurisdictions. Some examples may include:

- Regulation of the use of nonnative hardwoods.
- Regulation mandating the use of products made in the United States.
- Regulations mandating the use of fire-resistive plant materials in new construction or fire-resistive building components.
- Regulations mandating that new construction meet or exceed permeability requirements, or storm water drainage or discharge requirements.

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PROJECT ADMINISTRATION

PROJECT MANAGEMENT

The project manager is essential to the success of any project. He or she is the person responsible to the client for delivering a quality project on time and within budget. The project manager is also the person responsible to his or her employer for ensuring the quality of a project, making a profit, and looking out for the company's interests. Finally, the project manager is responsible to the project team for defining roles clearly and communicating what team members need to know to be able to perform their duties well.

WHAT MAKES A GOOD PROJECT MANAGER?

The successful project manager needs to have:

- Organizational ability
- Effective communication skills
- Sense of responsibility and ownership
- Technical skills

Organization

First and foremost, the project manager must be able to organize large amounts of information for easy reference by the project team. Digital and paper files should be stored in a central place accessible to all members of the project team. Keeping records of all meetings and correspondence is essential to protecting the interests of the design firm as well as the client.

Communication

The project manager is responsible for keeping the client, principals, and project team up to date about project developments. Excellent communication skills are essential in this effort. The project manager must be able to communicate ideas effectively both verbally and in writing. Furthermore, the manager must be comfortable presenting ideas and directions in multiple settings, such as to an individual team member, to the team collectively, to the client, to the employer, and at times, to community groups or city officials.

Sense of Responsibility

The project manager must possess a strong sense of ownership of the project, fully recognizing that he or she is the person responsible for the success or failure of the project.

Technical Skills

Finally, the project manager must possess the necessary technical skills required for each specific project. Though he or she is not required to personally perform the tasks at hand—that is what specialists on the team are for—the project manager needs a general knowledge of the work required to ensure the suitability and quality of all the products of the team.

DUTIES OF A PROJECT MANAGER

The duties of a project manager include:

- Proposal writing
- Project initiation
- Scheduling and budgeting
- Work planning
- Monitoring
- Finance management
- Team/subconsultant management
- Client/owner management
- Additional services management
- Quality control
- Project closeout

Proposal Writing

Often, the project manager's first involvement in a project is the preparation of a proposal. The project manager and principal may collaborate in preparing the scope of services and fee proposal, ensuring from the outset a mutual understanding of the firm's obligations to the client. During this phase the prospective client often wants to meet the project manager, to get to know whom he or she will be working with during the life of the project.

Project Initiation

The first task of managing a project is to form the project team. Identifying the appropriate team members should be based upon the required skills, professional goals, and interests of staff members, in conjunction with project budgetary requirements. In addition, the principal and project manager must identify and secure the services of any necessary subconsultants.

It is important to have a signed contract in place before starting any work. That way project participants will understand the roles and responsibilities of all involved parties. It follows, then, that the project manager and principal are responsible for the timely preparation and execution of subcontracts that clearly spell out the tasks and responsibilities of each subconsultant. (Contract preparation is addressed at length in the Project Manual and Overview of Construction Documentation sections.)

Scheduling and Budgeting

Another of the duties of the project manager is to estimate how many hours each person on the team will need to complete each task, for the purpose of determining how most of the project budget will be spent. The most effective way to do this is to consult with each team member, the goal being to agree on an answer to the question, "How long should this task take?" This participatory approach creates a sense of ownership among the entire team for the project budget.

In addition, the project manager must determine how much money to set aside out of the budget for expenses and to pay subconsultants. Budgeting about 10 percent of the fee amount for contingency is recommended. Some tasks take longer than anticipated, so having this contingency amount in reserve can prevent a project budget overrun.

Work Planning

Once the project team is in place and all roles and responsibilities have been clearly defined, the project manager should prepare a plan for executing the project. A well-thought-out work plan and schedule helps keep the project manager and team members on track. Proper planning allows greater control over the project and helps to reduce errors, changes, and costs associated with corrections.

The work plan contains a breakdown of tasks to be performed, with clear milestones and schedules for each. It indicates the time for product delivery, as well as the effort it took to complete each task. Defining a project schedule helps keep the project within the established budget—in general, when schedules stretch out, budgets do too. Scheduling in this way from the outset communicates to the project team, as well as to the client, the expectations for timely reviews of submittals, meetings, delivery of information, and other items that can affect the timely completion of the project.

Monitoring

Once the work plan, budget, and schedule are in place, the project can get underway. Regular monitoring of these three components is essential to the success of the project, in terms of quality, client and team satisfaction, and finances. Regular team meetings with internal staff, as well as consultants, help confirm that everyone is on track and that the project is moving along according to schedule and budget. Subconsultants may be included in these meetings, or the project manager may choose to communicate with subconsultants independently.

Finance Management

Regular updates of the project budget are crucial to making sure that the project meets profitability expectations. Costly surprises later in the project can be prevented by regularly checking the hours actually expended, then correlating them to the budget. A staff member charging full-time on a project can spend between $10,000 and $15,000 in four weeks, so checking the budget on a weekly or biweekly basis can prevent expensive mistakes.

Team and Subconsultant Management

In addition to holding regular progress meetings, the project manager should meet informally with staff members and consultants on a periodic basis in order to gain a clear understanding of the personal dynamics of the project. The project manager can assess if personal goals of team members are being met and determine whether there are any problems that he or she needs to address.

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Client/Owner Management

Frequent communication with the client is essential. The project manager needs to make sure that the client is satisfied with the progress of the project. This is a preventative measure: It is always best to anticipate dissatisfaction and resolve any problems early. This reduces the chances of confrontations later, such as a client refusing to pay an invoice due to disagreements about the progress of the project or discontent with the products received.

Additional Services Management

Having a good work plan and clearly defined schedule also allows for easy tracking of any additional services. Often, clients are not intimately familiar with the provisions of the contract; and even if they are, sometimes they insist on asking for more. One of the project manager's main responsibilities is to monitor efforts and products to make sure that they are within the scope of the contract. Keeping track of additional service requests, and communicating to the client when requests constitute additional services, can help ensure the financial success of the project, as well as the goodwill of the team. To that end, the project manager should make sure that all project team members are familiar with the contracted scope of services, so that when a team member receives a request for something outside the scope, he or she can alert the project manager that there has been a request for additional services.

Quality Control

Landscape architects owe it to themselves, their firms, the profession, as well as to their clients, to ensure that all products are of the highest quality possible. Third-party review of products is often the best way to ensure that product quality is delivered; review by a professional who has not been involved in the day-to-day progress of the project can reveal inconsistencies and errors that are not obvious to the project team. Third-party review of documents, including correspondence and drawings, is advisable.

Project Closeout

Once the project has been successfully completed, all digital and paper records should be organized and stored in a secure place.

Experienced project managers reward successful teams at the completion of a project. The rewards may take several forms: celebratory drinks or meals, written thank-you notes, or commendations or announcements at office meetings.

As part of project closeout, the project manager also should meet with team members, as well as the client, to discuss where things went right and wrong, what could have done better, and what lessons were learned that can be applied to the next project.

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BUSINESS ADMINISTRATION: RECORDS, LEGAL, LIABILITY

Good business administration practices and procedures are crucial to the health of any business. They can foster a good business reputation for the company and have positive financial results. For companies that provide professional services, including landscape architecture firms, good business administration practices can also mean the difference between negligent or nonnegligent conduct. In order to understand how to do things right, it is essential to look at the converse impact of doing things wrong: The impact of bad record keeping and bad professional processes can be a significant potential liability. That said, an obsessive focus on liability can paralyze the professional. Instead, it is best to strive for a healthy attention to best practices, which free professionals to be the best they can be and potentially also have the effect of lowering the risk of liability.

PROFESSIONAL OBLIGATIONS OF LANDSCAPE ARCHITECTS

Professional Standard of Care and Negligence

First and foremost, a landscape architect is a professional. Even in those jurisdictions where there is no licensure of the practice of landscape architecture, in the event that the acts or omissions of a landscape architect result in damages, the courts entertain, and may require, testimony of other similarly situated professionals to ascertain whether the act or omission was "negligent"—that is to say, whether the act or omission fell below the standard of care practiced by similarly situated professionals in the locality. Only by comparing the typical conduct of other landscape architects to the particular conduct of the one whose acts or omissions are in question can a finder of fact assess whether the particular conduct was negligent or not negligent.

So, for example, for a jury to determine whether or not a landscape architect working in a desert environment was negligent in specifying a tree for a use that called for drought-tolerance, they would have to assess whether similarly situated landscape architects would or would not have specified the same species of tree in a similar circumstance. This "duty of care," a comparison of the practices of other similarly situated professionals in the locality, at the same time, is applicable in every circumstance where professional care and discretion are required in the rendering of professional opinion or the implementation of that opinion in action. Of course, the duty of care also applies to instances of "nonfeasance," where the professional fails to take action or render an opinion when one would have been called for. An obvious circumstance where the duty of care applies is when a landscape architect reduces a design concept to graphic representation in plan form. Less obvious circumstances include the duty to notify the client when the landscape architect receives direction that is inconsistent, or where the "client" is composed of various entities that request services or solutions that conflict with one another. In addition, the landscape architect must consider circumstances where a client must be informed that there may be unknown consequences of the use of untested materials or of tested materials used in unique ways.

The duty of professional care also requires that a landscape architect review, analyze, and conform his or her professional services to the requirements of applicable law. Just as ignorance of the law is no excuse generally, ignorance of applicable law that regulates or affects landscape architectural practice is no excuse either.

It is important to understand that even when a landscape architect is hired by a sophisticated client, blindly following the direction or decisions of that client may not insulate the landscape architect from liability if that direction or decision was wrong. Even the use of the client's "standard" specifications or details might be problematic, if they are flawed or out of date. The landscape architect is being hired to provide professional guidance and counsel; therefore it is always good practice to put in writing any professional concerns and questions raised by client direction, to communicate those to the client, and to maintain copies of those documents in the project file.

Professional liability may also be "shared" with others, including where a landscape architect may become responsible for the acts or omissions of others. The most common situation is where a landscape architect hires or otherwise engages individuals or entities to assist in the rendering of professional services generally or for a particular project. Where a landscape architect represents to the client that he or she has the capacity to oversee and coordinate the work of subconsultants or advisors, and contracts with that client for the performance of services incorporating that work, the landscape architect will be "vicariously liable" for the acts or omissions of those subconsultants and advisors. This is one of the reasons why it is always important to have a well-drafted and comprehensive written contract between a landscape architect and any subconsultant or advisor.

Another circumstance where the liability of others may be assumed by a landscape architect is where a joint venture is formed for the purpose of performing professional services and the landscape architect is a member of this joint venture. In many jurisdictions, the liability associated with joint venture participation, as well as other circumstances, may give rise to "joint and several" liability, which means that each party is fully responsible for the total damages caused. As in all instances where new entities are being formed, it is very important to consult with competent and independent counsel to ensure that you are receiving the best advice possible.

In some cases, clients will request that they be granted rights of ownership not only in the hard copy deliverables provided as part of the rendering of professional services, but also the rights of intellectual property that attach to the creation of those deliverables. This is a matter that is best discussed with competent counsel. However, a landscape architect should always consider the possible consequences of reuse of his or her work product and how to mitigate against the harm that might be associated with that reuse. Again, an attorney is a good place to start here.

Liability for professional negligence is one type of what are called "tort" liabilities (another type will be discussed later on). In general, professionals can be sued for damages that are caused by their professional negligence (subject to certain rules about who can or cannot sue in certain circumstances) and must pay the cost of restoring injured parties to the state that they would be in had the negligence not occurred. This is a very simplistic summary; again, an attorney should be consulted as to the special rules that apply to this generality.

Contractual Obligations

It is important to learn the basics of contracts as they apply to landscape architectural practice in order to have a general understanding of the liabilities associated with contracting for the performance of landscape architectural services.

Contracts are little "worlds" created by the parties that negotiate them. With limited exception, parties can enter into contracts that contain just about any provisions imaginable. This means that, in general, a party can agree to provide services of just about any type, to be performed within just about any schedule, subject to just about any terms, for just about any payment. As such, a landscape architect can contract to assume much more liability than he or she can be sued for in a court of law for negligent performance of professional services. If landscape architects don't pay attention to, or control how contracts are created, they can find themselves inhabiting a world they might regret helping to create.

In general, a contracting party can be sued for contract damages in the event that such party "breaches" (or fails to perform) the contract in some aspect and the breach causes damages. In general, nonbreaching parties can collect as damages the amount necessary to put them in the position that they would be if the contract obligations had been fulfilled.

In some cases, a contracting party may owe obligations under the contract to a third party to the contract and have liability to this third party if he or she breaches. In other cases, the contract will require that a contracting party make a representation to a third party, who then may sue on the basis of any misrepresentation. In general, anytime a contract requires a landscape architect to perform a duty to a third party, or for the benefit of a third party, or make a representation to a third party (such as a bank or lender), the landscape architect should contact an attorney to discuss the requirement.

Strict Liability

In some rare circumstances, the performance of landscape architectural services may result in the assumption of strict liability in tort, which is another type of tort liability. Generally, however, the landscape architect can and should avoid the assumption of strict liability.

The most common example of liability which a landscape architect may become involved with that is a form of strict liability is infringement of the intellectual property rights of others. A claim for infringement of copyright, trademark, or patent generally requires only that there be substantial similarity between the infringing work product and the protected intellectual property and no privilege for use of the intellectual property or other exception to liability. No "negligence" on the part of the infringing party must be shown. Infringement is most likely to come up when a landscape architect is given or comes into posses-

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sion of the work product of another party and incorporates it into his or her own work product without permission. It is important to secure permission before using the work of others.

One type of strict liability that a landscape architect should be wary of, and not assume by contract, is that associated with the sale of goods. Work product associated with professional services is generally not a "good," but an instrument of professional services. Any contract that seeks to impose liability for sale of goods, or warranties associated with the sale of goods, such as the implied warranty of merchantability should be reviewed with an attorney.

POSSIBLE ENHANCEMENTS TO LIABILITY

There are some circumstances, relationships, or events that, on average, may tend to increase the possible liability associated with a particular project.

Certain client relationships may pose unique challenges. Again, these are general statements that do not apply to any one particular client or any specific set of circumstances; these are merely considerations for general review in appropriate circumstances.

When considering a project, a landscape architect may wish to consider the following:

- Is the client an amalgam of different groups or divisions with potentially differing interests and goals?
- Is the client sufficiently funded for the work to be performed, or is the client in part reliant upon funding that may be generated or influenced by the work to be performed?
- Is the client changing design professionals in the middle of a project; if so, why?
- Is the client embroiled in contentious or demanding negotiations with third parties that relate to the project?

None of these may be reasons *not* to take a job, but they may be reasons to ask more questions.

Some types of projects themselves may be worthy of questioning whether they represent a greater risk of liability. Landscape architectural professional liability insurers maintain lists of such project types, and it may be appropriate to consult with an insurance broker on this topic.

Some types of project delivery methods, such as fast-track projects, design/build projects where the landscape architect is taking a prime role, or design/build joint ventures, may be circumstances where additional questions need to be asked. Where the landscape architect is taking a prime consultant role, and the subconsultant team is in whole or in part dictated by the client, additional considerations regarding liability may need to be taken.

Finally, on certain projects, the services required may be beyond the particular skill set of the landscape architect, who should beware being overextended. The wise landscape architect will take on only those services he or she can perform without jeopardizing the professional quality of those services.

CONTRACTUAL LIMITATIONS ON LIABILITY

Certain contract provisions, such as indemnities and limitations of liability, can be used to partially manage the risk associated with contracting for professional services. Consulting with a competent attorney is the best way to consider whether such contractual protections may be applicable in any particular circumstance.

BEST PRACTICES AND RECORD KEEPING

This section outlines in brief terms some of the issues a landscape architect should consider, and usually document, during the successive phases of a job. This summary may be considered a rough outline for further study or solicitation of additional consultation by a competent attorney.

Precontract and Marketing

The most common issue that arises in the context of marketing the services of a landscape architect is the risk that marketing materials will make such express and definitive claims as to constitute a promise that will form the basis of either a contract or a representation that may give rise to liability. For example, saying that one's firm provides quality services using a unique "team" approach across internal disciplines is probably acceptable. In contrast, saying that one will employ only experts in their respective fields to serve as members of a team that will perform work on a project must be a true statement, or it may result in liability.

Contracting

Firstly, it's necessary to consider the law of the state under which the professional services will be contracted to determine whether there are legal requirements that dictate certain terms and conditions of the contract. Some states require that the license number of the landscape architect appear (this may also apply to marketing materials), as well as other specific requirements. In general, regardless of the applicable law, it is always good practice to have a written contract so as to fix the mutual intent and codify the expectations of the parties.

Although a letter of intent or understanding may be elected to be used to "kick off" the professional services on a temporary basis pending negotiation of a contract, a document that adequately addresses the necessary elements of a typical professional services contract should always be entered into.

Many governmental and large corporate entities use a manuscripted contract that is specific to that entity and not a standard industry contract such as one of the American Institute of Architects' or Engineers Joint Contract Documents Committee's suite of documents. These manuscripted contracts may be written to strongly favor the interests of the drafter and hence should be carefully reviewed and amended (if possible) before execution.

As discussed above, a prime landscape architect will be vicariously liable for the professional services of any subconsultant and may be able to be sued for their acts or omissions. It is therefore in the best interests of the prime landscape architect to insist upon a written contract with all of his or her subconsultants. It is also very important to ensure that every scope item contracted for in the prime agreement either is going to be performed by the prime landscape architect or appears prominently in the scope of services of one of the subconsultants. In some instances, the scope of services of the prime landscape architect is developed in conjunction with discussions held with the subconsultants, but the scope of services in their actual contract is not negotiated until later. Unless the landscape architect is careful, the later definition of scope may unintentionally omit something that is presumed by either the landscape architect or the subconsultant to be part of what the other is doing.

Services

There are a number of issues, events, or activities that should be considered and documented during the various phases of performance of services on a project. Three of these are:

- *Design.* Review, analyze, document, and respond to direction provided by, or decisions made by, the client. Document and respond to any delay in decisions and the possible impact of such delay. Confirm that the landscape architect has the right to rely upon the information provided by the client, or others at the direction of the client, as well as the implied representation that such information can be used in the landscape architect's work product without infringing upon the intellectual property rights of others. Document code changes, or differing code interpretations, and any related economic consequences. Document changes due to value engineering, and (if known) the possible implications of such changes. Document any changes to the design by others, and (if possible) the possible implications of such changes.
- *Bidding/negotiated bid.* Assist the client in ensuring that all bidders receive the same information, at the same time. Document any changes that arise out of this process and the possible implications of such changes.
- *Construction administration.* Document any change orders, field changes, substitutions, and so on. If possible, describe the possible implications of such changes. Document any changes arising out of the acts or interpretations of governmental entities or inspectors. Document and respond in a timely manner to requests for information, but ensure that the contractor is instructed to refer to the contract documents when such referral is sufficient. Act upon and respond in a timely manner to submittals by construction contractors. Deal appropriately with any submittals that are out of sequence or too early.
- Possible implications of changes made may include, but not be limited to; affects to maintenance of a project, changes to the performance of materials, equipment or design element immediately or over time, interactions with other elements or aspects of design of the project, increased risks of bodily injury or property damage, project delays, or cost implications.

Document Retention

There are three interrelated considerations that inform how long project documentation should be retained. First, consider the statute of limitations for claims that may arise out of the performance of the services being rendered. In many states, the statute of limitations for claims related to a "latent" design defect (one that is not readily observable) is approximately 10 years. This is not, in and of itself, a reason to hold onto documents for 10 years, but should be one of many considerations. Second, consider any statutory or contractual obligations to maintain

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records. Many professional service contracts obligate that project documentation be maintained for a certain period. Some local, state, or federal statutes may also apply and mandate periods of retention. Third, consider the business implications of losing the project documentation. Will it mean the loss of an important resource for future designs or marketing of future projects?

A demand for the production of electronic documents is a now ubiquitous feature of any claim against landscape architects. This means that email, CAD files, and document files, are typically demanded by one or more participants in a lawsuit. Given how difficult it is to "ensure" that electronic files are deleted, and the shelf-life of such documents, this has become a complex area that requires close consultation with competent counsel.

QUALITY ASSURANCE/RISK MANAGEMENT

One of the most important aspects of professional practice is good project management and project planning. Many resources are available to assist in improving the professional skill level in this area, and money invested here is almost always money well spent.

Generally, it is good practice to consider whether each particular project may benefit from a well-thought-out project work plan, driven by scope at the task level. Assignment of personnel and scheduling should follow a logical sequence that considers the impact of other projects on the project at hand, and the availability of internal and external resources. Contingencies should to be established early on, and additional services or time sought as early as possible. The landscape architect should compile an information database from documentation provided by the client and by others at the client's direction, along with any applicable codes and regulations. The landscape architect should seek to have the right to rely upon this database, as well as on the implied representation that the information contained in it can be incorporated into the work product without infringing upon the intellectual property rights of others.

Quality assurance is vital not only to the management of professional liability arising out of the services rendered by a landscape architect, but also to the business longevity and reputation of the landscape architect. A reputation for professional quality and integrity is one of the most valuable assets of any professional service provider.

A landscape architect should prepare, and then follow, a regimented process of ensuring that the work product he or she produces is reviewed for technical quality before delivery to the client. Peer review (internal and external), best practices exchanges and "lessons learned," and comprehensive checklists are all elements that could be considered and then implemented in any quality assurance program. It is, of course, important to ensure that the same level of concern for quality is met or exceeded by one's subconsultants, and a prime landscape architect may want to insist upon seeing the quality assurance plan prepared by his or her subconsultants, as well as confirmation that it is used on a particular project.

Finally, it is important to note that a quality assurance plan that is conceived but not implemented may *increase,* rather than limit, the liability of a landscape architect. Therefore, it is necessary to ensure that any program put in place is implemented, so as to avoid questions of intent should a claim arise out of the "one" project where the quality assurance process wasn't followed.

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PROJECT MANUAL

Owners, landscape architects, engineers, architects and contractors all rely on a project manual for every project to clearly convey how to bid the project, the extent of the project and the specifications related to the details for carrying out the work. The project manual includes those documents that can easily be bound into a book format, including the bidding requirements, contract forms and conditions, and technical specifications. If the landscape architect is working with a client to help prepare the project manual, it is important to take care in developing the technical specifications, including Division 1/General Requirements and Supplemental General Conditions, in a manner that is compatible with the specific public or private bidding requirements.

Most project manuals will be developed in three major sections: Division 0, Bidding and Contract Requirements; Division 1, General Requirements; followed by the Technical Specifications Divisions 2–16. Technical specifications should be organized following the Construction Specifications Institute's (CSI) 16 divisions and three-part format.

Most project manuals start off with a cover and title page that lists the project title and other pertinent information, such as the project location, project number, owner's name, designer's name and address, and, possibly, the designer's seal and signature. Next is the table of contents for the entire project manual.

Division 0 outlines the bidding and contract requirements, and may include the following:

- Public Notice—Invitation to Bid
- Instructions to Bidders
- General Conditions
- Supplementary Conditions
- Bid Bond Form
- Performance and Payment Bond
- Bid Form

The CSI 16-part format includes Division 1/General Requirements, which is used to provide greater clarification, additional requirements, or descriptions of unique project conditions. It should complement the General Conditions and Supplemental Conditions, not change them. Common examples of Division 1 material include, but are not limited to, the following:

- Summary of the work
- Work restrictions
- Alternates
- Change order procedures
- Payment application process
- Project meetings
- Submittal process
- Quality requirements
- Temporary facilities and controls
- Closeout procedures

The final portion of the project manual is the Technical Specifications, which should follow the industry-standard CSI format. Each specification section should include the general, materials, and execution CSI three-part format. In specifying products, unless the contracting agency has a specific product exemption on file, any specific product listing needs to be accompanied with "or approved equal" or similar language. In constructing these specifications, care needs to be taken to only supplement or clarify requirements listed in the General Conditions, Supplemental Conditions, and Division 1/General Requirements. Additionally, work described by each specification section should contain the acknowledgment that the requirements contained in these documents apply to the work of each and every section of the technical specifications.

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COST ESTIMATING

INTRODUCTION

When landscape architects know the construction costs required to implement their designs, it greatly improves their ability to control the design and documentation process. This knowledge is critical for maintaining credibility when representing proposed designs to the owner. Generally speaking, when the costs are under control, the project is under control.

Cost estimating can be a very controversial topic, and a highly scrutinized area of the overall project. In some instances, even the term, "cost estimating" is too sensitive. As a result, it is referred to as a "schedule of probable costs," to avoid warranting that the actual construction will come in as advertised. It is important that all parties acknowledge that, regardless of the term used, the effort is, at best, an educated guess of financial parameters. To limit any unforeseen financial surprises, landscape architects should always include a contingency, added to the amount of their cost estimation.

The owner often retains a professional costing consultant on the team whose job it is to examine and estimate the costs of construction. Even so, landscape architects should be aware of the construction cost of their scope elements. Landscape construction is not an exact science of measuring static building materials, so pricing can elude some cost estimation firms that are more accustomed to "sticks and bricks" in architecture projects. Sometimes, when it comes to landscape planting, they rely heavily on the landscape architect's own recommended unit costs and quantification techniques, which have been developed through extensive experience.

THE OWNER'S LANGUAGE

All owners have at least one thing in common: For them, financial considerations drive decisions. In fact, it sometimes is *the* most important factor on which to base their judgment, almost superseding the real estate program driving the project. To maintain involvement and control over the design and documents process, the landscape architect must be versed in cost analysis. It is common for the designer to hear from the owner, "It looks great, but tell me how much it costs; then I'll tell you if I like it." It is important to support the owner's comfort level early on. The more fluent the landscape architect is in relationship to project costs, the more the owner will be willing to talk about design concepts without always linking decisions back to dollars.

COST CONTROLS START EARLY

The landscape architect should begin the cost monitoring process even while proposing for the project. The fee is often developed as a function of a percentage of construction cost. Unlike some design professionals, such as interior designers, whose fees are based on commissions for elements of the design, landscape architects often work on a lump-sum fee basis. In essence, project payment does do not necessarily increase by an increase in the construction budget. However, it is commonly required that the landscape architect amend his or her design documents to bring the project within budget without an additional fee increase (if the budget amount is known to the landscape architect from the outset).

Once the project is awarded, the landscape architect should begin to track costs in association with the evolving design. It is even advisable during initial design to hold charrette workshops to quickly estimate preliminary costs and to assign relative value to plan elements.

Relative Value

Relative value is a tool used by landscape architects to speak the owner's language of cost assessment. By quickly calculating the general costs of design elements during a design work session, the landscape architect builds confidence in the process and helps the owner make decisions about the value of various parts and subparts of the project. For instance, there is a hierarchy in both the level of design and relative cost that each assigns to a project. Ranging from intensively designed, and more expensive per square foot to construct, to less complicated and cheaper, the "Hierarchy of Cost Structure Diagram" below identifies a variety of possibilities.

Each of the options has a relative value to the project and can be assigned a representational symbol, not unlike the practice of using a dollar sign scale ($$$$ vs. $) in restaurant guides to establish price level. For example, it would be expected that the primary use areas would receive the most dollar symbols ($$$$), as compared to screening and buffering, as it is the most expensive per square foot. The use of assigning relative value to the various areas of a design helps the project stay on track, and the owner understand how resources are being allocated appropriately. In turn, the process helps reduce the chances of surprises down the line.

Schedule of Probable Costs

The schedule of probable costs is a spreadsheet with quantifiable elements that calculates the estimated costs for landscape-related construction as shown in the example on the following page. The spreadsheet is constructed of columns and rows allowing for calculation of costs.

Column headings are generally:

- Item name (to be constructed, specific or general)
- Units (feet/meters, square feet/square meters, cubic yards/cubic meters, linear feet/linear meters; also could be lump sum or allowance)
- Quantity (actual or estimated count)
- Unit cost (price per each unit)
- Extension (quantity multiplied by unit cost)
- Comments (description and special notes)

Rows consist of a listing of elements in the landscape architect's scope (either specific or general):

- Earthwork
- Hardscape including paving, site structures, fountains, site furnishing, site lighting, site signs
- Landscape including trees by various sizes and categories, shrubs, groundcover, vines, turf grasses, ornamental grasses, aquatics
- Irrigation system elements (or square foot allowance)

Quantification

To estimate a cost you must consider objects by counting individual items (for example six benches) or quantify in some other way units of measurements such as linear distance, volume, or area. Landscape architects can estimate areas based on mathematical calculations; for example, area of circle or circumference. Other measurements include:

- Square foot/square meter
- Acre/hectare
- Linear foot/meter
- Cubic yard/meter
- Lump sum
- Allowance

Once these quantities have been determined they are entered into your price schedule, and the next step is to estimate unit costs. Cost estimators generally rely on a number of manufacturers specifications, numbers and quality of units, or by quantities or amounts of materials called for in the design and specifications.

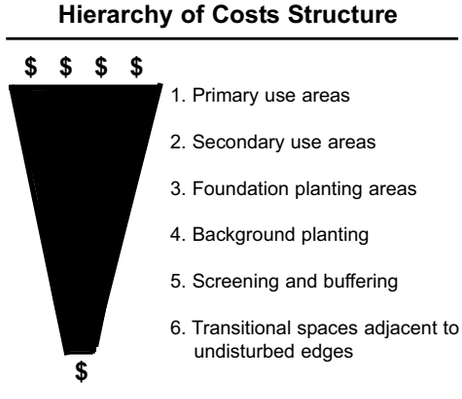
Influences on Unit Pricing

Units costs and pricing estimations are influenced by a number of factors beyond strict manufacturing costs these include:

- Industry standards—cost estimates based on quality and location of installation
- Historic data—prices based on experience in the market on previous projects
- Industry trends—prices are reflecting an increase or decrease based on oversupply or intense demand
- Inflation/deflation—prices are increasing or decreasing as a result of larger economy

Factors Affecting Accuracy

- *What to estimate.* Are elements grouped or measured individually?
- *Level of detail.* More general in early design phases, more detailed toward construction documents phase.



HEIRARCHY OF COSTS STRUCTURE DIAGRAM

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TOWNE PARK SYSTEM, FLORIDA
PHASE ONE—SCHEMATIC COST ESTIMATE **Prepared by: EDAW, 22 July 2003**

Urban Park

Total Park acreage: 45.54
Urban Plaza acreage: 2.44
Type: Neighborhood
Relative Value: High
ROW included: No

Net park upland, SF: 106,286
Cost Per SF: $5.53

ITEM	COMMENT	UNIT	QUANTITY	UNIT COST	TOTAL
HARDSCAPE		SF			
Concrete Paving		SF	38,772	$4.50	$174,474.00
Specialty Paving	unit pavers	SF	3,448	$8.50	$29,308.00
		Total Hardscape Paving SF	**42,220**		
Street Lights	spacing 80' oc, conduit / wire NIC	ea		$7,800.00	
Pedestrian Lights	spacing 40' oc, conduit / wire NIC	ea	7	$4,800.00	$33,600.00
Landscape Uplights		lump sum	1	$2,500.00	$2,500.00
Park Signage		lump sum	1	$2,500.00	$2,500.00
Pavilion		ea		$35,000.00	
Benches		ea	13	$1,800.00	$23,400.00
Trash Cans		ea	10	$1,200.00	$12,000.00
Drinking Fountains		ea	1	$7,500.00	$7,500.00
Water Aeration		lump sum		$80,000.00	
Pedestrian Overlooks		lump sum		$110,000.00	
Entrance Monuments		lump sum		$200,000.00	
				Subtotal	$285,282.00
LANDSCAPE		SF	62,670		
Fine Grading		SF	62,670	$0.15	$9,400.50
Shrubs		SF		$2.50	
Groundcover		SF	34,559	$4.50	$155,515.50
Sod		SF	28,111	$0.40	$11,244.40
Seed		SF		$0.15	
Sod (sf)			208,168	$0.45	$93,675.60
Canopy Tree (ea)			245	$700.00	$171,500.00
Irrigation		SF	62,670	$0.45	$28,201.50
Large Canopy Tree	5-6 caliper	ea	1	$2,500.00	$2,500.00
Canopy Tree	3-3 1/2 caliper	ea	81	$700.00	$56,700.00
Flowering Ornamental Tree	2-2 1/2 caliper	ea	30	$350.00	$10,500.00
				Subtotal	$274,061.90
				5% contingency	$27,967.20
				Total	$587,311.10

NOTE: This estimate is based on schematic design and is approximate only.
This estimate was based on a plan drawn at 1= 40'-0 scale.
Construction details were not completed at the time of this estimate.
Items Not Included:

SCHEDULE OF PROBABLE COST SPREADSHEET EXAMPLE

- *Regional variations*. Labor and material costs vary greatly depending on location.
- *Age of unit prices*. Periodic corrections for economic fluctuations.
- *Rounding of units*. Fractions of units or extension of decimal places should be commensurate with level of detail.

Contractor Influence

- Availability of material affects price, for example sand, rock, and timber are all less expensive near where they mined or harvested.
- "Fire sales" require immediate response even if the price is significantly less expensive: Is it right for the project, even at reduced cost?
- Long lead times means reduced chance of rush charges and generally results in a lower cost.
- Competitiveness of contractor market—impacts contractor mark-ups.
- Market fluctuations in both materials manufacturing and labor availability affect contractor pricing.

Separation of Discipline

Site development estimates often cover both site landscape and civil engineering and infrastructure costs. When landscape costs estimates are included in the combined landscape and civil engineering and infrastructure budgets, it becomes difficult to get a correct price estimate, because infrastructure construction pricing can dwarf landscape construction and warp estimates. Therefore it is sometimes necessary to price landscape site development work separately from civil engineering and infrastructure work to get a more accurate estimate.

Contingency

Landscape architects must plan and budget for events which are hard to predict or unforeseen. Contingency must be built into all estimates. A greater contingency must be built into design and real estate programs with less certainty. For example those projects in the early stages of design and planning should consider upwards of 15 percent as a contingency to budget. Projects with more certainly, for example those in later phases of design and documentation where more specific quantities are known, need only budget 5 percent for contingency.

All estimates must be defensible; however, unforeseen the events must be recognized, and these events drives need for contingency in planning and budgets. Unforeseen factors include the following issues with potential examples:

- *Security issues*. A war breaks out or a security threat is uncovered.
- *Hazardous environment*. Undiscovered hazardous waste is uncovered.
- *Market influences*. The Dow Jones Industrials or Bond markets significantly rise or fall, effecting the availability of capital for building or for funding the project.
- *Location/region*. Regional issues affect project viability, weather, economies, or population shifts.
- *Commodities market*. Concrete or plywood, for example, may be in short supply when construction begins due to demand elsewhere.
- *Project funding sources*. Are the sources locked in? Will the money be available at the time construction begins?
- *Development schedule and timing*. The further out into the future, the less certain.
- *Political entitlements*. The project may requiring rezoning or other permit issues, which take time and are difficult to predict.

Qualification

The following are general qualifications that may be applied to estimates. They help explain the nature and influencing factors of an estimate:

- Describes the accuracy (or general nature) of the estimate
- Describes about the intended use of the schedule of probable costs
- Identifies sources of unit costs and measurement techniques
- Explains how calculations were derived (to re-create if necessary)
- Places a time frame limitation on accuracy of estimate

Updates

Cost estimates are typically updated at successive design/documentation phases from schematic design to design development, or design development to construction documents. As estimates are updated with the successive developments of the document, the estimates become more accurate. Estimates are also updated:

- When significant changes occur to project program
- Significant project element requantifying occurs
- Updated unit prices are received

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BIDDING

In order to select a contractor or award a contract, clients or owners will often go through a bidding process. This process can vary greatly depending on whether it is a public bid or a private bid. What they do have in common is that, in most cases, qualified contractors are asked to provide their lowest responsible bid for a specific scope of work or a specific project. Below are just some of the differences between a public bid and a private bid process:

Public Bid
- A well-defined process to follow
- Predetermined time period to advertise for bid
- Specific advertising process
- Open process
- Predominately low-bid selection process
- Specific bid due date and time
- Public opening and reading of each bid
- Requirement for complete and thorough bids

Private Bid
- Not legally bound by public procurement process
- Selective, prequalified list of bidders
- Little or no advertisement
- Flexible due date and time
- Partial bids may be accepted
- Private analysis of each bid
- No requirement to select lowest bidder

The bid documents are usually made up of the drawings, specifications, and the bid manual. At a minimum, the landscape architect is responsible for providing the drawings and specifications. In some instances, the landscape architect would also develop the bid manual or might possibly coordinate with a construction manager or client representative to provide those services. To help offset the expense of printing and compiling the drawings and bid manual, the contractors are required to purchase their bid sets. This also has the advantage (depending on the cost) of deterring the not-so-serious bidders from participating.

In addition to the technical specifications, the bid manual is also made up of what is called Section One, the instructions to bidders. This section outlines the specific steps that each contractor must follow to submit an acceptable and responsive bid. This section also includes any pertinent bid forms, prequalification forms, bid bond and performance bond forms, and any other boilerplate information affecting the bid. As noted above, on a public bid there may be very specific forms and instructions that each bidder needs to follow, or risk being disqualified.

The following lists common elements found in many bids, along with their associated definitions:

Bid bond: Acceptable surety furnished by a bidder as a guaranty that he or she will enter into a contract and will furnish the contract performance bond and payment bond if a contract is awarded to him or her. The amount of the required bid bond is indicated in the bid manual.

Performance/payment bond: The approved form of security executed by the contractor and his or her surety, who guarantees complete execution of the contract and the payment of all legal debts pertaining to the construction of the project. Usually the performance bond is required in the sum equal to the full amount of the contract.

Unit prices: Some bids require that the contractor provide unit prices for the required work in the project so that if either additions or deductions are encountered, the client can negotiate these in a fair and unbiased manner.

References/prequalification: This is the process by which the prospective bidders are required to establish their responsibility and competence in advance of submission of a bid proposal. Prequalification is primarily used on either very high-dollar-amount projects or on projects that require a specific expertise or skill set.

In order for the bidding process to be successful and as fair as possible to all parties involved, it is necessary that the same project information and bidding instructions be conveyed to each and every interested party. For this reason, a prebid meeting is held by the client. The landscape architect is asked to be present at this prebid meeting to answer questions relative to the drawings, specifications, and scope of the project. It is important that the landscape architect take good notes and record every question and every answer so that this information can be distributed to all prospective bidders.

Once all of the bids have been collected, the landscape architect may be asked to help analyze the bids with the client and make recommendations for contractor selection. This process is more likely to happen with a private bid process rather than the more prescriptive public bid process. If this is requested by a client, it is important for the landscape architect to thoroughly analyze each bid before recommending the most qualified (not always the lowest) responsible bidder. This analysis would include verifying that the math is correct and that the numbers indicated on the bid actually "add up." The analysis would also include checking the contractor's list of references, calling each one and making sure that the job was completed in a satisfactory manner within a reasonable amount of time. If required, the analysis should also include making sure that each contractor supplied a valid bid bond, indicating each company's ability to carry out the work being tendered.

On many private bids, and even certain public bids, determining prequalification requirements for the contractors, if allowable, is an excellent way to make sure that the selected contractor will have the desired skills, experience, and qualifications to perform the job. Prequalification requirements help identify the contractors that don't have the proper or specific expertise required for a particular project. Prequalification can also make sure that the contractor has the labor power and resources necessary to complete a large job on time and within budget.

On most public bids, proposals will be opened and read publicly at the time and place stated in the Notice to Contractors. Bidders and their authorized agents are invited to be present, and this is the best way for contractors to see how their bids compare to the competition.

If the contract is awarded, it is usually given to the lowest responsible bidder whose proposal has met all of the prescribed requirements. From this point on, the contractor has a prescribed number of days to make sure that all of the required paperwork and forms are delivered and complete.

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CONSTRUCTION OBSERVATION

Construction observation, sometimes called construction administration (although this is not a legally accurate term), is a crucial function of the landscape architect to ensure that the original design intent of the documents is upheld during the construction process. Complete and well-documented construction documents will not assure a well-constructed project. Construction observation is the most important time to make sure the project meets all design intent. It is important to understand that the landscape architect is only an observer of the construction progress; he or she should not discuss means and methods with the contractor. In an observation role, the landscape architect visually compares the contract documents (drawings and specifications) with the work in place by the contractor. The landscape architect does not instruct the contractor on their methods (unless danger to personal bodily harm is imminent). The landscape architect observes and records completed work and the status of work in process and provides a written report to the owner of any discrepancies or variances from the contract documents.

Good construction observation requires knowledge of the design process from the original inception to early concepts through preparation of contract documents and on to final construction. This is crucial, as it is common for project team members to change over the course of a project on both the owner's and designer's side. Many firms are set up to transition from idea people in the early stages to technical, management, and maintenance specialists for the construction of a project. Original thoughts, ideas, and intentions may be lost in the transition, so it is the landscape architect's job to show evidence of the origin of ideas and how they are carried forward into the contract documents.

This section has been divided into subsections explaining the many roles, responsibilities, and functions associated with the landscape architect providing construction observation services.

CONSTRUCTION SITE WORK RELATIONSHIPS

The construction period of any project can be difficult. Establishing and maintaining a positive relationship with the owner, design team, general contractor, and landscape contractor can help mitigate conflicts that may arise. Having a positive attitude toward finding solutions, rather than assigning blame, also helps. Always try to couple the identification of a problem with a proposed solution, even when others may not uphold a positive outlook. By creating a calm process of observing construction, landscape architects are more likely to see successful implementation of their designs.

Today, it is not unusual for enlightened owners to conduct team-building exercises. The newly formed construction and design team conduct these exercises to break down barriers and foster strong interpersonal relationships before construction begins. The construction period can test all of the good that may come out of team building and positive relationships. Creating a strong relationship among participants will help overcome issues that arise in the field and more quickly resolve disputes.

BUSINESS CONSIDERATIONS OF CONSTRUCTION OBSERVATION

The construction observation portion of the scope begins with owner's acceptance of the 100 percent construction documents package. As a percentage of the total contract for a project, the construction observation portion may be as much as 15 percent of the fee. Often, however, the amount is reduced due to budget constraints in earlier phases of the project. Landscape architects should strive to ensure that the construction observation period is well funded so that the landscape architect can respond quickly and thoroughly to issues that inevitably arise in the construction field.

To that end, the contract agreement should include specific language regarding the construction observation scope, which outlines how to handle events related to observation of work and contractor interface. For example, revisions made to the documents to incorporate contractor-proposed changes should be performed as an hourly additional service and established in the contractual agreement. Additional site visits requested by the owner should be treated as additional service and invoiced on a time and materials basis. Preparation of as-designed and/or as-built documents may require significant hours by landscape architectural staff labor, so a provision should be considered in the scope of services.

RECORD KEEPING

It is paramount to maintain excellent records of correspondence and contractual agreements, incoming and outgoing correspondence, project information, and drawings and documents during the design and documents phase and into the construction phase.

The landscape architect will be called upon to provide backup to hearsay about conversations and "understandings" between various parties during construction. The landscape architect's job is to know the background of the design process, from the original concept design through preparation of contract documents and as construction progresses, and to rely on written documentation to support his or her recollections.

Project team members may change over the course of time, even on the owner's side. As previously stated, many organizations are set up to transition from big-idea people at the front end of a new project to technical, management, and maintenance specialists as the project progresses. Many original thoughts, ideas, and intentions could be lost in transition without careful documentation, and it is the landscape architect's job to be able to show evidence of the origin of ideas and how they are carried forward into the contract documents.

During construction, the contractor may try to "paper over" the consultant with requests for information (RFIs), submittals, memos, and so on to keep the landscape architect preoccupied. The intent is to keep consultants in a reactionary position defending their documents, when, instead, the landscape architect should be proactively observing the work in process and being mindful of the upcoming scheduled work. This is common on large complex projects where activity in the field is often accelerated or compressed due to tightening schedules and multiple contractors working in a constricted area. Careful record keeping and detailed workflow management are required to combat these potential conflicts.

A well-organized, automated document logging system should be set up at the landscape architect's office or field trailer location to record all incoming and outgoing correspondence. It is important to maintain a chronological and serial number record of when items arrived, with a date stamp, as well as when a response is sent out. To help clarify this process, provision in the project technical specifications should describe the required turnaround time for review and comment for RFIs, submittals, and shop drawings, usually measured in business days. Timeliness is paramount in the construction observation process, and the landscape architect may be called upon to defend his or her actions. It is common for designated clerical staff to log incoming and outgoing correspondence by date and type on a computerized list prior to passing it on to the landscape architect for further review. This adds professional integrity to the quality of the landscape architect's business procedures and promotes efficient access to recall needed information later in the process.

After the project is complete, the landscape architect should be the one with the best records to assist in resolving any potential disputes—the fact that they have maintained excellent records will lend credibility if mediation or other legal action becomes necessary.

SAFETY AND SECURITY

It is the responsibility of all persons on the project site to uphold safety and security practices. Even though the landscape architect is not involved in instructing the contractor in means and methods of construction, he or she should always be aware of the surroundings of an active construction site and be cognizant of his or her personal safety, as well as the safety of others. All of the persons working on the site, including the landscape architect, are responsible for reporting any dangerous situations observed on the site immediately to the site superintendent and owner.

EQUIPMENT AND CLOTHING

The landscape architect must *always* wear a hard hat, protective eyewear, boots, and long pants to access an active project construction site, per the safety standards set forth by the general contractor and owner. Additionally, the landscape architect must have the following on hand: earplugs, a mobile phone (or two-way radio), clipboard, digital level (inclinometer to check the slope of hardscape/formwork), camera, tape measure, marking spray paint (nonpermanent), rain gear, sun protection, and other appropriate clothing articles needed to walk the project site.

BIDDING ASSISTANCE

The scope of the landscape architect may include assistance during the preconstruction bidding period to represent the owner in recommending contractors, reviewing bids, and clarifying the construction docu-

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ments. This may include submitting a list of recommended vendors, suppliers, and contractors that he or she believes are qualified to bid on the project. The professional credibility of the landscape architect is considered by owners when making their decisions about contractor selections recommended by the landscape architect, so it is important to offer only qualified names.

A landscape architect versed in the preparation of the construction documents may attend or coordinate a prebid meeting to provide clarification and interpretation during the bid period and to represent the owner as a professional team member. At the owner's request, the landscape architect may also review and comment on the bid submissions regarding proposed bid costs, contractor-proposed changes to the design, and potential work relationships, prior to selection of a given vendor. (Also, see Bidding pg. 51)

PRECONSTRUCTION CONFERENCE

Following the award of the construction contract, the landscape architect may attend a preconstruction meeting. The purpose of the meeting is to discuss the construction scheduling and sequencing, as well as address any open questions and coordination items brought up by the contractor. It is assumed that the meeting will be coordinated with the overall meeting schedule by the owner's representatives and to coincide with other design review activities. A provision should be made in the contract scope of services to limit the number of meetings and site visits so that this aspect of the landscape architect's function is not an open-ended responsibility.

OFF-SITE CONSTRUCTION OBSERVATION: SERVICES PROVIDED FROM THE LANDSCAPE ARCHITECT'S OFFICE

Before construction work begins in the field, significant up-front procurement and research are performed by the contractor to prepare the work. All of this should be logged and recorded in the files as previously described, both incoming and outgoing responses. The responsibility of the landscape architect is to compare the contractor correspondence for compliance with the construction documents and report back to the team on the findings. This is not a time to make subjective changes to the documents; once they are released for construction, they are complete and everyone on the landscape architect's team should uphold and defend the contents.

The landscape architect should be available to review and comment on contractor-proposed alternates and substitutions. Many times, the awarded contractor will try to save money by proposing an amendment or change to the documents. This may or may not directly benefit the project; for instance, the contractor may have found a less expensive unit price for a plant species not on the proposed plant list. If the team has a good working relationship, and the adjustment is minor, the change may be acceptable; but if it is not equal or an improvement, the landscape architect should recommend to the owner to not accept the substitution. Alternates and substitutions should be entertained only if they can be shown to directly benefit the owner and/or project. A written response should record the landscape architect's professional opinion, either pro or con.

PLANT PROCUREMENT

Following the award of the landscape construction contract, the landscape architect will assist the owner representative and contractor in the plant procurement process to ensure the availability and quality of the specified plant material. The contract should have a provision to establish a set number of nursery trips and duration for each trip and to determine limits of search area and region. It is possible, as a way to select plant material, to review some general plant materials (small trees, common shrubs, and ground covers) using representative photographs and information about the qualitative practices of the grower.

For specimen plants, unique species, large trees, and hard-to-find material, the landscape architect accompanies the owner representative and/or the contractor to visit qualified nurseries, collection sites, or tree farms to locate the plants.

Once trees meeting the specifications and plant list criteria are identified, a locking tree tag with firm name and serial number is secured on a branch to specifically mark each tree. The number and character comments are recorded by the landscape architect, as a record for the file, and copied to the team. Trees or plant material without these tags should not be unloaded at the construction site.

The owner may have to determine whether to make a cash or credit deposit to hold hard-to-find material, pay to have the trees "stepped up" to the next container size for later delivery as a larger caliper size, or to contract grow plant materials. The landscape architect should serve as an advisor in the discussions to represent the owner's interest.

ON-SITE CONSTRUCTION OBSERVATION

During the course of construction, members of the landscape architecture team will make visits to the project site to observe the progress of work being installed, including pedestrian hardscape, landscape, and irrigation installation. The average site visit should be of a predetermined duration, as agreed in the scope of services contract. Following each site visit, the landscape architect should prepare a field report noting the status of work in place, deficiencies, key photographs, status of stored materials, and review of mock-ups and samples.

Items for the landscape architect's observation onsite may include (depending on the specific contract):

- General overview of the work in process to observe compliance with the documents, make notes about job-site cleanliness and any apparent safety hazards, to consider upcoming work to avoid potential coordination issues and conflicts (beyond means and methods), and to note protection and maintenance of completed work prior to turnover
- Specific observation of esthetic grading for landform sculpting, and coordination with area drain location
- Formwork for hardscape paving to observe formwork prior to installation of concrete walls, curbs, and other cast-in-place (CIP) elements to ensure proper alignment, shape of edge (avoid kinks), cross slopes and primary slopes for ADA compliance, alignment, and connection with other work
- Approval of samples and mock-ups for finishes, color and texture, as well as compliance of work in place with the contract documents
- Observation of other hardscape site structures (within landscape architectural scope); carpentry, fountains, walls, fences, and so on for compliance with documents
- Irrigation mainline and lateral pipe routing, head layout, and testing
- Adherence of plant material to quality standards
- Tree and shrub placement, coordination with underground utilities, signs, and lighting to avoid conflicts
- Observation of planter bed line shape, and layout of plants at proper spacing and triangular pattern (may require the landscape architect to mark the ground with paint the preferred bed line and plant locations to illustrate to the contractor)
- Placement of site furnishings; coordination with signage and lighting locations

AMERICANS WITH DISABILITIES ACT COMPLIANCE

The Americans with Disabilities Act (ADA) is an important factor that directly affects the work of the landscape architect with regard to hardscape design. To avoid problems later on, the landscape architect should observe that the dedicated handicap route, as identified on the contract documents, does not exceed the maximum slopes and is properly laid out prior to installation of paving. A digital level (inclinometer) may be used to ensure that cross slopes of accessible routes do not exceed 2 percent, and that nonramp primary slopes are less than 5 percent.

The landscape architect may play a professional consultant support role to identify to the owner and contractor a reasonable construction tolerance for adherence and variance from the ADA guidelines.

See Section on *Accessibility* for specific guidelines and requirements.

SCHEDULING SITE VISITS

While it is generally not the responsibility of the landscape architect to control the construction schedule, it is important that the landscape architect be proactive in monitoring and contributing to upholding the schedule.

The landscape architect should avoid causing a delay in the construction schedule due to inaction or failure to provide information in an agreed time frame. By combining team coordination meetings with site visits, such as regularly scheduled monthly contractor coordination meetings, the landscape architect can streamline the construction observation process. Depending on the contract provision, the owner's representative and/or contractor should request in advance (agreed notification time) that the landscape architect arrange site visits to coincide with scheduled work so that observation of critical prior steps (formwork or plant bed layout review) be performed before permanent installation. In addition, the contract should clearly state a reasonable advance notification time (one to two weeks) before requested site visits, to avoid work disruptions in the field.

The landscape architect can assist in scheduling reviews to comment on progress, time to perform proper tree and plant procurement, and issues

Todd Hill, ASLA, EDAW

regarding plant installation and also to ensure that there is enough time for proper site reviews and punch list follow-up.

Some large and complex projects require a period of full-time on-site construction observation services, to enable the landscape architect to, essentially, be on call for site visits. This requires advance planning for efficiency.

FIELD NOTES

The more standardized the process of writing and collecting field notes, the easier it is to maintain good notes from site walks. It is common to use a formatted form for site visits, which has blanks created for various site visit data (date, time, temperature/weather); names of individuals contacted on-site; status of work being observed; and specific comments regarding work in place, potential issues coming up, as well as other significant issues. Attachments to the notes may be photographs, field sketches, or copies of contract documents to illustrate the necessary information.

The notes should be either typed or copied and distributed within an agreed time frame to the prime consultant and development team. Meeting minutes from contractor coordination meetings should also be recorded and distributed to the prime consultant and development team in a timely manner.

FIELD SKETCHES

Periodically in the course of construction a condition is encountered that does not conform to the contract documents of the landscape architect, architect, or civil engineer (or others), or it could be a combination of these packages not conforming to field conditions. Also, the existing site may be divergent from what was surveyed and represented on the documents. Whatever the cause, the landscape architect may be called upon to assist in resolving the issues in the field. The clock is running on an active construction site, with labor and equipment waiting, and it can be stressful to come up with a quick answer.

It is vital that the construction observation representative either be authorized by the owner and firm to make decisions independently or to record the conditions and solicit the assistance of others within the organization and development team to address the problem. The landscape architect should avoid being caught in a situation of directing the contractor to proceed with alternative solutions without the written authorization of the owner.

It is common to develop a field sketch or landscape sketch (LSK), which may be a single 8½ × 11 drawing, which incorporates many different drawing layers, to address one location while considering the other aspects of construction. For instance: A pipe is buried too shallow and the owner doesn't want to lower it, so the landscape architect has to essentially redesign the pedestrian pathway and grading to go over the shallow pipe—without losing the design intent. This could affect other elements, ADA, site furnishing, site lighting, planting, and irrigation. The drawings may be prepared by hand or in CAD, but the focus generally is on a specific condition. The LSK is transmitted to the owner representative, who reviews and either rejects or approves of issues to the contractor for a change order estimate.

RFIS AND CLARIFICATIONS

An RFI, or request for information, is a written question from the contractor regarding an interpretation of the construction documents. This is usually a noncost-related question to clarify the intent of the drawings. A clarification is usually provided on a form on which the landscape architect answers the RFI to provide more information or explain the intent of the documents. A chronological record of RFIs and clarifications is logged into the landscape architect's file system.

DIRECTIVES

Directives are usually a noncost-impacting change issued by the owner to the contractor for minor adjustments in the field. The owner may request that the landscape architect provide recommendations regarding the directive. The contractor may try to negotiate a cost change associated with a directive (which would become a change order). The owner will try to prove why it is not a cost impact and may solicit the assistance of the landscape architect to support his or her argument.

CHANGE ORDERS AND CONTRACTOR-PROPOSED CHANGES

Note: A provision should be made in the contract scope of services to limit the landscape architect's open-ended responsibility.

A change order is a contract amendment issued through the owner to the contractor to alter the contract documents. It has financial impacts, either increasing or deceasing the construction contract amount. The proposed solution of an LSK or bulletin may result in a change order. It is the landscape architect's job to represent the project's interest in weighing the benefits of the proposed change to uphold the original design intent, enhancement of the overall project, or to improve efficiency or in some other way make it better.

Contractors may try to initiate a change order if they believe that the field conditions are sufficiently different from the contract documents, or if they discover errors and omissions in the documents. Often, a thorough review of contractor-proposed changes is performed by the design team to determine the benefit of the change to the final design. The role of the landscape architect is to counsel the owner as to whether the change will benefit the project as a whole and/or uphold the original design intent, and to determine if the change is driven by the contractor seeking to reduce their cash outlay.

In the event that the awarded contractor recommends to the owner specific changes to the design (beyond means and methods) that affect the documents, the landscape architect will be requested to amend the drawings. It is important to have a contract in place to address these potentially open-ended events.

The landscape architect is not authorized to approve change orders.

If it is deemed valuable by the team and owner to incorporate the recommended contractor change, the landscape architect should perform any amendments to their documents as an additional hourly service. It is potentially a volatile issue at the end of a project as to why change orders were required; and, in some instances, the owner may come back to the landscape architect in an attempt to be compensated after the fact.

BULLETINS

When a significant change to the documents is initiated once construction has commenced, and the amendment is more than can be covered in a simple landscape sketch, or affects multiple disciplines, it may trigger issuance of a bulletin document. The cause of a bulletin may be a program change driven by the owner, or discovery of a site condition that results in a redesign of a portion of the project, or an error and omission discovered after release of the documents. Beyond an error cause directly attributed to the landscape architect, the landscape architect should be prepared to negotiate an additional service to perform the redesign and document revisions for the portion of the project under study.

All changes are clouded (shaded or outlined) and numbered on the document, and the affected drawings for all disciplines are reissued for pricing to the contractor as a formal contract amendment. The prime consultant on the project, sometimes the architect, typically coordinates the team's bulletin package. This prime consultant may be the contracting entity with which the landscape architect negotiates any additional fee.

AS-DESIGNED DOCUMENTS

If the scope of services includes a provision for as-designed documents, the landscape architect will be required to provide in his or her final submittal, updated documents illustrating all actual edits and changes made during the construction phases. This typically includes updated CAD drawing files of all changes (clouded with date) and an updated specifications manual for all landscape architect-contracted scope items and subconsultants.

Preparing as-designed documents can run into hundreds of labor hours and can cost thousands of dollars. Therefore, as-designed documents should be carefully managed by updating the master files as changes occur.

AS-BUILT DOCUMENTS

If the scope of services includes a provision for as-built documents, the landscape architect may be required to provide the contractor CAD drawing files to update and edit reflecting as-installed underground elements included in the landscape architect's scope of work. (See *Overview of Construction Documentation* regarding role of record drawings.)

In some cases, the owner will request that the landscape architect perform the CAD edits based on drawing mark-ups by the contractor. In this case, the contract should be clear as to the roles and responsibility prior to commencement of work, as this may constitute an additional service.

PROJECT CLOSEOUT AND SUBSTANTIAL COMPLETION

At the point at which the general contractor believes they have reached substantial completion, they may request that landscape architect perform a final "punch"

EDAW

MEMORANDUM

EDAW INC.
THE BILTMORE
817 WEST PEACHTREE STREET, NW
SUITE 770
ATLANTA GEORGIA
30308

TEL 404 870 5339
FAX 404 870 6590
www.edaw.com

TO Client Representative
FROM Eric Bishop
Ray Strychalski
DATE May 26, 2004
CC file

SUBJECT Project Punchlist

Based upon an initial site punch on April 21st and a follow up visit on May 19th the following items were noted as needing correction.

1. There appear to be several issues with the finish of the colored concrete work throughout the plaza. The color is very mottled in appearance, and several pours appear to be entirely of a different color. Other issues were noted in a separate walk with Mr. Jones of Concrete Color Company. The items discussed during this meeting relating to the finish of the concrete on the plaza will be issued under separate cover as meeting minutes. (pictures attached)
2. Drainage problems were noted on the Southwest portion of the large circular (plan area C, 3.5) adjacent to the intersection with the smaller circular planter during the April site visit. Water was standing at the surface after a recent rain. During the May site visit, no problems were noted, but no substantial rain had occurred near the time of the second visit. Has this issue been corrected? Further observation is required. (photo attached)
3. Near the intersection of the small circular planter and the large circular planter, the wall has received a different finish and apparently a different colored concrete. This 'patch' needs to be of the same color and finish as the rest of the new walls on site. Other inconsistencies in the sandblast finish show within this wall section that need to be corrected. (photo attached)
4. The grading on the North side of the small circular planter has a slope that is far too steep. This area needs to be re-graded and re-sodded. (picture attached)
5. EDAW noted a possible issue with fall hazards on the small circular planter wall. This wall, although not intended to be a pathway, could pose an issue if people walk on top of it and fall. EDAW would like to review with the architect, possibly adding some railing at two strategic points on top of this wall. (pictures attached)
6. On the west side of the plaza, EDAW counted two fewer movable planters along the Client wall, than were previously counted. Were these planters removed to other parts of the plaza? In reviewing the overall planting, EDAW would also like to discuss moving four of the movable planters to the face of the national hotel on the Eastern side of the plaza. (Line up with columns)
7. The nosings for the stairs on the plaza were not installed according to detail 1/LS501.
8. The mondo grass in the small circular planter appears to be installed at 12" o.c. rather than 8" o.c. as per the plans. Contractor needs to verify that the quantity of material on the drawings was installed. EDAW will independently review in the field.
9. The large expansion joint that runs through the circular planters are very roughly constructed. These need to be reviewed for possible fixes.

SAMPLE PROJECT PUNCHLIST LETTER

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walk to review and identify deficient items that will need to be completed, repaired, or replaced prior to final acceptance. The landscape architect will attend a set number of site review walks for the project and prepare a formal written punchlist and associated map diagram keying the work to be completed by the contractor.

The landscape architect will attend a subsequent review walk, of set duration, to validate corrections and provide written comments to the owner's representative. The landscape architect should put limits on the number of iterations to review final work, or communicate to the owner that the project is not substantially complete.

PAYMENT APPLICATION REVIEW

The landscape architect may be requested by the owner to review the contractor invoices. To do this, the landscape architect compares the invoices with amount of work completed by the contractor to see if work has been satisfactorily completed and complies with percentage complete or if the amount is commensurate with percentage of work completed. The landscape architect then makes a written recommendation to owner regarding approval or denial of payment as requested.

The landscape architect may also be asked to review materials delivered to or stocked on site for payment. Photographs of the site-stocked materials should be attached to the payment application for verification in case the materials are stolen or removed.

OPERATION AND MAINTENANCE MANUALS (O&M MANUALS)

Projects include O&M manuals for many elements of the functioning landscape, and it is typical to provide information to the owner for ongoing maintenance of the following:

- Irrigation systems
- Fountains
- Lighting
- Plant pruning
- Plant maintenance
- Hardscape maintenance, finishes, and repair/replacement
- Site furniture, finishes, and repair/replacement

ERRORS AND OMISSIONS (E&O)

E&O generally addresses areas of the contract documents that resulted in mistakes or missing information necessary for contractors to perform their work. E&O are not caused by the intent to mislead; rather, they may be the result of documents that were not coordinated within the consultant team.

The outcome of E&O issues usually includes claims by the contractor that are initially addressed by the owner and prime consultant for resolution. In other cases, mediation may be required.

CONCLUSION

Observing the construction of a project is a critical step in the success of design implementation. The landscape architect responsible for this phase of a project needs to be knowledgeable about the original concept intent, have a positive attitude with regard to team relationships, represent the owner and documents favorably to the contractor, and stay informed about progress of the work being constructed in the field. The landscape architect should also be aware of potential situations that may result in contractual issues and should keep impeccable records. An adequate budget in the overall project agreement should be allocated to this key aspect of project process, as it often requires a great deal of time in order to do the job correctly.

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POSTOCCUPANCY EVALUATION

INTRODUCTION

Postoccupancy evaluation (POE), the study of the effectiveness for human users of occupied designed environments, is so named because it is done after an environment has been designed, completed, and occupied.

Unconsciously, in everyday life, humans evaluate environments all the time: which table to sit at in a restaurant, which route to take to work, and so on. And while buildings, for centuries, have been informally evaluated for structural integrity and other issues of design, it wasn't until the 1960s that researchers began to look at how well buildings and outdoor spaces satisfied the needs of users. This concern coincided with the social ferment of the times—consumer rights, civil rights, and so on—and a recognition that professional designers and planners didn't always know best.

The 1970s and 1980s saw the development of systematic methods of evaluation and analysis; the appearance of organizations that supported and disseminated this research (e.g., Environmental Design Research Association) and the publication of journals that released research results (e.g., *Environment and Behavior*, *Journal of Environmental Psychology*, *Journal of Architecture & Planning Research*, and *Landscape Journal*).

WHY CONDUCT A POE?

There are several reasons to conduct a postoccupancy evaluation:

- To generate information about how a facility is used—for example, the garden at a particular Alzheimer's facility.
- To generate a set of design guidelines—for example, a series of POEs for a particular type of outdoor space, such as downtown plazas.
- To provide information to guide the redesign of a park that no longer meets the needs of the neighborhood.
- To fine-tune a garden that isn't used as much as it might be—for example, a POE of a nursing home garden where lack of shade is the problem, prompting a redesign that adds a porch overhang, gazebo, arbor, or other problem-solving structure.

WHO SHOULD CONDUCT A POE?

Ideally, a POE should be conducted by a team that includes both social scientists and designers. And though it is desirable that designers conduct indicative POEs of their own work, to inform themselves of successes and failures, it is not recommended that designers do more detailed, published POEs of their own designs, as their evaluation may not be objective enough.

TYPES OF POE

There are three types of postoccupancy evaluations: indicative, investigative, and diagnostic.

Indicative POE

This type of POE can be accomplished in a short time span: from one to two hours to one to two days. Methods may include interviews with staff and/or designers, a walk-through evaluation, or use of an audit tool. This type of POE can provide indications of major successes and failures and is most reliable if the evaluator is familiar with the type of environment being evaluated.

Investigative POE

This type of evaluation is often prompted by issues raised in an indicative POE. It covers more issues at greater depths and reliability. The evaluation criteria are often explicitly stated—for example, the relative use by staff/patients/visitors of a therapeutic garden; or how well a neighborhood park meets the needs of nearby residents.

Diagnostic POE

This is the most comprehensive and in-depth evaluation, requiring considerable time and budget. To provide reliable findings, it is essential to use multiple methods—questionnaires, interviews, observations, physical measurements, and so on. Sometimes this level of POE is used to do comparative evaluations of several facilities of the same type. Recommendations are often aimed at improving not just one facility, but creating design guidelines for future facilities of that type—for example, outdoor spaces in assisted living facilities or therapeutic gardens for cancer centers.

POE Methods Methods for conducting postoccupancy evaluations include observation, analysis, and interviews, as detailed below.

Observation and Recording of Project Context

These activities would encompass adjacent buildings and their use, entries, and views into and from the space.

Site Analysis

A site analysis would record sun and shade patterns, prevailing winds, topography, and so on.

Interviews with Designers

Interviews with project designers makes it possible to document how client goals were translated into design. It also provides a way of understanding and interpreting goals that couldn't be met, budget problems, site issues, and other difficulties.

Interviews with Staff

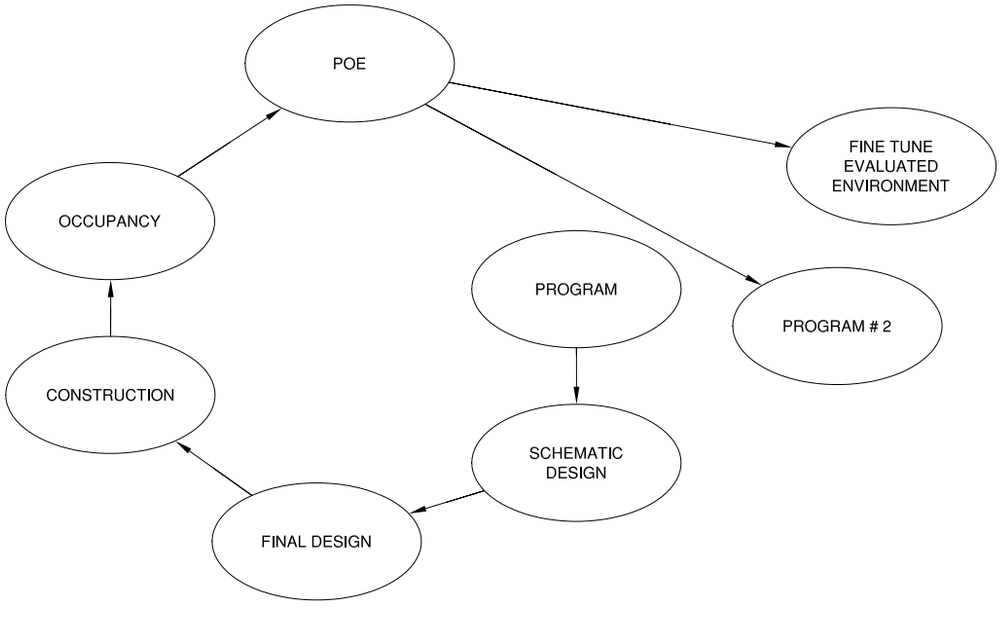
Staff interviews—to include, for example, the activity director, facility manager, gardener, and others—are conducted to document views as to who uses the space and for what activities both programmed and nonprogrammed; to understand problems related to design, access, and so on; to listen to any additions and/or changes they would like to see, as well as space for activities desired by users.

Observation of Users: Behavior Traces

Observing a space for visible clues as to what users do—and don't do—which can be done even when no one is present. Clues such as, for example, cigarette butts around a bench, a short-cut path worn across a lawn, or raised gardening beds full of weeds, all tell a story. The location of these clues should be included on a site plan.

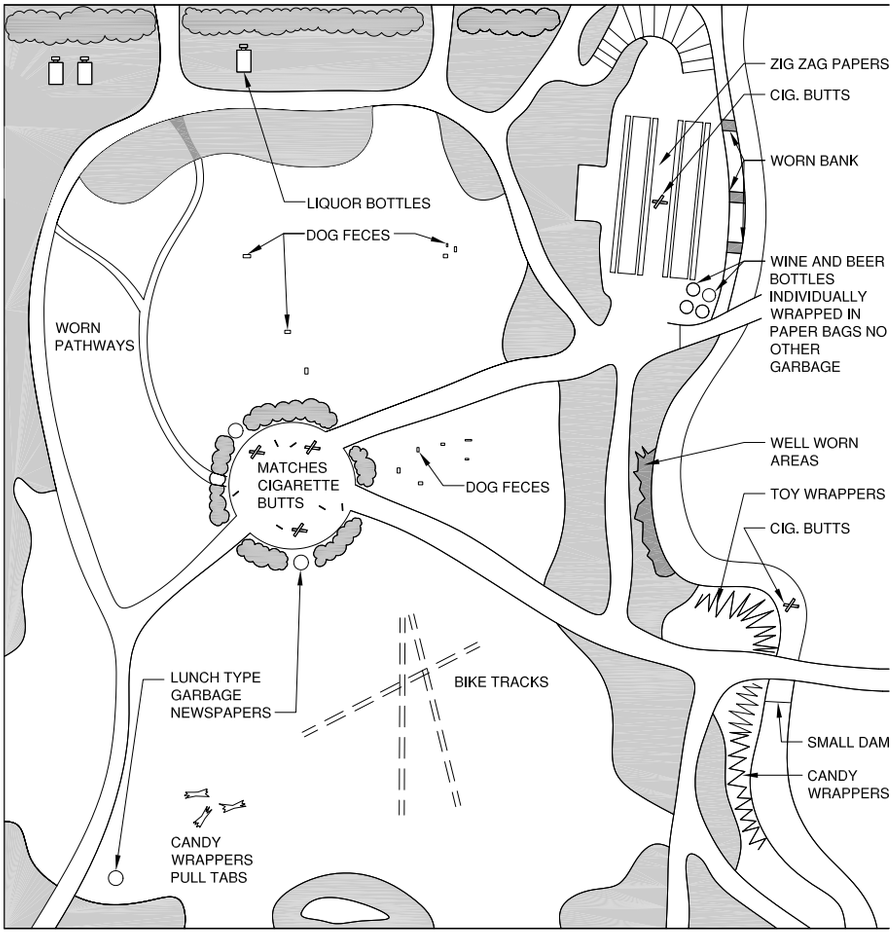
Observation of Users: Behavior Mapping

This POE method involves the systematic observation and recording of actual use at different hours of the day and different days of the week (e.g., 11 a.m. to noon, Mondays; 4 to 5 p.m., Wednesdays; noon to 1 p.m., Saturdays; 3 to 4 p.m., Sundays). Times and days might be determined in consultation with staff (at a staffed facility), or by casual observation at a

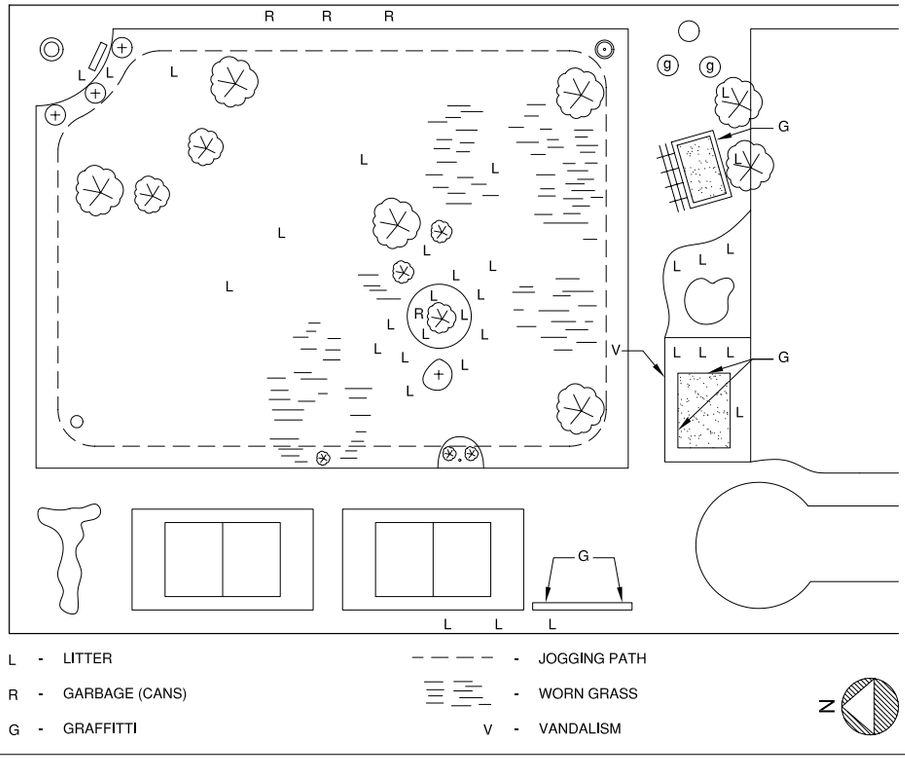


POSTOCCUPANCY EVALUATION DIAGRAM

Clare Cooper Marcus, Professor Emerita, Departments of Architecture and Landscape Architecture, University of California, Berkeley



PLOTTING OF BEHAVIOR TRACES, LIVE OAK PARK, BERKELEY, CALIFORNIA



PLOTTING OF BEHAVIOR TRACES, WILLARD PARK, BERKELEY, CALIFORNIA

more public facility, to ensure the major use periods are being covered. If the space being observed is used to a very limited degree—for example, the garden of a nursing home—the time period of each observation might be one hour. If the space is heavily used—for example, a downtown plaza—15 minutes might be sufficient to record a typical pattern of use.

For each observation period, record all that is happening, as follows:

- Locate with dots on a site plan the exact location of each user.
- Number the dots.
- Record against numbers in a field notebook the age, gender, and activity of each user.
- Add arrows to indicate movement. Circle dots to indicate people in a group.

It is important to use a new copy of the site plan for each visit, as these activity maps will be used like stop frames in a movie. When all the observations are completed, the data can be aggregated onto one comprehensive site plan (typical pattern of use), aggregated by different variables (e.g., dot map of male/female use, adult/child use), displayed as bar graphs (e.g., of different activities, overall use by adults/teens/children), or displayed as a line graph (e.g., use throughout day). All the data recorded by this method is quantitative and is much more accurate than asking people. That said, this form of observation provides no information as to what people *feel*—why they come to this place. Hence, it is also necessary to conduct interviews.

Interviews with Users

Interviews with users are essential to learn *why* they come to the space, *how often* they come, what they *like*, what they'd like to *change*, whether they *feel different* after being there (if yes, what it is about the place that helps them feel different). There are two basic ways of wording questions in an interview: multiple choice or open-ended. It is good to use both types.

- An example of a multiple-choice question is: "Do you come here more than once a day/once a day/once every few days/about once a week/less often." You check the appropriate box corresponding to the response on the interview form; data is quantitative.
- An open-ended question might ask, "How do you feel after spending time in the garden?" Write down all that the respondent says. This provides richer, more qualitative answers.

Later, you may categorize the answers (content analysis) and thus quantify the data. It is important to have two researchers do this independently to avoid a skewed analysis.

It is important to point out that the information will be more accurate if the researcher interviews users face to face and writes down the answers. Handing out questionnaires and collecting them later or having them mailed back is not as reliable. To be considered "scientific," researchers must interview a random sample: for example., every tenth person entering a park. Consult texts (e.g., Bechtel, Marans, and Michelson, 1987; Zeisel, 1981) regarding random

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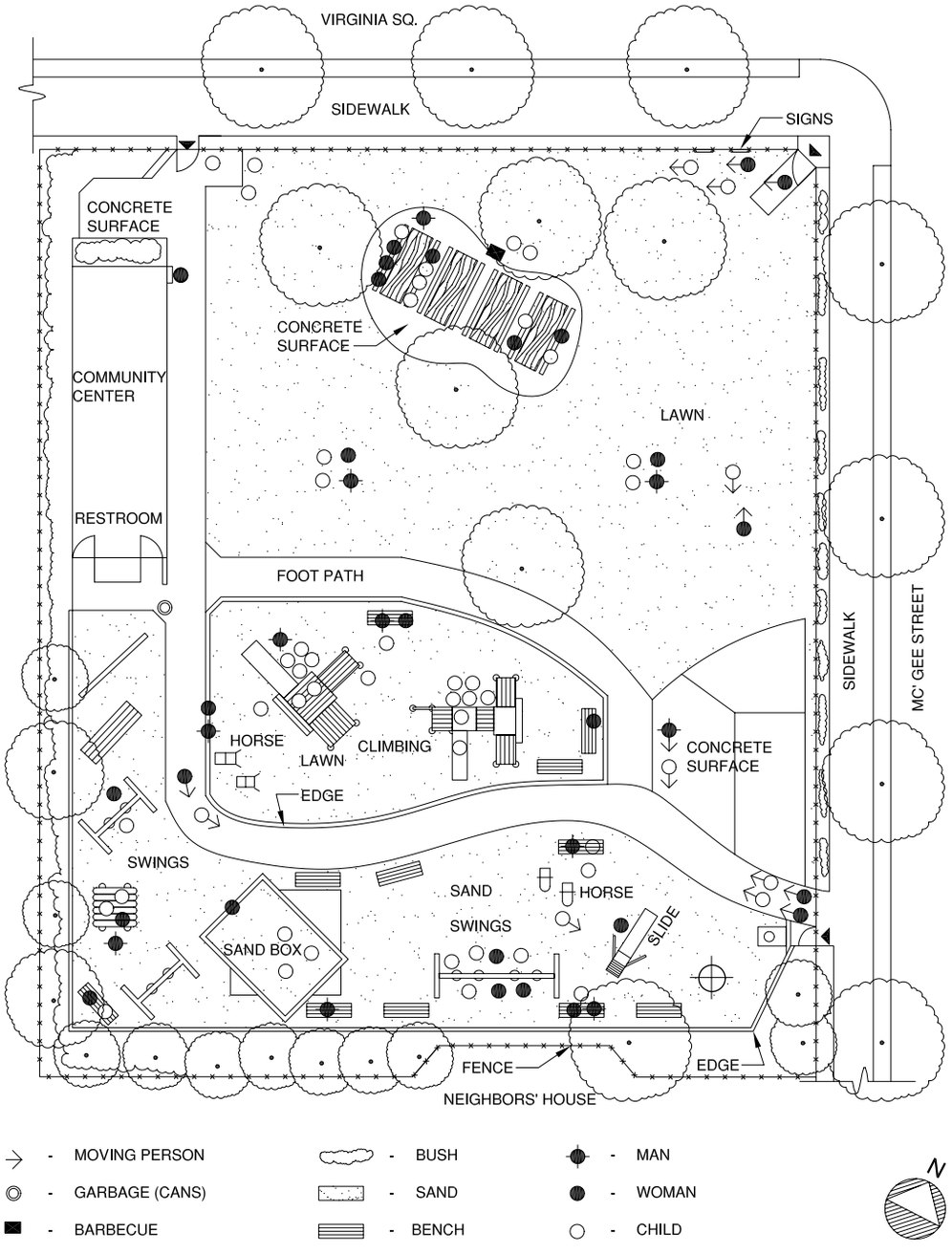

BEHAVIOR MAP, TOTLAND, BERKELEY, CALIFORNIA

sampling and interview or questionnaire design, as these important topics are beyond the scope of this discussion.

If possible, also interview nonusers. For example, a POE of the Children's Hospital in San Diego, California interviewed people using a new children's garden, as well as took a random sample inside the hospital. It was discovered that a considerable proportion of those interviewed inside the hospital didn't know the garden existed, which resulted in the hospital later adding signs.

POE REPORT

The final POE report should include data aggregated into maps, graphs, tables, and other forms; text analyzing data; quotes from interviews to "humanize" the report; a discussion of issues of use, overuse, lack of use, user benefits, nonconformities between what users want in a space and what is actually there; a discussion of nonconformities between what the designer intended/hoped would happen in this space and what is actually happening there; a discussion with management as to how space is managed/staffed/perceived; problems uncovered by the POE, clearly stated, and with proposed design and/or management changes to address each of these. The proposed design changes should then be illustrated on a revised site plan with annotations as to the reasoning behind each change. Finally, design/management guidelines should be proposed for future spaces of this type.

PROBLEM DEFINITION AND REDESIGN

As an example of problem definition and redesign, the table on page 62 lists problems associated with Boeddeker Park, in San Francisco, California, as identified through observations, data collection, and interviews with users; stated goals to mitigate the problems; and concrete solutions conforming to the goals.

An overview of these problems suggests that, primarily, adjustments in management are necessary and that the design of Boeddeker Park itself is successful in appealing to many users in both expected and unexpected ways. With changes in management, perhaps all of these subareas will be in greater demand and the users will better represent the makeup of their neighborhood.

ETHICS OF POE RESEARCH

Since 1974, the National Research Act requires approval for research involving human subjects. If the researcher works for a private design firm and has no affiliation with a university or other funding agency, he or she is not required to go through human subjects review. However, if the researcher does have an academic connection, it is likely he or she will need to have the research protocol approved by the institutional review board for human subjects.

The location of the POE is also pertinent: if it is a hospital or nursing home garden, for example, permission from the institution would also be required; if it is a public park or plaza, probably not. The type of POE also matters: An indicative POE would not require approval; an investigative or diagnostic POE probably would.

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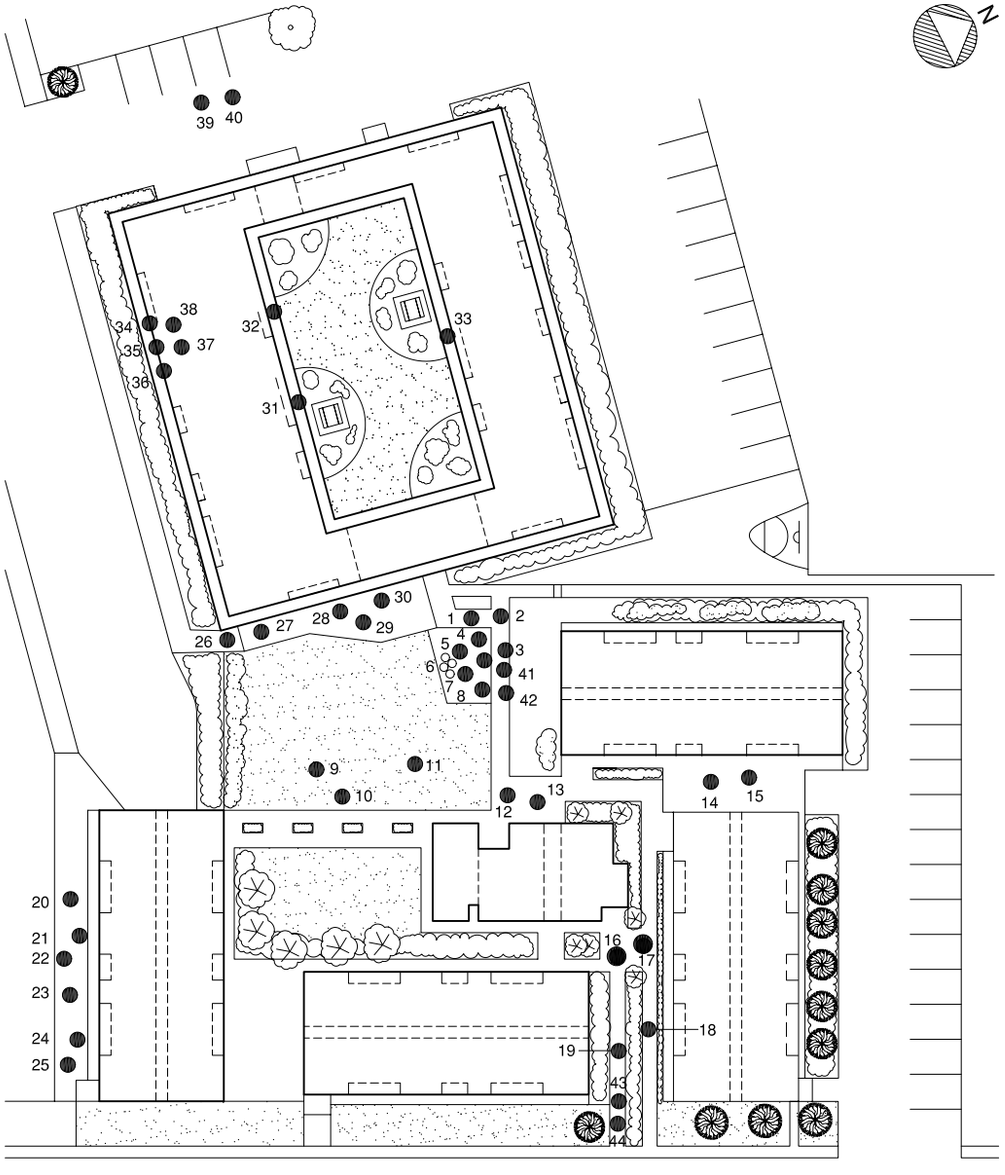

The number beside each dot is keyed to field notes where age, gender, and activity of each person observed is recorded.

BEHAVIOR MAP, KELLER PLAZA, A HOUSING DEVELOPMENT, OAKLAND, CALIFORNIA

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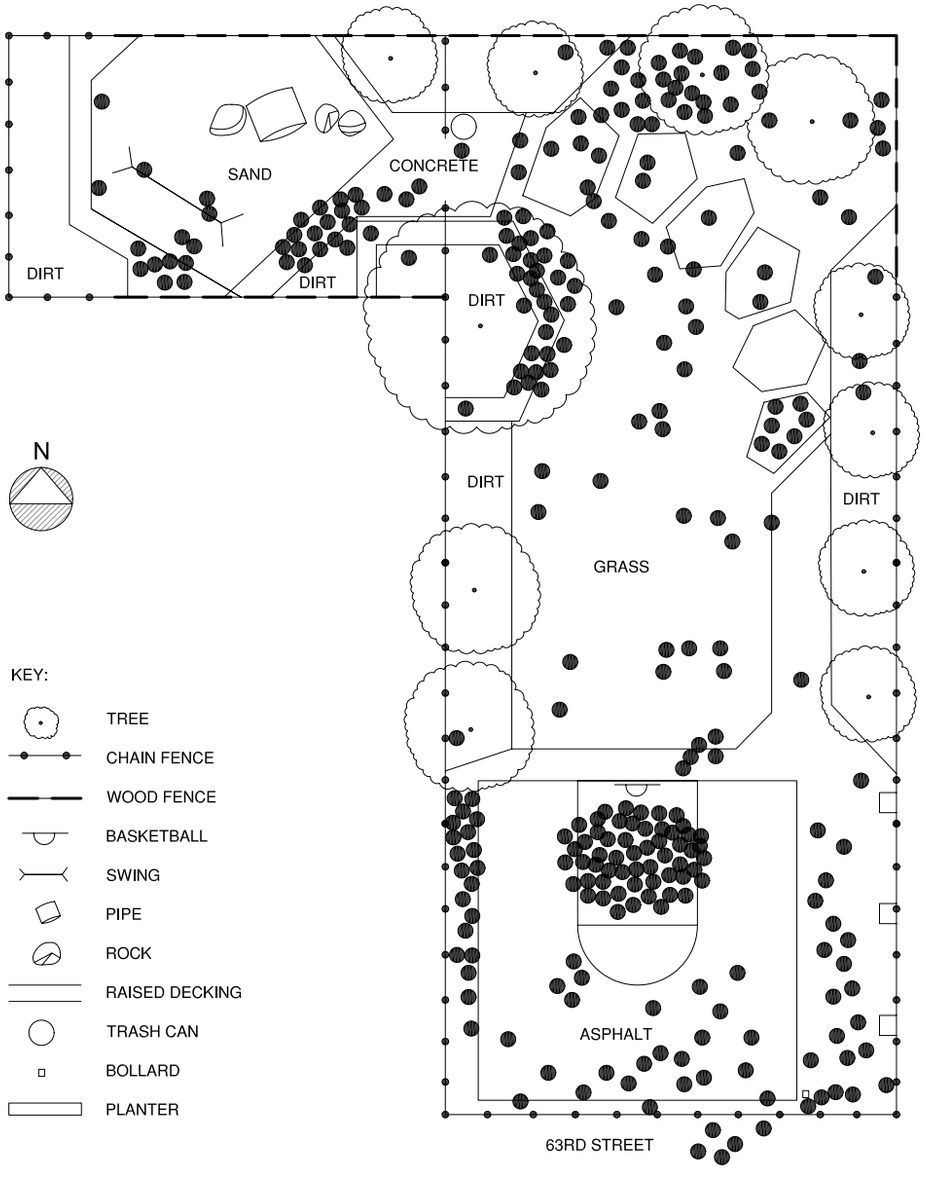

This map shows results after four separate behavior observations.,

AGGREGATE BEHAVIOR MAP, 63RD STREET MINIPARK, BERKELEY, CALIFORNIA

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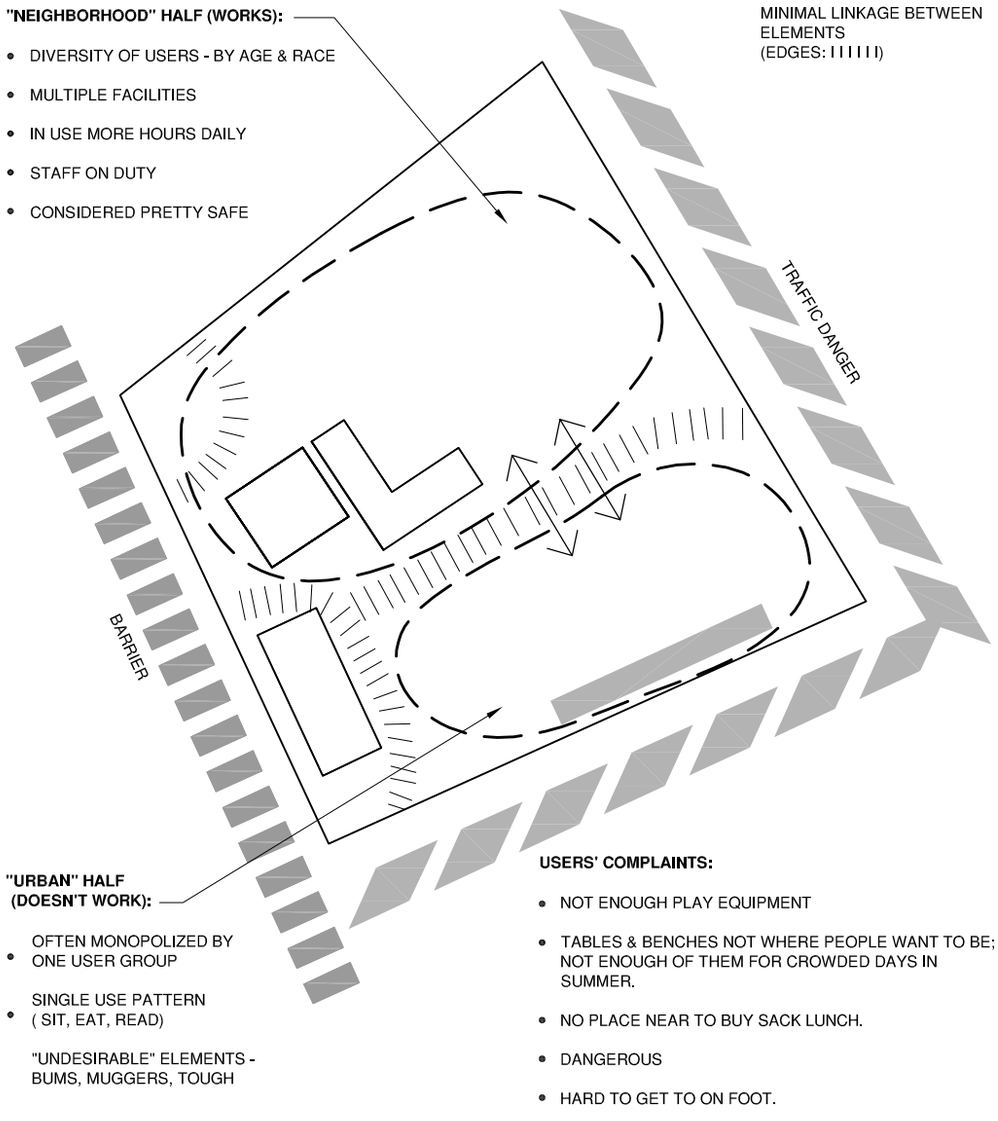

POE SUMMARY OF PROBLEMS AT MOSSWOOD PARK, OAKLAND, CALIFORNIA

PAGE OF FIELD NOTEBOOK, BEHAVIOR OBSERVATIONS, BAKER BEACH, SAN FRANCISCO, CALIFORNIA*

ZONE	BEACH	10/31/75	3:00 PM - 5:00 PM	5:00 PM	DAY OF WEEK: FRIDAY WEATHER: SUNNY, MILD						
SOCIAL				GROUP						ACTIVITY	MISC. NOTES (CONFLICTS, DISRUPTIONS, ETC.)
NUMBER	SEX	AGE	RACE	INDIVI-DUAL	COUPLE	PEER	FAMILY	ORGANI-ZATION	NO. IN GROUP		
1	F	20	C	X						Sitting on beach against log	
2	M	20	C		X				2	Playing frisbee	
3	F	20	C		X					Playing frisbee	
4	M	30	C		X				2	Walking toward parking area	
5	F	30	C		X					Walking toward parking area	
6	F	20	C	X						Walking along beach	
7	M	40	C		X				2	Standing looking at water	
8	F	40	C		X					Standing looking at water	
9	M	20	BL	X						Jogging along beach	
10	M	40	SP			X			4	Sitting eating dinner	
11	F	40	SP			X				Sitting eating dinner	
12	M	40	C			X				Sitting eating dinner	
13	F	40	C			X				Sitting eating dinner	
14	F	5	C	X						Sitting on beach against log	
15	M	20	C	X						Walking with dog along beach	
16	F	40	C	X						Walking with dog along beach	Dog not on leash

**Adapted, original entries are handwritten onto base sheet*

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SUMMARY OF PROBLEMS AND POTENTIAL SOLUTIONS AT BOEDDEKER PARK

PROBLEM (BASED ON DATA)	GOAL	SOLUTION
Children are not safely separated from "undesirable" users, e.g., prostitutes, etc.	Provide a safe environment for children to play in.	Reinstate a patrol to monitor illegal and unsafe activity.
The public bathroom is not efficiently located for the daycare group.	To accommodate the daycare group.	Placing a portable toilet would not be an ideal solution since vandalism may occur. Instead, the park director may offer to assist in monitoring the children when they need to be accompanied to the restroom.
Playgrounds can get too warm at times.	Provide shading.	Plant trees to cast shade onto the playgrounds.

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