

The Cottonwood Town Center District

E



DISTRICT



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March 30, 2005

Centerra District E Design Guidelines

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DISTRICT A-The Gateway District



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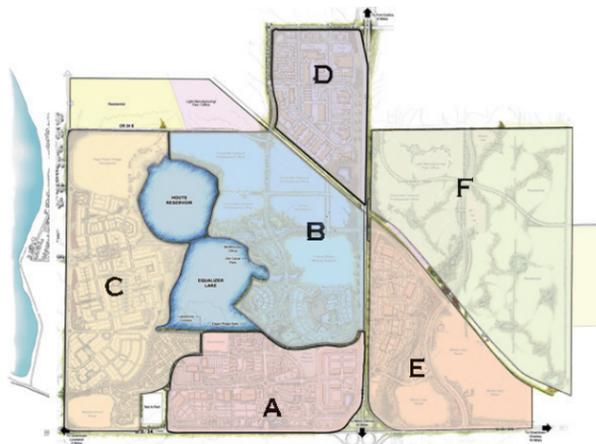
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DISTRICT D-The Northern District



DISTRICT E-The Cottonwood Town Center District



DISTRICT MAP



This exhibit is provided for illustrative purposes only, and shall not be deemed to be warranty, representation, or agreement by landlord that the center, common areas, buildings and/or stores and restaurants will be as illustrated on this exhibit, or that any of the tenants which may be referenced this exhibit will at any time be occupants of the center. Landlord reserves the right to modify the size, configuration, and occupants of the center at any time.

Preface

A successful planned community depends on setting, view corridors, amenities, environmental sensitivity, and the economic market. A commitment to consistent qualities in the physical appearance of the site, architecture, and landscape is also critical to the success of any community. Achieving a healthy and vibrant image is a primary goal of these guidelines. They advocate a strong and consistent community design vision for Centerra, with architecture and landscaping that is reflective of the Community Values established by McWhinney Enterprises. To that end, these Centerra Design Guidelines have been established to assist prospective developers, builders and designers in developing neighborhoods, buildings, places, and landscapes that are consistent with the Community Vision and Values.

Community Vision and Values

In an effort to set the standard for all developments in the Northern Colorado Front Range, the overall vision for Centerra starts with its Community Values. These Values provide the basis for each Guideline and Standard in this document:

- ✎ **Establish a strong relationship with the City of Loveland, its heritage, and the region.** Make Loveland’s pioneer and agricultural heritage evident in the built environment: in the landscape public spaces, open spaces, water, lakes, architecture, and the overall marketing identity of Centerra. Be part of Loveland, but with a regional benefit and influence.
- ✎ **Create an identity and a sense of place.** Provide everything a regional community has; with a balance and mix of land uses. Create a unique and noticeable quality experience along I-25 and US 34, while unifying the east and west sides together. Be a gateway to Loveland, Northern Colorado and the Rockies.
- ✎ **Promote ecological stewardship and environmentally responsive building.** Establish a strong and lasting relationship with Centerra’s environmental assets. Reinforce Centerra’s environmental mission throughout the property. Promote environmental stewardship through education, development requirements, and design guidelines.
- ✎ **Feature the Colorado experience and lifestyle.** Be a small Colorado community with regional amenities. Celebrate the views to the mountain backdrop in the context of the lakes and prairie setting that define Centerra. Emphasize the active and healthy, yet relaxing lifestyle and culture that Colorado is known for.

✎ **Stimulate economic and social vitality.** Establish Centerra as the destination of choice to live, work and play in the Northern Colorado Region. Look, Act and Be the Number 1 Community in Northern Colorado. Add value to Centerra and the Loveland Community through land use and development decisions.

The overall Vision and Master Plan for Centerra represents a unique opportunity to create an integrated pattern of land uses and development. Unlike conventional suburban development that emphasizes segregated, poorly linked and auto-reliant land uses, the Master Plan for Centerra provides for a mix of integrated land uses; strong connections for pedestrians and bicyclists; a range of housing opportunities in close proximity to jobs, shopping, and entertainment, and to create social gathering places.

Within Centerra, there are six defined areas that have unique and district characteristics that contribute to the overall identity of Centerra. These individual districts celebrate their unique characteristics though architectural themes and elements that may be used in that district, and its special District Center. The District Center, connected to the balance of the district via streets and a fabric of open space, will become the heart for each District, providing identity and the “public realm” that will become the signature of each District.

Centerra is blessed with among the finest open space and lake amenities of any community in Colorado. The presence of water, the mature landscape that relates to water, and the integration of the natural areas owned and managed by the High Plains Environmental Center, give Centerra its special character.

The open space and trail network will emanate from District Centers and connect throughout the community and its amenities. Major open space features will be visible from roadways and development parcels for all to enjoy. Visibility of the water is a key element in the open space fabric.

The Master Landscape Plan is the unifying element for all of Centerra. It builds upon the heritage of Loveland and the High Plains, with references to the agricultural and natural systems that were present here. In addition, the identity of Centerra as a unique place in Northern Colorado will be evident at I-25, with landscape visually unifying the east and west sides of Centerra.

Purpose and Intent

These Centerra Design Guidelines provide prospective parcel developers and builders (and their consultants), with a clear statement of the design Principles, Guidelines, and Standards for development within Centerra. The description of Design Principles, coupled with specific Design Guidelines and Standards is intended to assist in the identification and implementation of a strong, consistent design direction and level of quality. Standards **[S]** are to be treated as techniques that are mandatory. Guidelines reinforce the intent of the Principles, but may be subject to interpretation by the designer as approved by the Design Review Committee. In addition, a variety of photographs and graphic images have been assembled to assist parcel developers and builders (and their consultants), in the design of residential neighborhoods, commercial centers, offices, mixed-use places, and landscapes. After reviewing this document, parcel developers, builders (and their consultants), will have a clear and concise design direction and the knowledge necessary to produce creative and aesthetically pleasing Site Planning, Architecture, and Landscape concepts for each of the six Centerra Planning Districts:

- District A - The Gateway District**
- District B - The Lake Front District**
- District C - The High Plains Village Center District**
- District D - The Northern District**
- District E - The Cottonwood Town Center District**
- District F - The Big Sky District**

The intent of these guidelines is to encourage creative individual Site Planning, Architectural, and Landscaping statements, that when viewed as a whole, produce an equally outstanding community environment.

Who Uses These Guidelines

These design guidelines within combination with the City of Loveland’s Ordinances and Codes and the Millennium General Development Plan (GDP) are to be used by parcel developers and builders (and their consultants), in developing new residential neighborhoods, commercial centers, and office complexes, and mixed-use places, within the Centerra Planned Community. As the “keepers” of the vision for Centerra, the Design Guidelines will also be used by the Centerra Design Review Committee (DRC) relative to the review and approval of proposed development. The design review process encourages a high level of design quality and continuity within the overall community, while providing the flexibility needed to encourage creativity on the part of parcel developers and builders (and their consul-

tants). All guidelines and standards are subject to the reasonable discretion of the DRC, which shall make final determinations in good faith.

How the Design Guidelines are Organized

The Centerra Design Guideline document is divided into two major components that include **District Design Guidelines**, tailored to creating a unique image and environment for each of the six Centerra Planning Districts; and **General Design Guidelines** that provide design criteria related to Sustainable Development, Landscaping, Lighting, and Signage. Specific components contained within each district section include the following:

District Design Guidelines

Each of the six Centerra Planning Districts is further divided into five unique components that include:

1. District Image

The District Image component includes photographic images and text designed to describe the desired characteristics that compose each individual District. A summary of physical characteristics related to Site Planning, Architecture, Landscape Architecture, and Signage is provided in an effort to establish a tone or direction that is tailored to each individual District. The intent is to establish a unique character or image for each District, while harmonizing with the Centerra Planned Community as a whole.

2. Site Planning

The Site Planning component contains Principles, Guidelines, and Standards primarily related to the proper orchestration of buildings, open space, and circulation/parking elements related to commercial, mixed use, residential, and office developments. Each Site Planning component is accompanied by a Conceptual Site Plan with call-outs that visually depicts the desired image and physical layout for each specific land use type that occurs within each District. In addition, each Conceptual Site Plan illustrates a pedestrian circulation network designed to promote connectivity between adjacent developments. Included are a variety of photographic Vignettes that depict specific desired site planning conditions.

3. Architecture

The Architecture component is concerned with the design, image, and function of various building types that include commercial, residential, mixed use, and office, to name a

few. The Architecture component includes Prototypical Elevations with call-outs that successfully deconstruct each building type into a series of architectural elements and characteristics. Included are design Principles, Guidelines, and Standards tailored to addressing specific design issues such as Building Massing, Roof Form, Building Facades, and Materials. In addition, various photographic Vignettes have been included, designed to highlight architectural characteristics related to each building type.

4. Landscape Architecture

The Landscape component contains design Principles, Guidelines, and Standards tailored to addressing issues primarily related to on-site landscapes. This component is designed to provide landscape guidance related to: Building Landscaping (Landscapes designed to soften building architecture); Parking Lot Landscaping (Landscapes designed to soften and screen large expanse of pavement); and Open Space Landscaping (Landscapes designed to frame and enclose formal open space).

In addition, the Landscape component contains a Conceptual Street Furniture Palette designed to add character and identity to special pedestrian-oriented District land uses, especially those in the District Center for each District. Included are various photographic images with associated call-outs designed to encourage landscapes that complement their immediate setting while contributing to the overall Centerra landscape image.

5. Prototypical Public/Private Interface Cross Sections

Prototypical cross sections have been provided, designed to highlight the interface area located between the public street ROW and private developer parcel. Cross section information includes the size of Park Strips, Sidewalks, Utility Easements, Building/Parking Setbacks, and Height limitations.

General Design Guidelines

General Design Guidelines have been developed for the entire Centerra planned community related to the following topics:

1. Sustainable Development Design Guidelines

Contained within the Sustainable Design Guidelines are certain principles and standards that must be met as a minimum, as well as recommendations for resources and techniques for achieving a high level of environmental sensitivity for all projects. For example, it is highly recommended that all developments use the LEED Green Building System to document the level of sustainability for the project and achieve a minimum of 26 points.

2. General Landscape Design Guidelines

General Landscape Guidelines have been established for the Centerra Planned community designed to create on-site landscapes that are sustainable, attractive, and complementary to the Landscape Master Plan, natural, and built environment, which constitutes Centerra. Various on-site landscape criteria is contained within the General Landscape section, designed to address Irrigation Water Use; Landscape Installation Period; Soil Amendments; Shrub and Tree Sizes and Placement; Parking Lot Landscaping; Parking Lot Screens; Landscape Maintenance; Grading, Streetscapes, and Landscape Materials

The intent of the General Landscape Guidelines Section is to provide landscape guidance to parcel builders and developers (and their consultants) designed to address a broad-spectrum of generalized landscape concerns that may occur within any of the six Centerra Planning Districts.

3. General Lighting Design Guidelines

General Lighting Guidelines have been established to address issues related to the lighting of open space and natural areas; roadways; parking lots; and pedestrian walkways and paths which relate to each of the six Centerra Planning Districts. In addition, special lighting guidelines have been developed for specific land use types including Residential and Business Park uses.

4. General Signage Design Guidelines

General Signage Design Guidelines have been provided to create a strong image and reduce clutter, while allowing for signs that inform residents and visitors of the various amenities, services, and business found within Centerra. These guidelines will regulate all signs except in those cases where a planned sign program has been developed for a specific project. Design guidelines have been provided for various sign types that include Freestanding and Building-Mounted Identity Signs; Projecting Signs; Banners; Window Signs; Temporary Signs; and Building Entry Information Signs.

Design Review Committee Review Process and Procedures

All proposed development in Centerra must be reviewed by the Centerra Design Review Committee (DRC) to determine compliance with applicable Covenants, General Development Plan, and Design Guidelines DRC approval is required prior to the City of

Project Review Flow Chart

Project Review Flow Chart				
1. Orientation Conference	Informal meeting with staff and selected DRC members -Participants: Applicant, Architect, Landscape Architect, Land Planner Civil Engineer, DRC Staff and selected DRC members	Meeting takes place as soon as applicant signs LOI to purchase property in Centerra.	Applicant Submits to DRC Staff: Applicant Receives:	Nothing Required - Protective Covenants and Design Criteria - Vision Presentation (Centerra Projects) - Site Analysis/Design Context Plan - DRC Procedures and forms
2. Pre-Application and Preliminary Sketch Concept Conference	Informal meeting with staff and selected DRC members -Participants: Applicant, Architect, Landscape Architect, Land Planner Civil Engineer, DRC Staff and selected DRC members	Meeting takes place as required by applicant. Applicant may request additional informal meetings as needed prior to formal DRC submittal.	Applicant Submits to DRC Staff: Following meeting Applicant schedules with City:	- DRC Submittal Cover Sheet - Contact List - Complete Site Data Form - Vicinity Map - Site Survey / Existing Conditions - Preliminary Site Plan - Preliminary Floor Plans - Preliminary Building Elevations Conceptual Review Team Meeting (CRT)
3. Schematic Design	DRC Meeting and Formal Presentation -Participants: Applicant, Architect, Landscape Architect, Land Planner, Engineer, DRC Staff and Consultants, DRC members -Validity of approval: One Year		Applicant Submits to DRC Staff:	- DRC Submittal Cover Sheet - Application Fee - Site Plan - Grading and Drainage Plan - Building Floor Plans - Building Elevations - Landscape Plan (optional) - Intent Statement (Centerra projects)
4. Design Development	DRC Staff Meeting and Formal Presentation -Participants: Applicant, Architect, Landscape Architect, Land Planner, Engineer, DRC Staff and Consultants, DRC members -Validity of approval: One Year.		Applicant submits to DRC Staff: Following approval, Applicant should make first submittal to City of Loveland Development Review or Building Permit	- DRC Submittal Cover Sheet - Site Plan - Grading and Drainage Plan - Utility Plans - Building Floor Plans - Roof Plans - Building Elevations - Exterior Materials Samples - Landscape Plan - Lighting Plan with Photometrics and Cut Sheets - Site Signage - Site Furnishings - Color Rendering of Building and Site Plan
5. Construction Document	DRC Staff Meeting -Validity of approval: One Year (May be extended at time of approval by DRC for phased projects)		Applicant submits to DRC Staff:	- DRC Submittal Cover Sheet - Architectural Plans - Civil Engineering Plans - Landscape Plans - Exterior Building and Site Lighting Plans - Exterior Building and Site Signage Plans
6. Certificate of Compliance	DRC Conducts Site Inspection of Project		Applicant submits to DRC Staff: Applicant receives:	- Complete DRC Certificate of Compliance Form - As-built drawings as submitted to the City DRC Certificate of Compliance (if approved)

Loveland. Refer to the Millennium Design Review Committee/ Centerra Design Review Committee Procedures and Information publication available from McWhinney Enterprises for more detailed information and specific submittal requirements. The following Project Review Flow Chart summarizes the process by which all projects proceed this Design Review.

Conflicts with Other Regulations

All development within Centerra is subject to the Performance Standards of these Guidelines.

In addition to these Centerra Design Guidelines, developers and builders (and their consultants) at Centerra are expected to meet all the criteria established by other documents (Millennium General Development Plan, Annexation Agreements, etc.) as well as the City of Loveland in relation to the City's Zoning Code and Site Planning Performance Standards. These documents should be reviewed specifically for each development. All development within the Centerra Planned Community shall comply with the codes and regulations of all Local, State, and Federal bodies and agencies, including, but not limited to, the City of Loveland. All development shall also comply with the Declaration of Covenants, Conditions, and Restrictions (CC&R's) adopted for Centerra. The Centerra Design Guideline document may be more restrictive than, but does not supersede or modify any existing City and County, or State codes or ordinances. In the event of conflict or discrepancy, or for subjects not addressed herein, the appropriate jurisdictional regulations and codes shall take precedence, and the most restrictive standards shall apply.

Waivers

The Master Developer (McWhinney Enterprises) or DRC shall have the right, from time to time, to waive, at its sole discretion, any provisions of this Design Guideline document as may be applied to any specific site, architecture, or landscape plan. No such waiver shall be construed or held to be a waiver of any provisions of this Centerra Design Guideline document, or of the same provisions as to any other party.

Amendments and Supplements

This Centerra Design Guideline document may, from time to time, be amended or supplemented by the Master Developer (McWhinney Enterprises) at its sole discretion. Any such

amendments shall be applicable to all development plans that are subsequently submitted for review and approval to the Master Developer and DRC.

Approvals

Unless otherwise explicitly provided herein to the contrary, all approvals shall be in writing and may be granted or withheld at the sole discretion of the DRC. Any approval pursuant to these Centerra Design Guidelines does not constitute a warranty, assurance, or representation by the approving party; and the approving party shall have no liability as a result of such approval.

Non- Liability of the Committee

Neither the DRC nor its respective members, Secretary, successors, assigns, agents, representatives, or employees shall be liable for damages or otherwise to anyone submitting plans to it for approval, or to any applicant by reason of mistake in judgement, negligence or non-feasance arising out of any action of the DRC with respect to any submission, or to otherwise follow these Guidelines and Procedures. The role of the DRC is directed towards review and approval of site planning, appearances, architectural vocabulary and aesthetics. The DRC assumes no responsibility with regard to design or construction, including, without limitation the civil, structural, mechanical or electrical design, methods of construction, or technical suitability of materials.

Accuracy of Information

Any person submitting plans to the DRC shall be responsible for verification and accuracy of all components of each submission, including, without limitation, all site dimensions, grades, elevations, utility locations, and other pertinent features of the site or plans.

Applicant's Representation

The Applicant represents by the act of entering into the review process with the DRC that all representatives of Applicant, including, but not limited to, Applicant's architect, engineer, contractors, subcontractors, and their agents and employees, shall be made aware by the Applicant of all applicable requirements of the DRC and shall abide by these Procedures, the Guidelines, and the Covenants.



The Cottonwood Town Center District

E

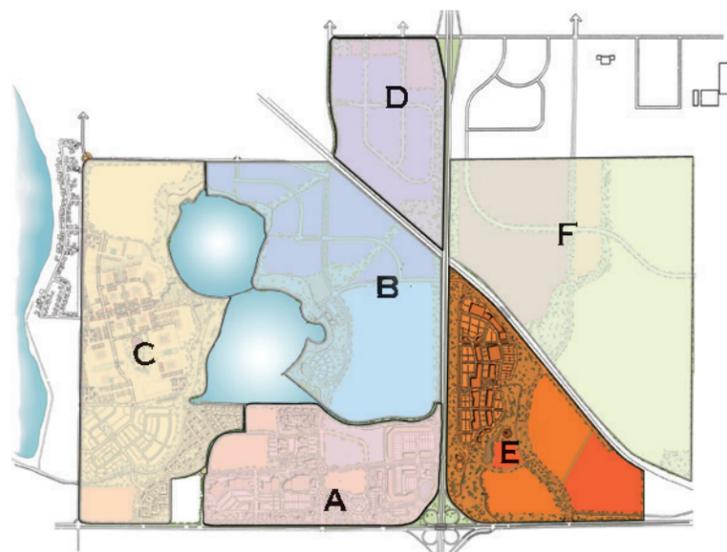


DISTRICT

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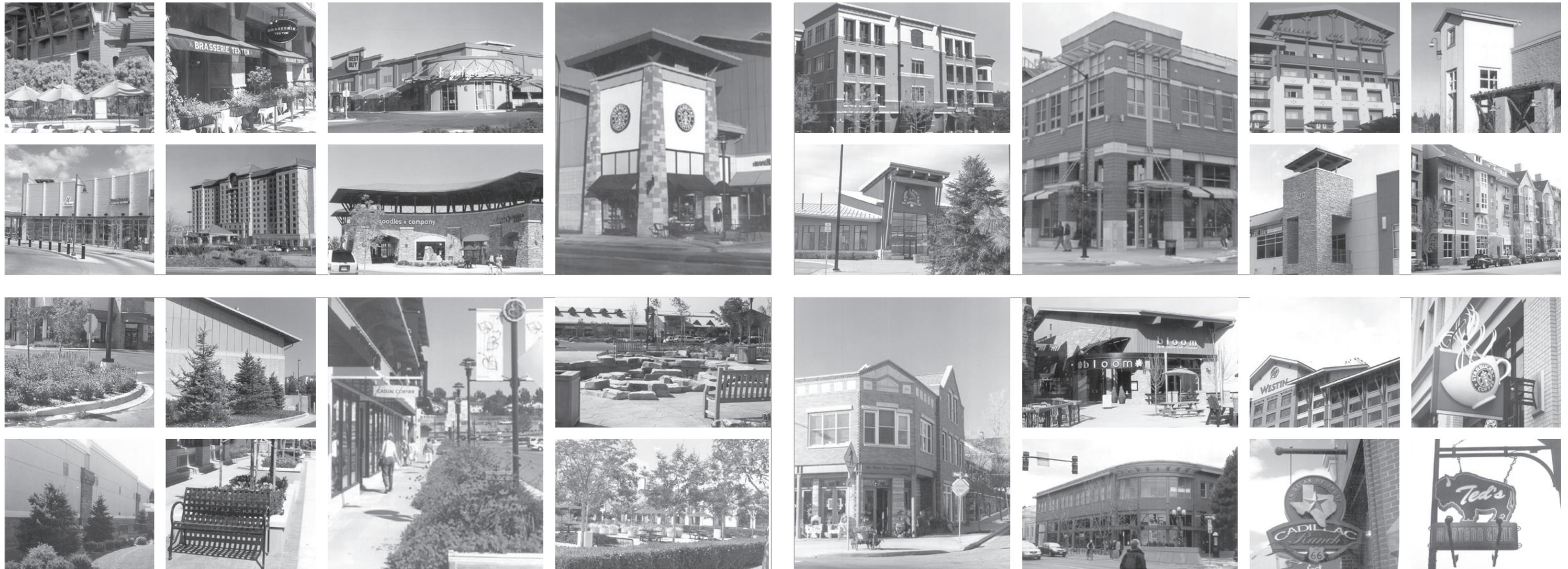
District and Key Map



District Description

Located in the eastern portion of the Centerra, District E, The Cottonwood Town Center District, will serve not only the commercial, business, and entertainment needs of the community, but also serve as an expression of higher-intensity urban living, functioning as the cultural and psychological center of Centerra. People will be attracted to The Cottonwood Town Center District because of its unique mixture of stores, entertainment facilities, restaurants, lodging facilities, offices, and cultural activities. Specifically, it is envisioned that the pedestrian-oriented Mixed Use Town Center will dominate the District, characterized as a higher-intensity urban oriented environment containing a lively mix of uses. Complementing the Town Center, a Mixed Use Lifestyle Center, The Shops at Centerra, will contain a variety of in-line retail storefronts, potentially anchored by larger retail establishments or department stores. Traversing The Cottonwood Town Center District, a prominent natural drainageway and linear park will provide relief from the built environment. It is envisioned that this drainageway will contain a public sculpture garden located in a unique natural setting composed of wetland features such as open water ponds and canals, complemented by cottonwood groves and rich natural landscape plantings. Added to the diversity of land uses contained within the District, a Mixed Use Retail Center, located in the extreme eastern portion of the community lying contiguous to U.S. 34, will be characterized by Large Format and In-Line retail establishments. Lastly, a Hotel and Conference Center complex may punctuate District E, becoming an iconic structure anchoring the intersection of Interstate 25 and U.S. 34, designed to “announce” entrance into the Centerra Planned Community. With exceptional from visibility Interstate 25 and US 34, The Cottonwood Town Center District will become the premier southern gateway into the community of Centerra.

DISTRICT IMAGE



District Characteristics

~1.0 SITE PLANNING~

- 1.1 - High-visibility development, such as Mixed Use, Lifestyle, Large Format Retail, and Hotel land uses are located adjacent to major circulation features including Interstate 25 and U.S. 34, maximizing vehicular exposure.
- 1.2 - Higher intensity Mixed Use Town Center buildings located contiguous to the roadway, frame and enclosed the streetscape creating a defined streetwall.
- 1.3 - Mixed Use Town Center buildings frame the streetscape, containing a lively pedestrian-oriented public walk.
- 1.4 - Mixed Use Town Center buildings frame and enclosed meaningful formal open space features such as forecourts, plazas, and greens.
- 1.5 - Lifestyle buildings are located in a linear fashion, creating a dynamic internalized "main street" and associated pedestrian promenade.
- 1.6 - Large Format, In-Line Retail, and Pad sites oriented towards U.S. 34, maximize motorist visibility.
- 1.7 - Natural drainageway and canal system dominates the site, becoming the armature or central focal point for the built environment.

~2.0 ARCHITECTURE~

- MIXED USE TOWN CENTER:**
- 2.1 - Architecture characterized by Traditional or Contemporary Contextual architectural expressions.
 - 2.2 - Two-to-four story buildings frame the streetscape creating a defined streetwall.
 - 2.3 - Ground floor retail storefronts oriented towards the pedestrian streetscape.

- 2.4 - Buildings commonly divided into individual structural bays composed of piers, spandrels, and recessed storefront windows.
 - 2.5 - Upper-story floors commonly contain office or residential uses.
 - 2.6 - Awnings punctuate storefront facades, adding dimension and color.
 - 2.7 - Traditional building materials, such as brick and stone, used in a traditional or contemporary fashion.
- LIFESTYLE CENTER AND REGIONAL RETAIL:**
- 2.8 - Architecture composed of Traditional or Contemporary Contextual architectural expressions.
 - 2.9 - One and two-story building masses define and enclose a linear vehicular/pedestrian corridor.
 - 2.10 - Buildings define and enclose formal open space, such as forecourts and plazas.
 - 2.11 - Commercial storefronts are interspersed with larger-scaled anchor tenant structures.
 - 2.12 - Building bases composed of masonry, visually anchoring Lifestyle buildings to the ground plane.
 - 2.13 - Tower elements positioned to terminate vistas or accentuate building corners are encouraged.
- LARGE FORMAT RETAIL:**
- 2.14 - Large building masses broken into scale-giving elements including entrance pavilions, tower elements, stone wainscots, cornice/parapet elements, pitched roof overhangs, and structural bays composed of articulated piers.
 - 2.15 - Articulated building entrances, such as gabled pavilions, are designed to "announce" entrance into Large Format buildings.
 - 2.16 - Glazed entrance pavilions designed to provide internal daylighting, while sheltering patrons from the elements.

- 2.17 - Trellis and arcades elements provide a rich layering of components, designed to break-up large expanses of facade area.
- HOTEL/CONFERENCE CENTER:**
- 2.18 - Large multi-story structures with a distinctive base, middle, and cap.
 - 2.19 - Hotel buildings are divided into individual structural bays that reveal the underlying structure of the building.
 - 2.20 - Hotel buildings commonly sit upon a discernable base, creating a pedestal that supports the building mass above.
 - 2.21 - Upper-story facades, divided by structural bays, create a consistent pattern of windows and balconies.
 - 2.22 - Buildings are capped by a discernable roof element, commonly consisting of gable and hip roof forms.
 - 2.23 - Gabled or hipped roof forms are sometimes supported by large brackets.
 - 2.24 - Hotel and out buildings frame and contain meaningful formal open space.
 - 2.25 - Awnings sometimes punctuate ground floor structural bays.
 - 2.26 - Building materials commonly consist of stone, stucco, and standing seam metal, punctuated by dimensional timber or metal framing elements.

~3.0 LANDSCAPE ARCHITECTURE~

- 3.1 - Coordinate landscaping with the Landscape Master Plan to provide a seamless transition from on-site to off-site.

- 3.2 - Native and agrarian-oriented plant materials enhance the existing drainageway and canal edge.
- 3.3 - Formal soldier rows of trees frame and enclosed common formal open space.
- 3.4 - Use of landscaping to screen and soften building architecture.
- 3.5 - Large landscape buffer lying contiguous to Interstate 25 "announces" entrance into the Cottonwood Town Center District and all of Centerra.
- 3.6 - Large medians and islands break-up large expanses of pavement in parking fields.
- 3.7 - See also the General Landscape Design Guidelines section.

~4.0 SIGNAGE~

- 4.1 - Mixed Use and Lifestyle signage promotes a lively pedestrian-oriented environment, characterized by wall and projecting signs that complement Traditional or Contemporary architectural expressions.
- 4.2 - Window and awning signs complement storefront architecture.
- 4.3 - Signature wall and monument signs identify Large Format, Mixed Use Retail uses and Hotel establishments.
- 4.4 - Office signage characterized by monument and wall signage.
- 4.5 - See also the General Signage Design Guidelines section.



Vignettes



FIG. 1 - ORIENT BUILDINGS TO FRAME AND ENCLOSE MAJOR CIRCULATION FEATURES SUCH AS INTERSECTIONS AND ROUND-ABOUTS.



FIG. 2 - ORIENT BUILDING STOREFRONTS TOWARDS THE PUBLIC REALM, DESIGNED TO FRAME AND DEFINE THE "MAIN STREET" PEDESTRIAN PROMENADE.



FIG. 3 - LOCATE TOWER ELEMENTS AT "MAIN STREET" INTERSECTIONS, DESIGNED TO ACCENTUATE THESE HIGHER INTENSITY PEDESTRIAN GATHERING PLACES.



FIG. 4 - ORIENT BUILDINGS TOWARDS THE PUBLIC STREETScape, CREATING SPATIALLY DEFINED INTERSECTION NODES.

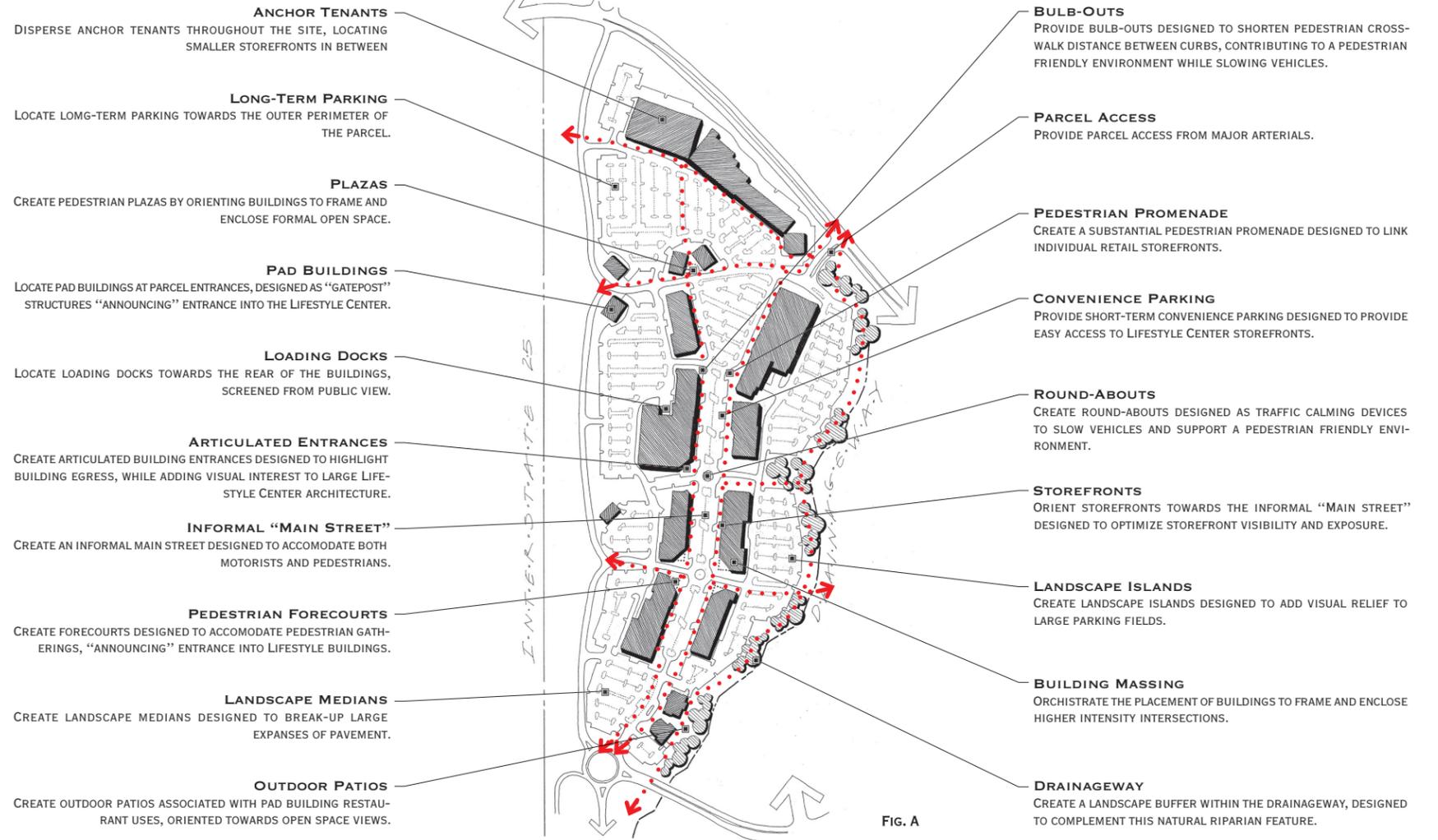


FIG. 5 - LOCATE SUBORDINATE RETAIL BUSINESSES AT INTERSECTIONS DESIGNED TO SOFTEN LARGE FORMAT ARCHITECTURE. NOTICE HOW THE SUBORDINATE RETAIL SHOP ANCHORS THE CORNER WHILE INTEGRATING HARMONIOUSLY WITH THE LARGE BIG BOX COMMERCIAL STRUCTURE.



FIG. 6 - USE LANDSCAPE MEDIANS AND ISLANDS TO SEGMENT LARGE PARKING FIELDS INTO SMALLER PARKING COURTS.

Conceptual Site Plan



~Guidelines and Standards (S)~

~1.0 BUILDING SITING AND ORIENTATION~

- 1.1 - Locate buildings to create and frame an internal-oriented pedestrian/vehicular "Main Street" (fig. 1, 4, A).
- 1.2 - Locate "anchor" tenant buildings as magnets, designed to attract pedestrians (fig. A).
- 1.3 - Locate buildings to define and enclose plazas, forecourts, and courtyards that are of a sufficient size and scale (fig. 2, A).
- 1.4 - Site buildings to frame and enclose "main street" intersections (fig. 1, A).
- 1.5 - Orient in-line retail storefronts contiguous to the "main street" promenade (fig. A, 2).
- 1.6 - Locate "gate post" pad buildings at site entrances and internal street intersections designed to anchor the corner (fig. A, 4).
- 1.7 - Orient freestanding building storefronts towards the street or formal open space areas such as plazas, forecourts, and courtyards.
- 1.8 - Locate tower elements and articulated entrances at higher intensity intersection locations (fig. 3).
- 1.9 - Orient building entries so they are easily identifiable from the informal "main street" (fig. 5).
- 1.10 - For specific building setbacks, please refer to the Millennium General Development Plan.

~2.0 FORMAL OPEN SPACE~

- 2.1 - Orchestrate the placement of buildings to frame and enclose formal open space areas creating pedestrian friendly courtyards, forecourts, and plazas (fig. A, 2).
- 2.2 - Create a pedestrian promenade designed to link "main street" storefronts.
- 2.3 - Avoid "shot-gunned" accumulations of buildings characterized by leftover, awkward, and useable formal open space areas.
- 2.4 - Orient formal open spaces to views of site amenities and activities such as architectural landmarks, fountains, and landscape features.
- 2.5 - Orient formal open spaces to off-site amenities including views of the Rocky Mountains.
- 2.6 - Create outdoor patios in association with restaurant uses, along the drainageway (fig. A, 2).
- 2.7 - Connect formal open space areas to major activities. Link urban open space areas to the following:
 - ~Open space drainages
 - ~Pedestrian promenades
 - ~Recreation trails
 - ~Patios

~3.0 VEHICULAR CIRCULATION AND PARKING~

- 3.1 - Create a "main street" designed to accommodate both pedestrians and vehicles. Create an environment that contains traffic calming feature so that pedestrians can co-exist with automobiles (fig. A, 1).

- 3.2 - Locate long-term parking towards the fringe of the parcel while providing short-term convenience parking adjacent to "main street" storefronts (fig. A).
- 3.3 - Discourage high-speed driving along the pedestrian/vehicular "main street". Use roundabouts, bulb-outs, and textured pavement treatments to slow vehicles (fig. A, 1).
- 3.4 - Segment large parking lots into smaller courts enclosed and framed by buildings and tree rows designed to minimize the perceived scale of the total parking area (fig. A).
- 3.5 - Align parking medians perpendicular to building entries. This alignment minimizes obstacles to pedestrians and encourages walking to remote parking lots.
- 3.6 - Use landscape medians to shade and screen parked vehicles, while physically breaking-up large expanses of pavement (fig. A, 6).
- 3.7 - Provide landscaped islands designed to terminate the ends of parking aisles (fig. A, 6).
- 3.8 - Border parking areas with concrete curbs and gutters, or other devices to collect and convey storm drainage. Avoid ribbon gutters that drain down the center of drive aisles.
- 3.9 - Locate loading docks towards the rear of buildings, screened from public view.

Principles

1. LOCATE BUILDINGS TO DEFINE AND ENCLOSE AN INTERNAL "MAIN STREET".
2. SITE BUILDINGS TO CREATE A STREETWALL DEFINED BY LIFESTYLE CENTER STOREFRONTS.
3. SITE AND ORIENT BUILDINGS TO CONCENTRATE AND REINFORCE PEDESTRIAN ACTIVITY ALONG THE PROMENADE.
4. SITE STAND-ALONE SATELLITE BUILDINGS AT HIGHER INTENSITY PARCEL ENTRANCES AND INTERSECTION LOCATIONS.
5. LOCATE BUILDINGS TO CREATE AND FRAME MEANINGFUL FORMAL OPEN SPACE.
6. CREATE SITE ACCESS GATEWAYS DESIGNED TO "ANNOUNCE" ENTRANCE INTO PARCELS OR INDIVIDUAL SITES.
7. PROVIDE SAFE AND EFFICIENT VEHICULAR PARKING LOTS WHILE MINIMIZING THE NEGATIVE VISUAL IMPACTS COMMONLY ASSOCIATED WITH LARGE EXPANSES OF PAVEMENT.

Conceptual Site Plan

- LANDSCAPE ISLANDS**
CREATE LANDSCAPE ISLANDS DESIGNED TO ADD VISUAL RELIEF TO LARGE PARKING FIELDS.
- PLAZAS**
ORCHISTRATE THE PLACEMENT OF BUILDINGS TO FRAME AND ENCLOSE MEANINGFUL FORMAL OPEN SPACE.
- SHORT-TERM PARKING**
LOCATE SHORT-TERM DIAGONAL PARKING ADJACENT TO BUILDING STOREFRONTS, DESIGNED TO ACCOMMODATE CONVENIENCE USERS.
- ARTICULATED ENTRANCES**
CREATE ARTICULATED BUILDING ENTRANCES DESIGNED TO HIGHLIGHT BUILDING EGRESS WHILE ADDING VISUAL INTEREST TO LARGE MIXED USE BUILDINGS.
- FORMAL "MAIN STREET"**
CREATE A FORMAL ENTRY AXIS DESIGNED TO ACCOMMODATE TRADITIONAL DIAGONAL PARKING SYMBOLIC OF "MAIN STREET" AMERICA.
- ROUNDABOUTS**
CREATE ROUNDABOUTS DESIGNED AS TRAFFIC CALMING DEVICES TO SLOW VEHICLES, PROMOTING A PEDESTRIAN-FRIENDLY ENVIRONMENT.
- IDENTITY ICONS**
CREATE TALL IDENTITY ICONS TO "ANNOUNCE" ENTRANCE INTO THE TOWN CENTER SUB-DISTRICT.
- PEDESTRIAN FORECOURTS**
CREATE FORECOURTS DESIGNED TO ACCOMMODATE PEDESTRIAN GATHERINGS, WHILE HIGHLIGHTING BUILDING ENTRANCES.
- OUTDOOR PLAZAS**
CREATE OUTDOOR PATIOS ASSOCIATED WITH STAND-ALONE RESTAURANT USES.
- GATEPOST ARCHITECTURE**
PROVIDE STAND-ALONE GATEPOST PAD BUILDINGS DESIGNED TO "ANNOUNCE" ENTRANCE INTO THE TOWN CENTER SUB-DISTRICT.

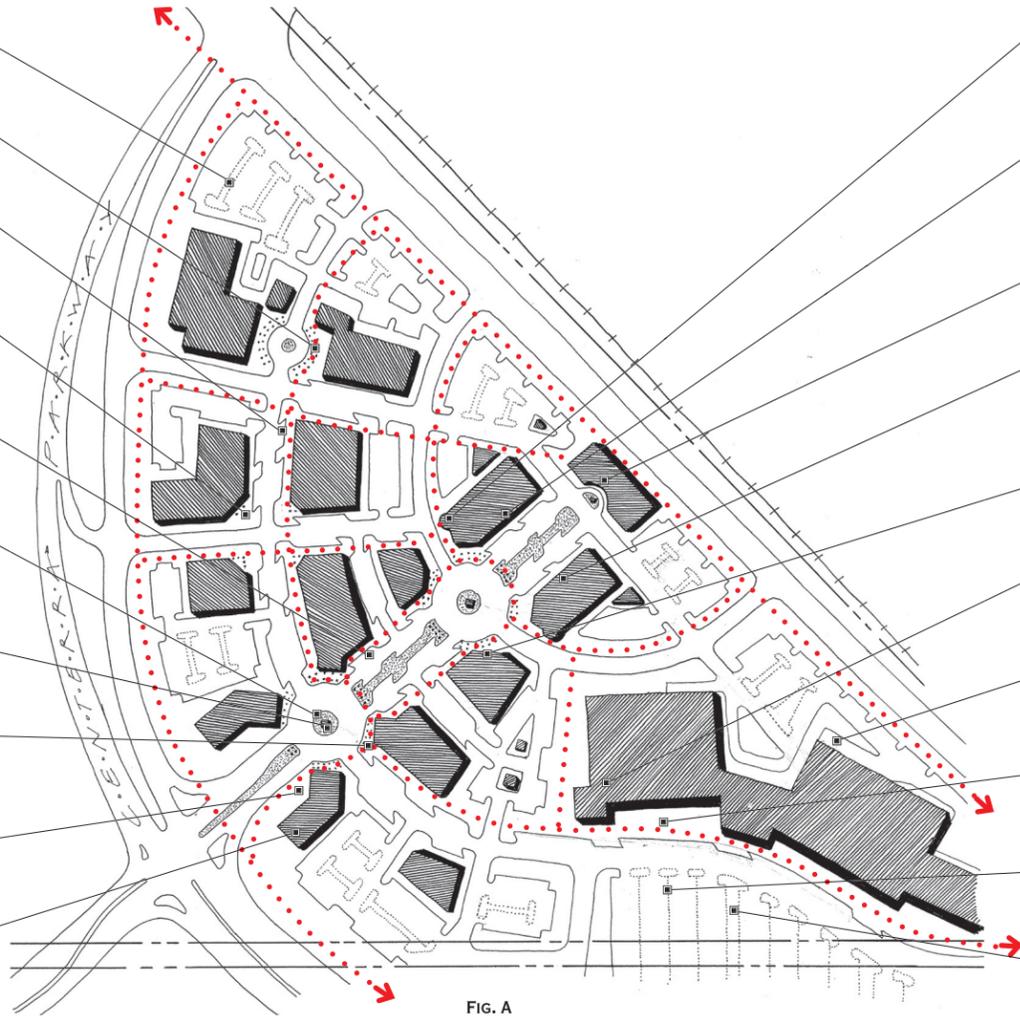


FIG. A

- CORNER TOWERS**
LOCATE TOWER ELEMENTS AT CORNERS, OR AS INTERNAL STREET TERMINI, DESIGNED AS IDENTITY ICONS HIGHLIGHTING HIGHER-INTENSITY INTERSECTIONS.
- STOREFRONTS**
ORIENT STOREFRONTS TOWARDS THE ENTRY AXIS "MAIN STREET" DESIGNED TO OPTIMIZE STOREFRONT VISIBILITY AND EXPOSURE.
- LANDMARK TERMINUS**
PLACE AN IMPORTANT ARCHITECTURAL LANDMARK DESIGNED TO TERMINATE THE "MAIN STREET" VIEW AXIS.
- BUILDING MASSING**
LOCATE HIGHER-INTENSITY PEDESTRIAN-ORIENTED BUILDINGS CONTIGUOUS TO THE ENTRY AXIS ROAD, DESIGNED TO FRAME, ENCLOSE, AND DEFINE THE STREETScape.
- BUILDING ORIENTATION**
ORIENT FREESTANDING BUILDING ENTRANCES TOWARDS ENTRANCE FORECOURTS, PLAZAS, AND THE STREETScape.
- ANCHOR TENANTS**
LOCATE "ANCHOR" TENANTS BUILDINGS AS MAGNETS DESIGNED TO ATTRACT PEDESTRIANS.
- LOADING DOCKS**
LOCATE LOADING DOCKS TOWARDS THE REAR OF THE BUILDINGS, SCREENED FROM PUBLIC VIEW.
- PEDESTRIAN PROMENADE**
CREATE A PEDESTRIAN PROMENADE DESIGNED TO LINK LARGE FORMAT AND IN-LINE RETAIL USES.
- LONG-TERM PARKING**
LOCATE LONG-TERM PARKING ASSOCIATED WITH LARGE FORMAT USES.
- LANDSCAPE MEDIANS**
CREATE LANDSCAPE MEDIANS DESIGNED TO BREAK-UP LARGE EXPANSES OF PAVEMENT.

Vignettes



FIG. 1 - ORIENT BUILDING STOREFRONTS TOWARDS THE PUBLIC REALM. CREATE STREETWALLS TO DEFINE AND ENCLOSE THE STREETScape.



FIG. 2 - ORIENT BUILDINGS TO FRAME AND ENCLOSE FORMAL OPEN SPACE, CREATING PEDESTRIAN ORIENTED PLAZAS, FORECOURTS, AND GREENS.



FIG. 3 - CREATE AN AMPLE PEDESTRIAN PROMENADE DESIGNED TO ACCOMMODATE PEDESTRIANS, STREET FURNITURE, AND OUTDOOR DINING.



FIG. 4 - ORIENT HIGHER DENSITY BUILDINGS TOWARDS THE PUBLIC REALM, DESIGNED TO FRAME AND ENCLOSE THE STREETScape.



FIG. 5 - CREATE CAFÉ ZONES DESIGNED TO ACCOMMODATE AL FRESCO DINING. NOTICE HOW THE RAILING DEFINES THE CAFÉ ZONE FROM THE PEDESTRIAN ORIENTED PROMENADE.



FIG. 6 - DISCOURAGE HIGH-SPEED DRIVING THROUGH THE USE OF BULB-OUTS THAT SHORTEN PEDESTRIAN CROSSINGS AT INTERSECTIONS.

Principles

1. LOCATE BUILDINGS TO DEFINE AND ENCLOSE THE STREETScape.
2. SITE BUILDINGS TO CREATE A STREETWALL DEFINED BY MIXED USE STOREFRONTS.
3. LOCATE BUILDINGS TO DEFINE AND ENCLOSE FORMAL PLAZAS, FORECOURTS AND VILLAGE GREENS.
4. SITE AND ORIENT BUILDINGS TO CONCENTRATE AND REINFORCE PEDESTRIAN ACTIVITY ALONG SIDEWALKS.
5. PROVIDE SAFE AND EFFICIENT VEHICULAR PARKING LOTS WHILE MINIMIZING THE NEGATIVE VISUAL IMPACTS COMMONLY ASSOCIATED WITH LARGE EXPANSES OF PAVEMENT.
6. CONCENTRATE PEDESTRIAN MOVEMENTS ALONG SIDEWALKS. INVITE PEDESTRIANS TO STROLL ALONG SIDEWALKS LINED WITH STOREFRONTS.
7. PARKING STRUCTURES, EITHER FREESTANDING OR ATTACHED, SHALL HARMONIZE WITH THE ARCHITECTURAL STYLE OF THE BUILDINGS THEY SERVE.

~Guidelines and Standards (S)~

~1.0 BUILDING SITING AND ORIENTATION~

- 1.1 - Site buildings adjacent to sidewalks (build-to-lines) designed to frame the street (fig. 1, 4).
- 1.2 - Site buildings to frame and enclose formal open space such as plazas and greens (fig. 2).
- 1.3 - Place buildings adjacent to front property lines. Buildings shall be located to frame the streetscape based upon the following guidelines:
 - **Percentage of buildings to be located at the build-to-line:** Eighty percent
 - **Percentage of building that may be placed within ten feet of the build-to-line:** Twenty percent
- 1.4 - Create continuous building facades along the street and public urban open space. Avoid blank facades and "dead" or vacant spaces within the streetwall.
- 1.5 - Site buildings to concentrate continuous pedestrian activity along the street and formal open space areas (fig. 3, 5).
- 1.6 - Locate higher-intensity building masses at corners characterized by larger building volumes and tower elements (fig. 1).
- 1.7 - "Saddle" lower-intensity building masses between corners, commonly characterized by smaller in-line tenant spaces.

- 1.8 - Orient building storefront openings towards the street or formal open space as opposed to rear parking areas (fig. 5).
- 1.9 - Avoid spatial gaps in the streetwall created by sidewalk-adjacent parking lots.
- 1.10 - **(S)** Orient services functions towards the rear of buildings.
- 1.11 - Avoid locating off-street parking lots between the public street and building frontage. Off street parking lots should be located internally, to the sides or rear of buildings (fig. A).

~2.0 FORMAL OPEN SPACE~

- 2.1 - Orchestrate the placement of buildings to frame and enclose formal open space areas creating pedestrian friendly courtyards, plazas, and greens (fig. 2, A).
- 2.2 - Avoid "shot-gunned" accumulations of buildings characterized by leftover, awkward, and useable open space areas.
- 2.3 - Orient formal open spaces to views of site amenities and activities such as architectural landmarks, fountains, and landscape features.
- 2.4 - Orient formal open spaces to off-site amenities including views of the Rocky Mountains.
- 2.5 - Visually or physically link formal open space. Courtyards and plazas should be partially visible from the street or linked to the street by a clear circulation element such as a pedestrian promenade, paseo, or building pass thru.

- 2.6 - Define urban open space with pedestrian amenities. The edges of courtyards, plazas, and greens should contain retail storefronts, restaurants, and/or offices. Blank walls and dead spaces without pedestrian interest shall be minimized.

~3.0 VEHICULAR CIRCULATION AND PARKING~

- 3.1 - Discourage high-speed driving. Use bulb-outs and textured pavement treatments to slow vehicles (fig. 6).
- 3.2 - Avoid ribbon gutters that drain down the center of drive aisles. Instead, design internal parking lots to drain to their edges.
- 3.3 - Segment large parking lots into smaller courts enclosed by buildings and framed by tree rows designed to minimize the perceived scale of the total parking area (fig. A).
- 3.4 - Align parking medians perpendicular to building entries. This alignment minimizes obstacles to pedestrians and encourages walking to remote parking lots.
- 3.5 - Plan for future structured parking needs. Where additional building space may be developed in later phases, plan for future parking needs at the project's onset.
- 3.5 - Provide short-term on-street parking composed of parallel or diagonal parking stalls, designed to accommodate patrons.



Vignettes



FIG. 7 - PROVIDE SHORT-TERM PARKING OPPORTUNITIES CHARACTERIZED BY TRADITIONAL DIAGONAL OR PARALLEL ON-STREET PARKING STALLS. NOTICE ALSO THE BULB-OUT THAT ENCOURAGES SAFE PEDESTRIAN STREET CROSSING.



FIG. 8 - INTEGRATE STOREFRONT FAÇADES INTO PARKING STRUCTURES, ORIENTED TOWARDS THE PUBLIC REALM. NOTICE HOW THE STOREFRONT ENHANCES THE PEDESTRIAN EXPERIENCE.



FIG. 9 - PROVIDE URBAN-ORIENTED SIDEWALKS TO PROMOTE PEDESTRIAN SOCIALIZATION AND COMMERCE (WINDOW SHOPPING). NOTICE ALSO THE LUSH LANDSCAPE PLANTERS AND RICH PAVEMENT TREATMENTS THAT DEFINE THE PEDESTRIAN REALM.



FIG. 10 - CREATE OPPORTUNITIES FOR PEDESTRIAN GATHERING PLACES AT STREET INTERSECTIONS. NOTICE THE CORNER CUT-OFF, RECESSED ENTRANCE, AND AMPLE SIDEWALK, DESIGNED TO ACCOMMODATE PEDESTRIANS.



FIG. 11 - CREATE PEDESTRIAN PASS THRU'S DESIGNED TO CONVEY PEDESTRIANS FROM REAR PARKING COURTS TO THE STREETScape.



FIG. 12 - USE SOLID MASONRY ENCLOSURES TO SCREEN TRASH DUMPSTERS FROM PUBLIC VIEW. NOTICE ALSO THE DURABLE METAL GATES.

Conceptual Site Plan

LOADING DOCKS
LOCATE LOADING DOCKS TOWARDS THE REAR OF THE SITE, SCREENED FROM PUBLIC VIEW THROUGH THE USE OF DECORATIVE WALLS AND LANDSCAPING.

DRAINAGEWAY
CREATE A LANDSCAPE BUFFER WITHIN THE DRAINAGEWAY, DESIGNED TO COMPLEMENT THIS NATURAL RIPARIAN FEATURE.

ARTICULATED ENTRIES
CREATE ARTICULATED BUILDING ENTRANCES DESIGNED TO HIGHLIGHT BUILDING EGRESS WHILE ADDING VISUAL INTEREST TO LARGE MIXED USE / RETAIL ARCHITECTURE

ON-SITE DETENTION
CREATE ON-SITE DETENTION PONDS DESIGNED TO CAPTURE AND CONTAIN SURFACE RUN-OFF.

SITE ACCESS
PROVIDE MID-BLOCK SITE ACCESS, AWAY FROM INTERSECTION CONFLICTS.

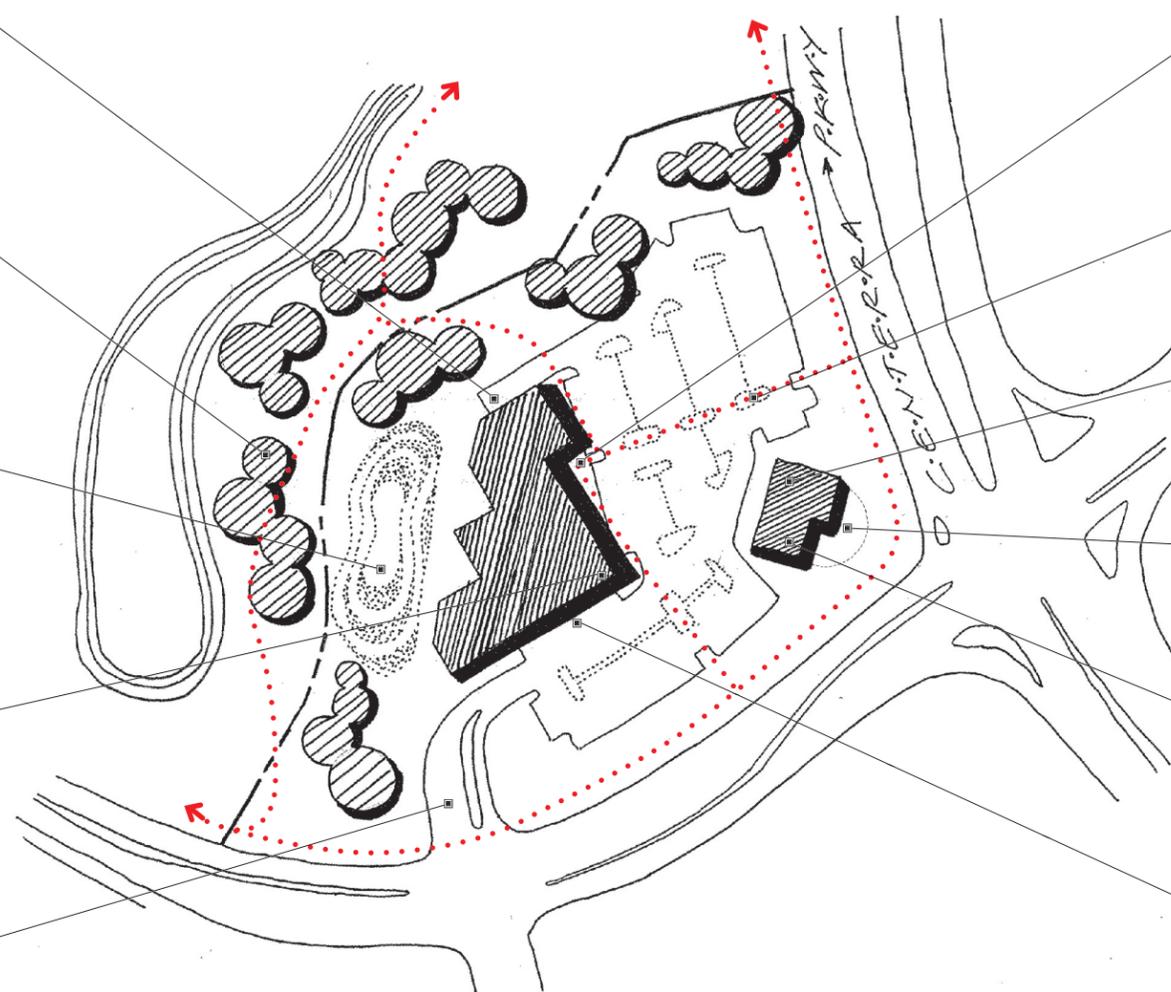


FIG. B

PEDESTRIAN PROMENADE
CREATE A PEDESTRIAN PROMENADE DESIGNED TO LINK INDIVIDUAL RETAIL STOREFRONTS WHILE ACCOMMODATING PEDESTRIAN MOVEMENTS.

LANDSCAPE ISLANDS
CREATE LANDSCAPE ISLANDS TO BREAK-UP LARGE EXPANSES OF PAVEMENT.

PAD BUILDINGS
LOCATE PAD BUILDINGS ADJACENT TO MAJOR ROADWAYS DESIGNED TO OPTIMIZE EXPOSURE.

OUTDOOR PATIOS
CREATE OUTDOOR PATIOS ASSOCIATED WITH PAD BUILDING RESTAURANT USES.

"GATEPOST ARCHITECTURE"
PROVIDE "GATEPOST" ARCHITECTURE DESIGNED TO ANCHOR THE CORNER, FRAMING AND ENCLOSING THE INTERSECTION.

STOREFRONTS
ORIENT STOREFRONTS TOWARDS THE STREET AND PEDESTRIAN PROMENADE, DESIGNED TO OPTIMIZE STOREFRONT VISIBILITY AND EXPOSURE.

- PARKING STRUCTURES:**
- 3.6 - Orient and design parking structure facades to be attractive and interesting at pedestrian levels (street level).
 - 3.7 - Locate and integrate storefronts at the ground floor level and office uses on the second floor of parking structures to provide visual relief and enhance the pedestrian experience.
 - 3.8 - Use screening to ensure that vehicle headlights are not visible from ground level.
 - 3.9 - Create convenient, weather-protected pedestrian connections, such as atriums, between parking structures and buildings.
 - 3.10 - Clearly identify entries to parking structures through the use of appropriate signage and site design.

~4.0 PEDESTRIAN CIRCULATION~

- GENERAL:**
- 4.1 - Provide pedestrian links to buildings and formal open space.
 - 4.2 - Delineate areas of intense pedestrian activity, such as forecourts, courtyards, and plazas with textured accent paving and special lighting.
 - 4.3 - Delineate areas of pedestrian/bicycle interface with vehicles. Provide accent pavement and signage features that alert pedestrians, cyclists, and motorists to potential conflicts.

- 4.4 - Avoid circuitous and meaningless pedestrian walkways. Orient walkways to provide direct access to buildings and formal open space.
 - 4.5 - Minimize the location of pedestrian walkways on the north sides of buildings where snow and ice build-up occurs.
 - 4.6 - Mount utility covers such as manholes and grates flush with the pavement.
- STREET-ADJACENT PEDESTRIAN MOVEMENTS:**
- 4.7 - Provide urban-oriented sidewalks. Sidewalks shall be required between the street and storefronts to promote pedestrian socialization and commerce (window shopping).
 - 4.8 - Create opportunities for pedestrian gathering places at street intersections using features such as recessed building entrances, corner cutouts, and arcades.
 - 4.9 - Provide safe cross bulb-out enhancements at intersections to promote safe pedestrian circulation by shorting crosswalk length.
 - 4.10 - Create pedestrian pass-thru's between buildings to facilitate pedestrian circulation from rear off-street parking areas to the streetscape.
 - 4.11 - Line pass thru's with storefronts to encourage pedestrian movements.

~5.0 SERVICE, DELIVERY, AND OUTDOOR EQUIPMENT STORAGE~

- GENERAL:**
- 5.1 - Avoid placing service areas where they are visible from adjacent buildings or streets.

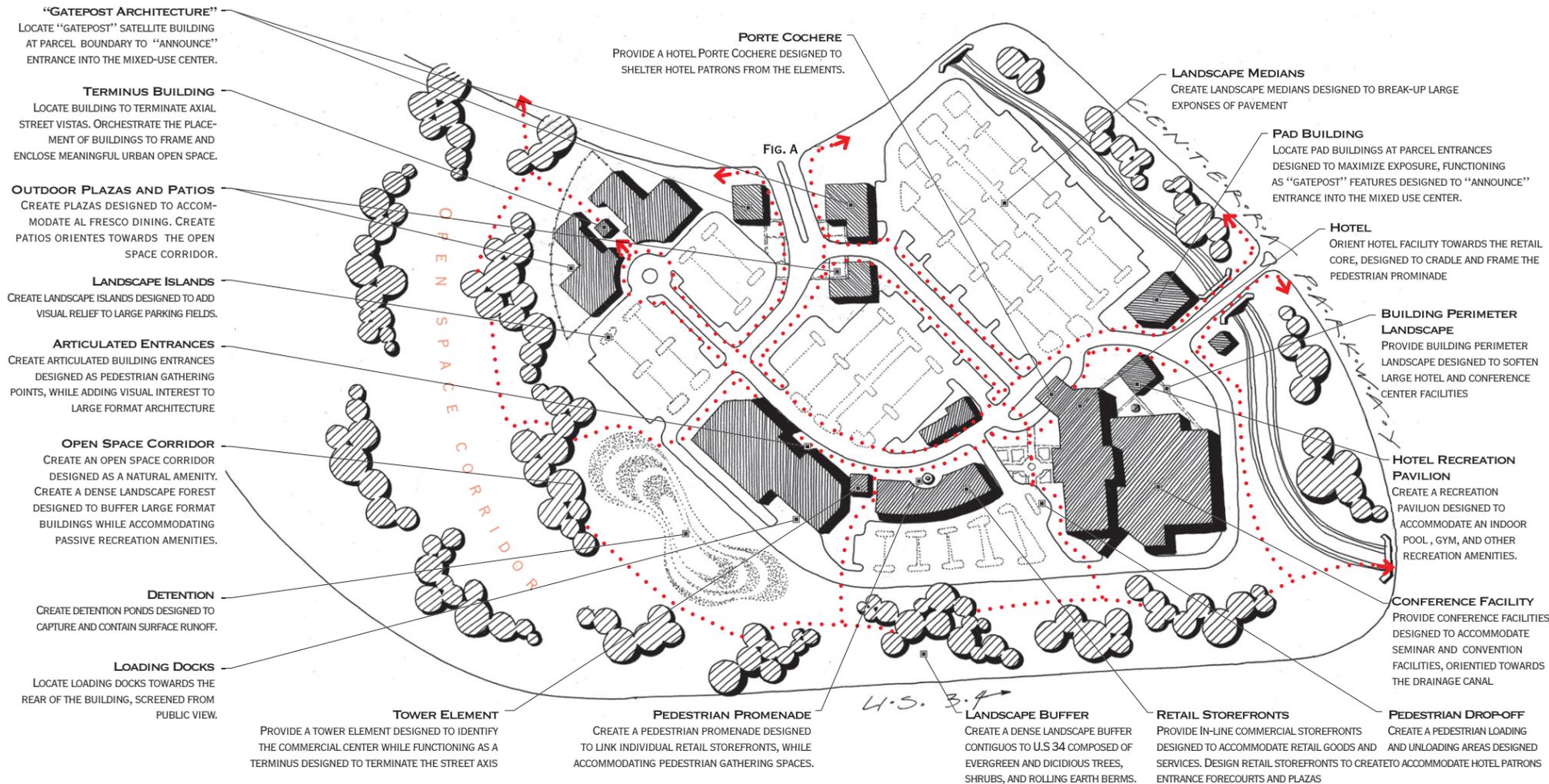
- 5.2 - Locate loading docks, trash enclosures, and service areas behind buildings accessed from alleys or internal parking courts.
- 5.3 - Provide separate parking areas for delivery trucks and service vehicles located behind buildings.
- 5.4 - **S** Do not locate loading docks, trash enclosures, and service areas in setback areas.
- 5.5 - Create shared service areas. Align service areas with those of adjacent buildings so that service drives may be shared.
- 5.6 - Locate accessory structures behind buildings.

UTILITY, MECHANICAL, AND TELECOMMUNICATION EQUIPMENT:

- 5.7 - **S** Do not locate transformers adjacent to pedestrian sidewalks or within formal open space areas.
- 5.8 - Screen utility transformers, telecommunications equipment, and switching boxes from public view.
- 5.9 - Contain utility transformers, telecommunications equipment, and switching boxes within solid masonry walled enclosures or screened with dense landscaping.

SITE PLANNING - In-Line Retail, Large Format Retail, and Hotel

Conceptual Site Plan - Hotel and Pad Buildings



Vignettes



FIG. 1 - USE BUILDINGS TO FRAME AND ENCLOSE MEANINGFUL, FORMAL OPEN SPACE. NOTICE HOW THESE IN-LINE RETAIL BUILDINGS CREATE A PEDESTRIAN FORECOURT.



FIG. 2 - ORIENT PAD BUILDINGS TOWARDS THE PUBLIC STREETSCAPE TO OPTIMIZE EXPOSURE, ANCHORING THE CORNER.

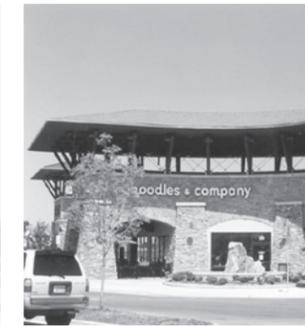


FIG. 3 - ORIENT IN-LINE RETAIL STOREFRONTS TOWARDS ENTRANCE FORECOURTS. NOTICE HOW THE IN-LINE RETAIL BUILDING CRADLES THE OUTDOOR PEDESTRIAN PLAZA.



FIG. 4 - CREATE OUTDOOR PATIOS ASSOCIATED WITH PAD BUILDINGS, PROVIDING OPPORTUNITIES FOR PEDESTRIAN GATHERINGS, AND OUTDOOR DINING.



FIG. 9 - USE SINGLE-STORY HOTEL PAVILLIONS TO FRAME AND ENCLOSE FORMAL OPEN SPACE, CREATING PEDESTRIAN ORIENTED PLAZAS AND FORECOURTS.



FIG. 8 - PROVIDE CONVENIENT PEDESTRIAN DROP-OFF FACILITIES. LOCATE PORTE COCHERES TO PROVIDE EASY ACCESS TO HOTEL/LOBBY ENTRANCES.

Principles

1. SITE IN-LINE RETAIL AND LARGE FORMAT BUILDINGS CONTIGUOUS TO THE PEDESTRIAN PROMENADE.
2. SITE SATELLITE PAD BUILDINGS AT PARCEL ENTRY POINTS AND HIGHER INTENSITY CORNER LOCATIONS.
3. ORCHESTRATE THE PLACEMENT OF THE HOTEL COMPLEX AS A LANDMARK ICON, VISIBLE FROM INTERSTATE 25 AND U.S. 34.
4. LOCATE BUILDINGS TO CREATE AND FRAME MEANINGFUL FORMAL OPEN SPACE.
5. SITE SATELLITE PAD BUILDINGS AND LARGE FORMAT RETAIL STRUCTURES TO BREAK-UP LARGE EXPANSES OF PAVEMENT.
6. DESIGN AMPLE DRIVE-THRU FACILITIES THAT CONTAIN STACKED VEHICLES WHILE SENSITIVELY ACCOMMODATING PEDESTRIAN MOVEMENTS.
7. SENSITIVELY SITE SERVICE, DELIVERY, AND OUTDOOR EQUIPMENT STORAGE FACILITIES TO MINIMIZE THEIR VISUAL IMPACT.

~Guidelines and Standards (S)~

~1.0 BUILDING SITING AND ORIENTATION~

- 1.1 - Locate "gate post" satellite pad buildings at parcel entries and internal street intersections designed to anchor the corner (fig. A).
- 1.2 - Locate In-Line Retail buildings to create and frame pedestrian promenades creating meaningful formal open space (fig. 1, 3, 5, A).
- 1.3 - Orient freestanding satellite pad building storefronts towards the street or formal open space areas such as outdoor patios (fig. A, 4).
- 1.4 - Avoid locating parking lots between the street and satellite Pad Buildings.
- 1.5 - Separate Pad sites from large parking fields with drive aisles and landscape medians designed to define pad site parking areas (fig. A).
- 1.6 - Orient building entries so they are easily identifiable from parking lots and pedestrian areas (fig. 7).
- 1.7 - Locate satellite and Big Box Retail buildings to create dispersed parking fields (fig. A, B).
- 1.8 - Orient Large Format building entrances towards pedestrian promenades and entrance forecourts (fig. 9, 7).
- 1.9 - Orient the hotel complex at the crossroads of Interstate 25 and U.S. 34, designed to anchor this highly visible gateway into Centerra (fig. B).

- 1.10 - Site hotel complex buildings to create and frame plazas, courtyards, and other formal open spaces that are of a sufficient size and scale (fig. 9, B).
- 1.11 - Orient hotel buildings, plazas, and patios towards the natural drainageway.
- 1.12 - Orient Hotel complex buildings to frame and spatially define intersections and roundabouts.

~2.0 FORMAL OPEN SPACE~

- 2.1 - Orchestrate the placement of In-Line Retail buildings to frame and enclose meaningful formal open space areas creating pedestrian friendly promenades, forecourts, courtyards, and plazas (fig. 1, 4, 7, 8).
- 2.2 - Avoid "shot-gunned" accumulations of buildings characterized by leftover, awkward, and unusable open space areas.
- 2.3 - Orient formal open spaces to views of on-site amenities and activities such as architectural landmarks, fountains, and landscape features.
- 2.4 - Orient formal open space to views of off-site amenities such as views of the Rocky Mountains.
- 2.5 - Link formal open space areas, such as forecourts, plazas and courtyards, to pedestrian promenades (fig. 1).
- 2.6 - Orchestrate the placement of hotel complex buildings to frame and enclose formal open space areas creating pedestrian friendly courtyards and plazas (fig. 9, B).

~3.0 SITE ACCESS~

- 3.1 - Limit the number of entry points into individual parcels to confine or limit vehicular and pedestrian conflicts (fig. A, B).
- 3.2 - Use mid-block street intersections along minor internal roadways to provide access into the site.
- 3.3 - Share entrance driveways with neighboring parcels. Reciprocal Access Agreements shall be required, designed to allow the passage of vehicles between adjacent parcels.
- 3.4 - Design entrance points to align with on-site focal points such as roundabouts, building entrances, landmark towers, and formal open space features.
- 3.5 - **S** Maintain a minimum separation of 200 feet between parcel entries, measured centerline to centerline or as otherwise required by the City of Loveland.
- 3.6 - Use mid-block street intersections to provide access into the hotel complex site.
- 3.7 - Design vehicular entrance points to align with on-site focal points such as landmark towers and formal open space features.

~4.0 VEHICULAR CIRCULATION~

- 4.1 - Do not "wall-off" commercial sites from surrounding Lifestyle and Mixed Use land uses.



Vignettes



FIG. 7 - ORIENT LARGE FORMAT ENTRANCES TOWARDS THE PUBLIC REALM. NOTICE HOW THE BUILDING ENTRANCE ENHANCES THE PEDESTRIAN PROMENADE.



FIG. 8 - USE BUILDING MASSES TO FRAME AND ENCLOSE PEDESTRIAN FORECOURTS. NOTICE HOW THE TWO TOWER STRUCTURES DEFINE AND ENCLOSE THE TRELLED PEDESTRIAN AREAS.



FIG. 9 - CREATE PROMENADES DESIGNED TO ACCOMMODATE PEDESTRIANS. NOTICE HOW THE AMPLE PROMENADE WITH ACCENT LANDSCAPING CREATES A CONTINUOUS PEDESTRIAN LANDING.



FIG. 10 - ORIENT PEDESTRIAN COLONADES CONTIGUOUS TO BUILDING FRONTAGES, CONTAINED WITHIN THE PEDESTRIAN PROMENADE, DESIGNED TO SHADE PEDESTRIANS WHILE SOFTENING LARGE FORMAT ARCHITECTURE.



FIG. 11 - ORIENT LOADING DOCKS TOWARDS THE SIDE OR REAR OF BIG BOX BUILDINGS, SCREENED FROM PUBLIC VIEW.



FIG. 12 - ORIENT OUTDOOR PLAZAS AND PATIOS WITH A SOUTHERN EXPOSURE, DESIGNED TO MAXIMIZE SOLAR GAIN.

Conceptual Site Plan - In-Line Retail, Large Format Retail, and Pad

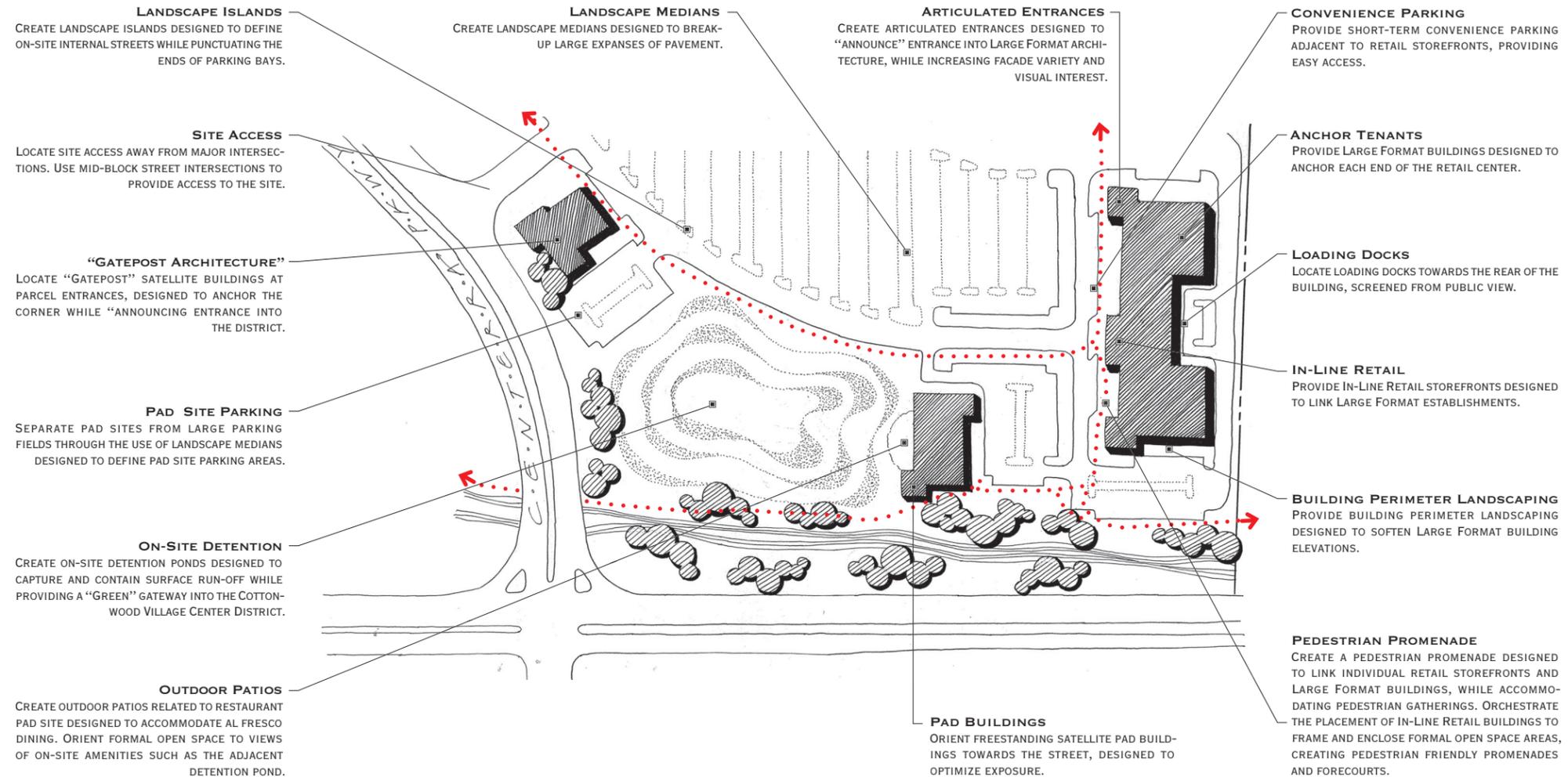


FIG. B

4.2 - Provide vehicular and pedestrian connectivity between the In-Line Retail and Large Format site and adjacent hotel and office land uses (fig. A).

4.3 - Use on-site internal streets as direct extensions of adjacent public streets, providing convenient and direct vehicular and pedestrian access to the site.

4.4 - Maintain a similar parking aisle direction between adjacent parking lots (fig. A, B).

4.5 - Discourage high-speed driving. Use bulb-outs, roundabouts, and textured pavement treatments to slow vehicles.

4.6 - Provide convenient loading and unloading zones for hotel uses. Create separate passenger drop-off areas designed to accommodate the loading and unloading of passengers (fig. 8, 11, B).

~5.0 DRIVE-THRU'S~

5.1 - Design satellite pad site drive-thru lanes to provide sufficient vehicle stacking behind the menu board to accommodate a minimum of six cars.

5.2 - Do not intersect major pedestrian walkways with pad site drive-thru lanes.

5.3 - Separate drive-thru lanes from site access points.

5.4 - **S** Provide ample drive-thru aisle width based upon the following standards:

Drive-thru Aisle Width:

- Curved Sections: 12 feet
- Straight Sections: 11 feet

5.4 - **S** Sensitive locate drive-thru circulation aisles. Drive-thru aisles shall be located a minimum of 20 feet from the property line.

~6.0 PARKING FIELDS~

6.1 - Segment large parking lots into smaller courts enclosed and framed by tree rows designed to minimize the perceived scale of the total parking area.

6.2 - Align parking landscape islands perpendicular to building entries. This alignment minimizes obstacles to pedestrians and encourages walking to remote parking lots (fig. A, B).

6.3 - Use landscape medians to shade and screen parked vehicles, while physically breaking-up large expanses of pavement.

6.4 - Provide landscaped islands designed to terminate the ends of parking aisles.

6.5 - Grade parking areas to drain to their exterior edges. Avoid ribbon gutters that drain down the center of drive aisles.

~7.0 SERVICE, DELIVERY, AND OUTDOOR STORAGE AREAS~

7.1 - Avoid placing service, delivery, and outdoor storage areas where they are visible from adjacent buildings or public view.

7.2 - Locate loading docks, trash enclosures, service facilities, and outdoor storage areas out-of-view from adjacent roadways, pedestrian walkways, and formal open space amenities. Use solid masonry screen walls to obstruct the view of outdoor storage areas.

7.3 - **S** Do not locate loading docks, trash enclosures, service facilities, and outdoor storage areas in setback areas.

7.4 - **S** Locate loading docks, trash enclosures, service facilities, and outdoor storage areas a minimum of 20 feet from any public street ROW, screened from public view.

7.5 - Provide separate parking areas and loading docks for delivery trucks and service vehicles located away from parking lots and pedestrian promenades (fig. A, B).

7.6 - Create shared service areas. Align service areas with those of adjacent buildings so that service drives may be shared between parcels.

7.7 - Screen pad site service facilities and trash enclosures from public view by solid decorative walls, reflective of the architectural style of the pad building.

Prototypical Elevation



FIG. A

Vignettes



FIG. 1 - USE SEPARATE BUILDING MASSES TO DIVIDE BLOCKS INTO INDIVIDUAL COMPONENTS. NOTICE HOW THE BLOCK IS SEGMENTED INTO THREE INDIVIDUAL MASSES, SEPARATED BY BUILDING RECESSES.



FIG. 2 - USE ARTICULATED BUILDING CORNERS TO ANCHOR HIGHER-INTENSITY INTERSECTIONS. NOTICE HOW THE ROUNDED TOWER ELEMENT "TURNS THE CORNER," RESOLVING TWO CONVERGING STREET WALLS.



FIG. 3 - ORCHESTRATE THE PLACEMENT OF BUILDINGS TO FRAME AND DEFINE FORMAL OPEN SPACE, CREATING OUTDOOR PLAZAS.



FIG. 4 - REINFORCE THE UNDERLYING STRUCTURE OF THE BUILDING. NOTICE HOW THE BRICK MASONRY PIERS AND SPANDELS DIVIDE THE BUILDING INTO INDIVIDUAL STOREFRONT BAYS AND UPPER-STORY FAÇADE OPENINGS.



FIG. 5 - INTEGRATE PARKING STRUCTURES INTO THE FABRIC OF THE BUILDING. NOTICE HOW THE STRUCTURED PARKING GARAGE MIMICS TRADITIONAL STREET-ADJACENT STOREFRONTS.



FIG. 6 - USE TOWER ELEMENTS TO ANCHOR BUILDING CORNERS. CREATE TOWER ELEMENTS THAT MEDIATE TWO CONVERGING STREET WALLS.

Principles

1. USE BUILDING MASSES TO CREATE A STREETWALL THAT DEFINES, FRAMES, AND ENCLOSES THE STREET SPACE INTENDED TO CONCENTRATE AND REINFORCE PEDESTRIAN ACTIVITY.
2. SEGMENT BUILDINGS INTO THREE MAJOR COMPONENTS: THE GROUND FLOOR BASE THAT ANCHORS THE BUILDING TO THE GROUND; THE UPPER STORY FAÇADE, THAT PROVIDES TRANSPARENCY; AND THE CAP THAT TERMINATES THE TOP OF THE BUILDING.
3. USE TOWER ELEMENTS AT CORNERS DESIGNED TO FRAME AND ENCLOSE INTERSECTIONS.
4. ORCHESTRATE BUILDING STRUCTURAL BAYS TO CREATE REPETITIVE BUILDING RHYTHMS.
5. USE REFINED URBAN-ORIENTED BUILDING MATERIALS THAT ARE HUMAN-SCALED.

~Guidelines and Standards (S)~

~1.0 BUILDING MASSING AND FORM~

- 1.1 - Divide large buildings into a series of individual storefronts, commonly occupying single or multiple structural bays of similar design and proportion (fig. A, 4).
- 1.2 - Differentiate individual buildings along the streetwall by slight variations in building height, groupings and rhythm of window openings, and different coloration (fig. A, 1).
- 1.3 - Design buildings that are scaled to the human (human scale). Reduce buildings into a series of scale-giving elements, ornamentations, textures, and building materials that respect the scale of the building.
- 1.4 - Rest the building on a ground floor storefront base or pedestal designed to visually anchor the building to the ground plane (fig. A, 7, 11).
- 1.5 - Emphasize horizontal building features such as sign bands, storefront windows, roof eaves, and upper-story windows that provide architectural continuity between neighboring buildings while defining individual floors (fig. A, 1, 7).
- 1.6 - Terminate the top of the building with a distinctive pitched or flat roof cap (fig. 8, 9).
- 1.7 - Avoid large, monumental, undifferentiated, and scaleless building masses.
- 1.8 - **S** Segment the blockscape into a series of individual buildings that visually break the streetwall into a series of storefronts (fig. A, 1).
 - ◉ Recommended Storefront Module Width: 30-40 feet wide

~2.0 TOWERS AND BUILDING CORNERS~

- 2.1 - Extend towers above the streetwall designed as community focal points and landmarks (fig. A, 6).
- 2.2 - Punctuate the skyline with corner towers. Tower elements provide a proper termination of converging street walls, accentuating the corner (fig. A, 6).
- 2.3 - Mediate the termination of two converging wall planes with an articulated building element, such as a rounded building mass designed to "turn the corner", forty-five degree corner cut-off, or square corner indentation (fig. 2).
- 2.4 - Use articulated corner elements to transition repetitive building components from one façade to the other (fig. 6).

- 2.5 - Design building corners based upon the following guidelines:
 - ◉ Articulated Building Elements: One on each corner at a street or civic intersection

~3.0 GROUND FLOOR STOREFRONT BASE~

- 3.1 - Divide ground floor storefront buildings into a series of structural bays composed of columns/piers and spandrels (fig. 4).
- 3.2 - Design storefronts that are distinctly different than upper story facades, characterized by a greater amount of store window openings (fig. A).
- 3.3 - Use commercial storefront heights to allow natural light to penetrate interiors. Ground floor storefront heights shall be designed, based upon the following guidelines:
 - ◉ Minimum Storefront Height: 10 feet

- 3.4 - Design storefront entries to safely accommodate outward door swings (fig. B).
- 3.5 - Design storefronts that are balanced, with symmetrical proportions and a central doorway (fig. A).
- 3.6 - Design storefronts that are distinctly different than upper story façades, characterized by a greater amount of transparency (fig. A, B).
- 3.7 - Create ample storefront openings (fig. A, B).
- 3.8 - Storefront openings (display windows, doors, transoms) shall occupy 50 percent of the total ground floor storefront base area.

~4.0 UPPER STORY FAÇADES~

- 4.1 - Design upper story facades that are composed of solid flat surfaces with punched window openings placed in a regular pattern (fig. A, B, 7).
- 4.2 - Create upper story window shapes that reflect traditional or contemporary architectural styles. Use vertically-oriented windows for traditional façades.
- 4.3 - Emphasize horizontal building features such as continuous cornice elements, repetitive window openings, and sign bands that provide architectural continuity between neighboring buildings.

~5.0 ROOF CAP~

- 5.1 - Terminate the top of the building with a distinctive roof cap. Design roof caps utilizing the following techniques:



Vignettes



FIG. 7 - USE REPETITIVE WINDOW RHYTHMS TO DISTINGUISH UPPER STORY FAÇADES. NOTICE HOW THE BUILDING'S STRUCTURAL BAYS DEFINE INDIVIDUAL RECESSED WINDOW OPENINGS.



FIG. 8 - FOR FLAT ROOFS, TERMINATE THE TOP OF BUILDINGS WITH A DISTINCTIBLE ROOF CAP. NOTICE HOW THE SUBSTANTIAL PROTRUDING CORNICE ELEMENT TERMINATES THE TOP OF THE BUILDING.



FIG. 9 - SUPPORT PITCHED ROOF OVERHANGS WITH BRACKETS OR CORBELS. NOTICE HOW THE AMPLE DIMENSIONAL TIMBER BRACKETS SUPPORT THE WIDELY OVERHANGING EAVE.



FIG. 10 - DESIGN STOREFRONT AWNINGS TO CONFORM TO INDIVIDUAL STRUCTURAL BAYS. CONTINUOUS AWNINGS SHALL BE AVOIDED.



FIG. 11 - PROVIDE A DISTINGUISHABLE BASE OR BULKHEAD DESIGNED TO ANCHOR THE BUILDING TO THE GROUND PLANE. NOTICE HOW THE BUILDING BASE FUNCTIONS AS A PEDESTAL, VISUALLY SUPPORTING THE BUILDING MASS ABOVE.



FIG. 12 - CREATE EASILY IDENTIFIABLE BUILDING ENTRANCES. RECESS BUILDING ENTRIES TO ACCOMMODATE OUTWARD DOOR SWINGS.

Prototypical Elevation

BUILDING MASSING
TIERED BUILDING MASSING "STEPS BACK" AS IT RISES, CREATING STREETSCAPE VISUAL INTEREST. BUILDING RECESSES ARE USED SPARINGLY, DESIGNED TO CREATE FAÇADE RELIEF AND OUTDOOR TERRACES FOR OFFICE OR RESIDENTIAL USES, WHILE RESPECTING BLOCKSCAPE CONTINUITY AND THE BUILD-TO LINE.

BUILDING CAP
SUBTLE CORNICE ELEMENT TERMINATES THE TOP OF THE BUILDING.

BUILDING MATERIALS
A COMBINATION OF BUILDING MATERIALS INCLUDING BRICK MASONRY, STONE VENEER, METAL CLADDING, AND STUCCO CREATE VISUAL INTEREST.

UPPER STORY FAÇADES
UPPER STORY FAÇADE COMPOSED OF REPETITIVE WINDOW BAYS CREATE A CONSISTENT STREETSCAPE RHYTHM (70 PERCENT SOLID, 30 PERCENT VOID). UPPER STORY WINDOW OPENINGS DIVIDED BY MULLIONS CREATING DUAL VERTICALLY-ORIENTED DOUBLE HUNG WINDOW OPENINGS.

LINELS AND SILLS
BRICK MASONRY LINELS AND SILLS DEFINE WINDOW OPENINGS WHILE TERMINATING TOP AND BOTTOM.

MATERIAL TRANSITION
MATERIAL CHANGE OCCURS ON AN INSIDE CORNER AT A CHANGE IN WALL PLANE.

BALUSTRADE
CONTEMPORARY STEEL BALUSTRADE COMPLEMENTS BUILDING ARCHITECTURE. STEEL ELEMENTS ARE USED SPARINGLY, COMPLEMENTING THE DOMINANT BRICK MASONRY STOREFRONT.

STRUCTURAL BAY
STRUCTURAL BAY COMPOSED OF BRICK MASONRY PIERS AND STRUCTURAL STEEL SPANDRELS FRAME INDIVIDUAL STOREFRONT WINDOWS.

TRANSOM WINDOWS
TRANSOM WINDOWS INCREASE INTERIOR DAYLIGHTING.

BUILDING PASS-THRU
BUILDING PASS-THRU CREATES A PORTAL DESIGNED TO ACCOMMODATE PEDESTRIAN MOVEMENTS FROM THE PUBLIC SIDEWALK TO REAR PARKING COURTS OR STRUCTURES.

BULKHEAD
STONE VENEER BULKHEAD VISUALLY ANCHORS THE BUILDING TO THE GROUND PLANE, CREATING A PEDESTAL FOR THE BUILDING TO REST UPON.

RECESSED ENTRY
RECESSED ENTRY ACCOMMODATES OUTWARD DOOR SWINGS WHILE SHELTERING PATRONS FROM THE ELEMENTS.

STOREFRONT WINDOWS
STOREFRONT WINDOWS PROVIDE AMPLE INTERIOR DAYLIGHTING WHILE DISPLAYING THE INTERIOR OF THE BUILDING (45 PERCENT SOLID, 55 PERCENT VOID).

Flat Roofs:

- ~Terminate the top of flat roofs with a distinctive cornice and parapet wall (fig. 8).
- ~Distinguish the cornice from the building façade. Corbel-forward from the front plane of the building façade to articulate the cornice (fig. 8).
- ~Top roof parapet walls with a distinctive cap or coping (fig. 8).
- ~Align cornice lines with neighboring buildings to avoid clashes in style and materials (fig. 1).

Pitched Roofs:

- ~Support pitched roof eave overhangs with corbels or brackets (fig. 9).
- ~Sheath sloped roofs with a roofing material that is complementary to the architectural style of the building.
- ~Avoid radical roof pitches that create overly prominent or out-of-character buildings.

~6.0 BULKHEADS~

- 6.1 - Where glazing to the is not used, anchor storefronts with bulkheads, based upon the following guidelines:
- **Minimum Height:** 18 inches
 - **Maximum Height:** 36 inches

~7.0 AWNINGS~

- 7.1 - Design awnings to complement the architectural framework of the building. Awnings shall express the shape and proportion of window openings (fig. 10).
- 7.2 - Do not use continuous awnings. Awnings shall be segmented, conforming to structural bays (fig. A, 10).

7.3 - Do not obstruct transom windows with awnings. When transom windows occur, awnings shall be located between the top of the storefront window and bottom of the transom to allow light penetration. (fig. A)

7.4 - **[S]** Prohibit internally illuminated awnings. Awning shall not be backlit.

7.5 - Construct awnings of durable material. Permitted awning materials include:
~Cotton/poly with acrylic coating (Sunbrella)
~Metal, Sheet

~8.0 BUILDING MATERIALS~

8.1 - Design buildings that use heavy, visually solid, foundation materials that transition upwards to lighter wall cladding and roof materials (fig. 11).

8.2 - Use indigenous building materials in a contemporary fashion that promotes a modern interpretation of Colorado vernacular architecture (fig. 5).

8.3 - **[S]** The following building materials shall be permitted:

Storefront Base and Upper Story Façades

- Masonry, Brick (i.e., Facebrick, FBX)
- Masonry, Stone (i.e., Ashler-laid, Broken Rangework, Pitched Face, Quarry Faced)
- Masonry, Stone Veneer (i.e., Brownstone, Sandstone, Slate)
- Metal, Wall Panels

- Metal, Corten Steel
- Metal, Corrugated
- Metal, Structural (such as I-beams)
- Stucco, Exterior Plaster) upper-story façades, only.
- Tile (Bulkheads only. Use traditional semi-gloss glazed transparent 4x4" square Daltile with deep colors such as Cobalt Blue, Vermilion, Timberline Green, Sunflower, Grape, Black)

Roofs

- Metal, Corten Steel
- Metal, Corrugated
- Metal, Standing Seam
- Rolled metal or rubber membrane roofing (flat roof sections, only). Screened from public view by a parapet and associated cornice.
- Tile, Concrete

Windows

- Glass, lightly tinted glass (Allowing 90 percent light transmission, minimum)
- Glass, Transparent

Brackets, Corbels, Beams, and Posts

- Dimensional Wood Timber or Metal

8.4 - Use building materials that are familiar in their dimensions and can be repeated in understandable modules or units (human scale).

8.5 - Use materials such as brick and stone that help interpret the size of the building.

8.6 - Combine building materials in modules that can be visually measured.

8.7 - **[S]** Avoid large, featureless building surfaces such as large all glass curtain walls and metal spandrel panels.

8.8 - Select building materials that will age with grace.

8.9 - Avoid building materials that may streak, fade, stain, mildew, attract dirt, or generate glare.

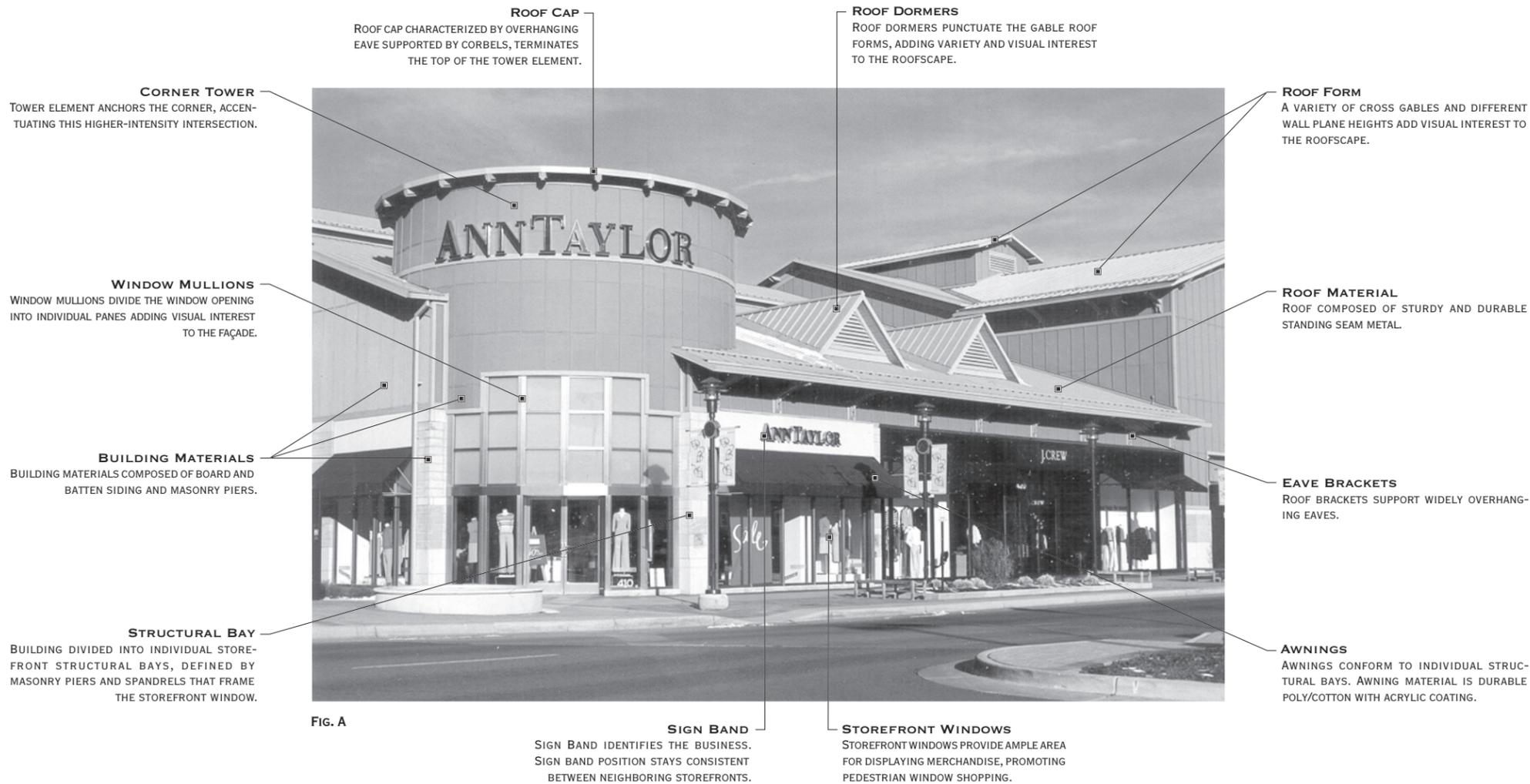
8.10 - Use durable, urban-oriented building materials. Wood shall only be used as an accent material for minor architectural elements, such as corbels and brackets.

8.11 - Use texture and application of color to add visual interest to an otherwise ordinary building surface.

8.12 - Pay close attention to wall surfaces. An otherwise ordinary building surface can be made interesting and expressive by the careful articulation of wall surfaces, textures, and application of color.

8.13 - Avoid excessive variety of façade materials.

Prototypical Elevation - Lifestyle Center



Vignettes



FIG. 1 - USE BUILDINGS TO FRAME AND DEFINE CIRCULATION FEATURES, SUCH AS THIS ROUND-ABOUT. NOTICE HOW THE CURVED BUILDING MIMICS THE CURVED ROUND-ABOUT FEATURE.



FIG. 2 - USE TOWER ELEMENTS TO PUNCTUATE BUILDING MASSES, ADDING VARIETY AND VISUAL INTEREST TO THE STREETScape.



FIG. 3 - USE TOWER ELEMENTS TO VISUALLY ANCHOR BUILDING CORNERS, DISTINGUISHING HIGHER-INTENSITY INTERSECTIONS.



FIG. 4 - USE BUILDINGS TO FRAME AND ENCLOSE FORMAL OPEN SPACE FEATURES SUCH AS PLAZAS AND FORECOURTS.



FIG. 5 - ACCENTUATE BUILDING ENTRANCES. USE LARGER BUILDING MASSES AND STOREFRONT WINDOWS TO DISTINGUISH BUILDING ENTRIES.



FIG. 6 - CREATE AMPLE INTERIOR DAYLIGHTING BY PROVIDING AMPLE STOREFRONT WINDOW HEIGHT. NOTICE HOW THE STOREFRONT WINDOWS ALLOW WINDOW SHOPPING OPPORTUNITIES WHILE ALLOWING AMPLE DAYLIGHTING.

Principles

1. SEGMENT BUILDINGS INTO THREE MAJOR COMPONENTS: THE GROUND FLOOR **BASE** THAT ANCHORS THE BUILDING TO THE GROUND, THE **MIDDLE**, THAT PROVIDES TRANSPARENCY, AND THE **CAP** THAT TERMINATES THE TOP OF THE BUILDING.
2. USE BUILDING MASSES TO DEFINE, FRAME, AND ENCLOSE THE INTERNAL VEHICULAR/PEDESTRIAN "MAIN STREET" SPACE, DESIGNED TO CONCENTRATE AND REINFORCE PEDESTRIAN ACTIVITY.
3. ASSURE STOREFRONT TRANSPARENCY TO OPTIMIZE MERCHANDISE DISPLAY AND PEDESTRIAN INTERACTION.
4. USE AWNINGS STYLES AND MATERIALS THAT REFLECT THE ARCHITECTURAL STYLE OF THE BUILDING.
5. USE AWNINGS TO ACCENTUATE AND DEFINE THE STRUCTURE OF THE BUILDING.
6. USE BUILDING MATERIALS THAT ARE HUMAN-SCALED. PERCEIVING THE SCALE OF A BUILDING IS IMPORTANT TO A PEDESTRIAN'S ABILITY TO RELATE TO IT COMFORTABLY.

~Guidelines and Standards (S)~

~1.0 BUILDING MASSING~

- 1.1 - Locate higher-intensity building masses at internal street intersections and corners. Transition buildings height outward and down to adjacent buildings (fig. A).
- 1.2 - Punctuate large building masses with towers designed as landmark icons (fig. A, 2, 3).
- 1.3 - **S** Reduce building mass. Use the following techniques to diminish the size and scale of Lifestyle Center and Regional Retail commercial buildings:
 - Variation of roof form and height (fig. A)
 - Variation of building color and texture (fig. B)
 - Expression of window and column/pier rhythms (fig. A, 4, 8)
 - Expression of building structural bays (fig. A, B, 4, 8, 9, 10)

~2.0 TOWERS AND ARTICULATED BUILDING CORNERS~

- 2.1 - Extend towers above the building, designed as focal points and landmarks (fig. A, 2, 3).
- 2.2 - Mediate the termination of two converging wall planes with an articulate building corner such as a cylindrical building mass designed to "turn the corner" (fig. A, B).
- 2.3 - Punctuate the skyline with corner towers. Engaged tower elements provide a proper termination of the front and side façade, accentuate the corner (fig. A, 3).

~3.0 STOREFRONT BASE~

- 3.1 - Rest the building on a ground floor storefront base or pedestal designed to visually anchor the building to the ground (fig. 9, 10).
- 3.2 - Locate the ground floor storefront base contiguous to the pedestrian promenade designed to ensure the visibility of display windows, creating a more pedestrian environment (fig. A, 1, 3, 4, 5, 6, 9, 10, 11).
- 3.3 - Create café zones and forecourts designed to support pedestrian activities within the vehicular/pedestrian "main street" (fig. 4).

~4.0 STOREFRONT FAÇADES~

- 4.1 - Articulate facades to reduce the massive scale of large Regional Retail buildings (fig. B).
- 4.2 - Divide storefront buildings into a series of structural bays composed of columns/piers and spandrels (fig. A, B, 4, 9).
- 4.3 - Side and rear facades shall express structural bays by projecting columns/piers a minimum of 12 inches from the building face (fig. 4, B).
- 4.4 - Incorporate architectural elements designed to articulate large commercial building facades. Use the following techniques to provide side and rear façade variety and visual interest:

- **Arcades and Trellis Elements:** Projecting from the building
- **Building Offsets:** Changes in wall plane both vertically and horizontally (fig. 2)
- **Projections:** Protruding from the building (fig. B, 2)
- **Reveals:** Recessed into the building with awnings
- **Color Change:** Changes in building color
- **Material Change:** Changes in building material (fig. A, B, 2, 3)
- **Display Windows:** Faux or real with awnings

- 4.5 - Promote four-sided architecture. Use similar storefront elements on side and rear building elevations that are visible from public view (fig. 4, 8, B).

~5.0 ROOF CAP~

- 5.1 - **S** Terminate the top of the building with a distinctive roof cap. Design roof caps using the following techniques:

Flat Roofs

- Terminate the top of flat roofs with a distinctive cornice and parapet wall (fig. 7, 11, B)
- Distinguish the cornice from the building façade. Corbel-forward from the front plane of the building façade to articulate the cornice (fig. 11, B)
- Top roof parapet walls with a distinctive cap or coping (fig. 11, B)



Vignettes



FIG. 7 - DESIGN PAD BUILDINGS, SUCH AS THIS FAST FOOD ESTABLISHMENT, TO REFLECT THE ARCHITECTURAL STYLE OF THE ENTIRE LIFESTYLE CENTER. NOTICE ALSO HOW THE CHILDREN'S PLAY STRUCTURES ARE LOCATED INTERNALLY WITHIN THE BUILDING.



FIG. 8 - DESIGN AWNINGS TO CONFORM TO INDIVIDUAL STRUCTURAL BAYS. NOTICE HOW THE SEPARATE AWNINGS REINFORCE THE SHAPE OF EACH BAY.



FIG. 9 - SEGMENT STOREFRONTS INTO A SERIES OF INDIVIDUAL STRUCTURAL BAYS. USE PIERS, SPANDRELS, AND BULKHEAD ELEMENTS TO DEFINE INDIVIDUAL STOREFRONT OPENINGS.



FIG. 10 - REST LIFESTYLE CENTER BUILDINGS ON A GROUND FLOOR STOREFRONT COMPOSED OF DISPLAY WINDOWS, TRANSOMS, RECESSED ENTRANCES, AND SIGN BANDS.



FIG. 11 - TERMINATE THE TOP OF FLAT ROOF BUILDINGS WITH A DISCERNABLE ROOF CAP. USE AMPLE CORNICE ELEMENTS AND PARAPET WALLS TO TOP THE BUILDING.



FIG. 12 - SUPPORT PITCHED ROOF OVERHANGS WITH A SUBSTANTIAL BRACKET OR CORBEL.

Conceptual Site Plan - Regional Retail



FIG. B

Pitched Roofs

- Support pitched roof eave overhangs with corbels or brackets (fig. 12)
- Sheath sloped roofs with a roofing material that is complementary to the architectural style of the building
- Avoid radical roof pitches that create overly prominent or out-of-character buildings

~6.0 AWNINGS~

- Design awnings to complement the architectural framework of the building. Awnings should express the shape and proportion of window openings (fig. 8).
- [S]** Create awnings that reflect the architectural style of the building on which they are located.
 - Square shed-style awnings shall accommodate square structural bays (fig. 8)
 - Rounded awnings shall accommodate arched structural bays.
- Do not use continuous awnings. Awnings shall be segmented, conforming to structural bays (fig. 8).
- Do not obstruct transom windows with awnings. When transom windows occur, awnings should be located between the top of the storefront window and bottom of the transom to allow light penetration.
- Permanently attach awnings to building façades.
- [S]** Construct awnings of durable material. Permitted awning materials include:
 - Cotton/poly with acrylic coating (Sunbrella)
 - Metal, Sheet

- Discourage "circus" awnings. Awnings shall not be internally illuminated or backlit.

~7.0 BUILDING MATERIALS~

- [S]** The following building materials shall be permitted: All material transitions shall occur at inside corners.

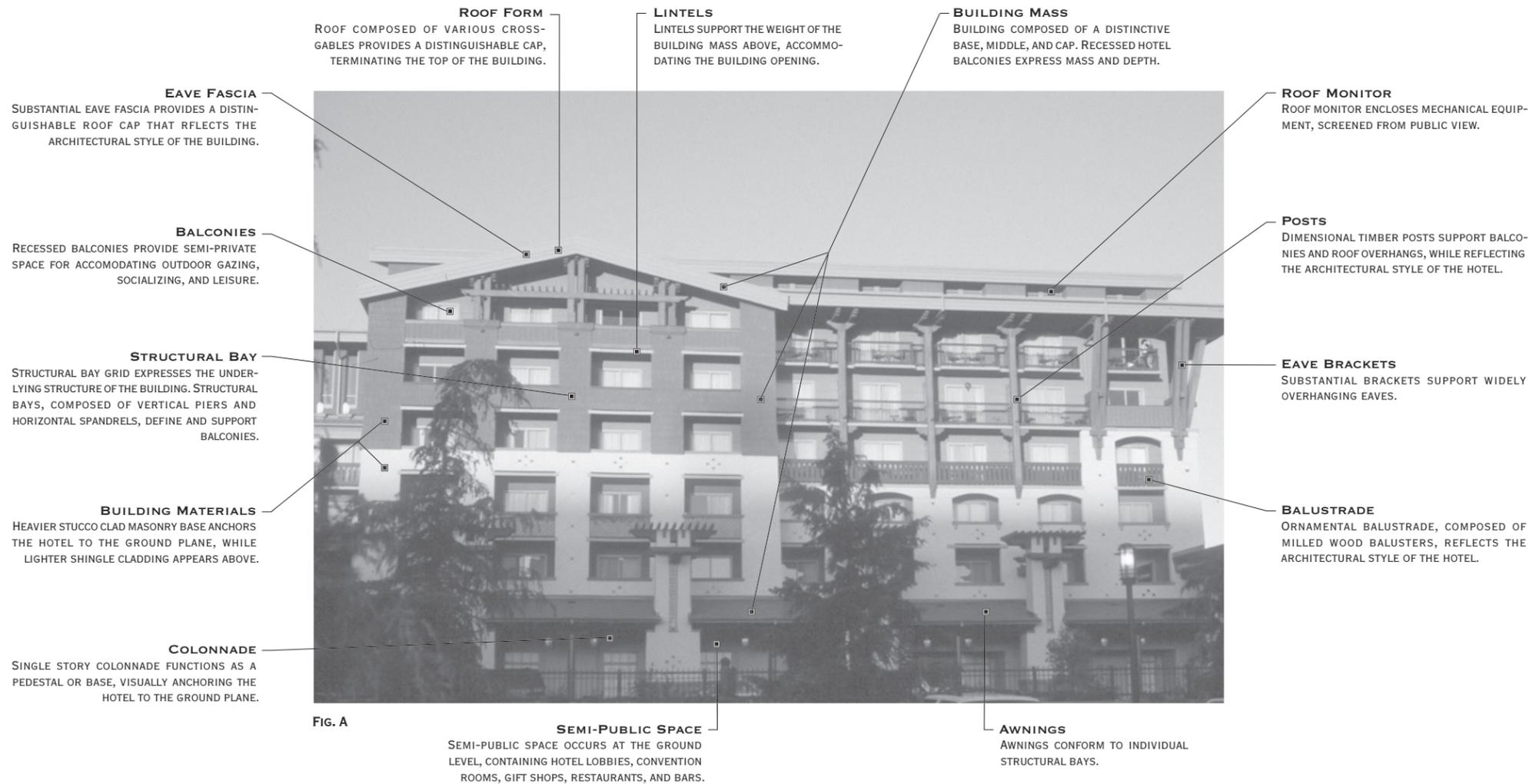
Building Base and Upper Story Façades

- Glass, Lightly Tinted (Allowing 90 percent light transmission)
- Glass, Transparent
- Masonry, Brick (i.e., Face Brick, FBX)
- Masonry, Stone (i.e., Ashler-laid, Broken Rangework)
- Masonry, Stone Veneer (i.e., Brownstone, Granite, Sandstone, Slate)
- Metal, Corrugated
- Metal, Corten
- Metal, Structural (such as I-beam spandrels), subject to DRC review and approval
- Tile, In-Line Retail Storefront (Bulkheads or decorative accents only. Use traditional semi-gloss glazed transparent 4 x 4" square Dal tile with deep colors such as Cobalt Blue, Vermilion, Timberline Green, Sunflower, Grape, Black)
- Stucco (upper stories only)
- Wood, Dimensional Timber (use for minor structural elements such as corbels and brackets).

Roofs

- Metal, Standing Seam
- Metal, Corten
- Rolled metal or rubber membrane roofing (flat roof sections, only. Screened from public view by a parapet and associated cornice).
- Tile, Concrete

Prototypical Elevation



Vignettes



FIG. 1 - DISTINGUISH HOTEL BUILDING ENTRANCES. NOTICE HOW THE RICHLY DETAILED PITCHED GABLE END, COMPOSED OF BEAMS AND BRACKETS, "ANNOUNCES" ENTRANCE INTO THE HOTEL.



FIG. 2 - CROWN HOTEL BUILDINGS WITH A DISCERNABLE CAP DESIGNED TO TERMINATE THE TOP OF THE BUILDING. NOTICE HOW THE WIDELY OVERHANGING EAVE IS SUPPORTED BY AMPLE BRACKETS.



FIG. 3 - CREATE SINGLE-STORY RESTAURANT PAVILIONS AS TRANSITIONAL ELEMENTS TO LARGER-SCALED BUILDING MASSES.



FIG. 4 - USE SINGLE-STORY PORTE-COCHERES AS TRANSITIONAL "STAIR-STEPS" TO LARGER BUILDING MASSES.



FIG. 5 - EXPRESS THE UNDERLYING STRUCTURE OF THE HOTEL THROUGH THE USE OF SUBSTANTIAL PIERS. NOTICE HOW THE BATTERED PIER REFLECTS THE ARCHITECTURAL STYLE OF THE HOTEL.



FIG. 6 - DIVIDE MIDDLE STORIES INTO A SERIES OF STRUCTURAL BAYS COMPOSED OF PIERS AND SPANDRELS THAT SURROUND RECESSED WINDOW OPENINGS AND BALCONIES.

Principles

1. SEGMENT HOTEL BUILDINGS INTO THREE MAJOR COMPONENTS: THE GROUND FLOOR BASE THAT VISUALLY ANCHORS THE BUILDING TO THE GROUND; THE UPPER-STORY MIDDLE THAT PROVIDES TRANSPARENCY; AND THE ROOF CAP THAT TERMINATES THE TOP OF THE BUILDING.
2. USE STRUCTURAL ELEMENTS TO BREAK-UP LARGE BUILDING MASSES INTO A SERIES OF INDIVIDUAL COMPONENTS.
3. ORCHESTRATE FAÇADE OPENINGS TO CREATE REPETITIVE BUILDING RHYTHMS.
4. USE BUILDING MATERIALS THAT ARE AESTHETIC, DURABLE, AND REQUIRE LOW MAINTENANCE.
5. USE BUILDING MATERIALS THAT ARE HUMAN-SCALED. PERCEIVING THE SCALE OF A BUILDING IS IMPORTANT TO A PEDESTRIAN'S ABILITY TO RELATE TO IT COMFORTABLY.

~Guidelines and Standards (S)~

~1.0 BUILDING BASE~

- 1.1 - Rest the hotel on a ground floor base or pedestal designed to visually anchor the building to the ground plane (fig. A, 6).
- 1.2 - Use smaller-scale building masses such as hotel restaurants, porte cocheres, colonades, gift shops, and out buildings as "stair steps" to larger multi-story building volumes (fig. A, 1, 3, 4).
- 1.3 - Integrate porte-cocheres into the fabric of the hotel. Porte-cochere roof forms shall be connected to the main body of the hotel building and shall not be designed as a "tacked-on" afterthought.
- 1.4 - Use traditional building base heights to allow natural light to penetrate interiors.
- 1.5 - Ground floor storefront heights shall range between 12 and 16 feet (fig. A).

~2.0 BUILDING MIDDLE~

- 2.1 - Divide upper story facades into a series of structural bays composed of columns/piers and spandrels (fig. A, 1, 5, 6).
- 2.2 - Design upper story facades that are composed of solid flat surfaces with punched window or balcony openings placed in a regular pattern (fig. A, 1, 6).
- 2.3 - Recess windows into the building façade, designed to express building mass. Windows shall be recessed into the façade a minimum of four inches.

~3.0 BUILDING CAP~

- 3.1 - Terminate the top of the building with a distinctive roof cap (fig. 1, 2, 6).
- 3.2 - Support pitched roof eave overhangs with corbels or brackets. (fig. A, 2)
- 3.3 - Sheath sloped roofs with a roofing material that is complementary to the architectural style of the building.
- 3.4 - Discourage radical roof pitches that create overly prominent or out-of-character buildings.

~4.0 BUILDING MATERIALS~

- 3.5 - **S** The following building materials shall be permitted: All material transitions shall occur at inside corners.

Ground Floor (Building Base)

- Glass, Lightly Tinted (Allowing 90 percent light transmission)
- Glass, Transparent
- Masonry, Brick (i.e., Face Brick, FBX)
- Masonry, Stone (i.e., Ashler-laid, Broken Rangework, Pitched Face, Quarry-faced)
- Masonry, Stone Veneer (i.e., Brownstone, Granite, Sandstone, Slate)
- Metal (structural metal only, such as I-beam spandrels, subject to DRC review and approval)

- Stucco, Smooth

Upper Story Facades (Building Middle)

- Glass, Lightly Tinted (Allowing 80 percent light transmission)
- Glass, Transparent
- Masonry, Brick (i.e., Face Brick, FBX)
- Siding, Clapboard
- Siding, Shingles
- Siding, Metal (Corten steel or corrugated metal)
- Stucco, Smooth

Roofs (Building Cap)

- Metal, Corten Steel
- Metal, Standing Seam
- Rolled metal or rubber membrane roofing (flat roof sections, only. Screened from public view by a parapet and associated cornice)
- Tile, Concrete



Vignettes



FIG. 7 - PUNCTUATE LARGE LARGE FORMAT BUILDINGS WITH TOWER ELEMENTS, ADDING VARIETY AND VISUAL INTEREST TO THE FAÇADE, WHILE ANCHORING THE CORNER.



FIG. 8 - USE TRELLIS ELEMENTS TO SOFTEN LARGE FORMAT ARCHITECTURE. NOTICE HOW THE SUBSTANTIAL STONE PIER AND DIMENSIONAL TIMBER TRELLIS STRUCTURE ADDS FAÇADE VARIETY AND VISUAL INTEREST. NOTICE ALSO THAT CART STORAGE IS SCREENED FROM PUBLIC VIEW.



FIG. 9 - TERMINATE THE TOP OF LARGE FORMAT BUILDINGS WITH A ROOF CAP, SUCH AS A SUBSTANTIAL CORNICE ELEMENT THAT PROVIDES A BUILDING TERMINUOUS WHILE CREATING RICH SHADOW LINES. NOTICE ALSO THE AMPLE STONE PIER AND BUILDING BASE.



FIG. 10 - ACCENTUATE LARGE FORMAT ARCHITECTURE WITH STRUCTURAL PIERS, ADDING VISUAL RELIEF TO THE BIG BOX FAÇADE.

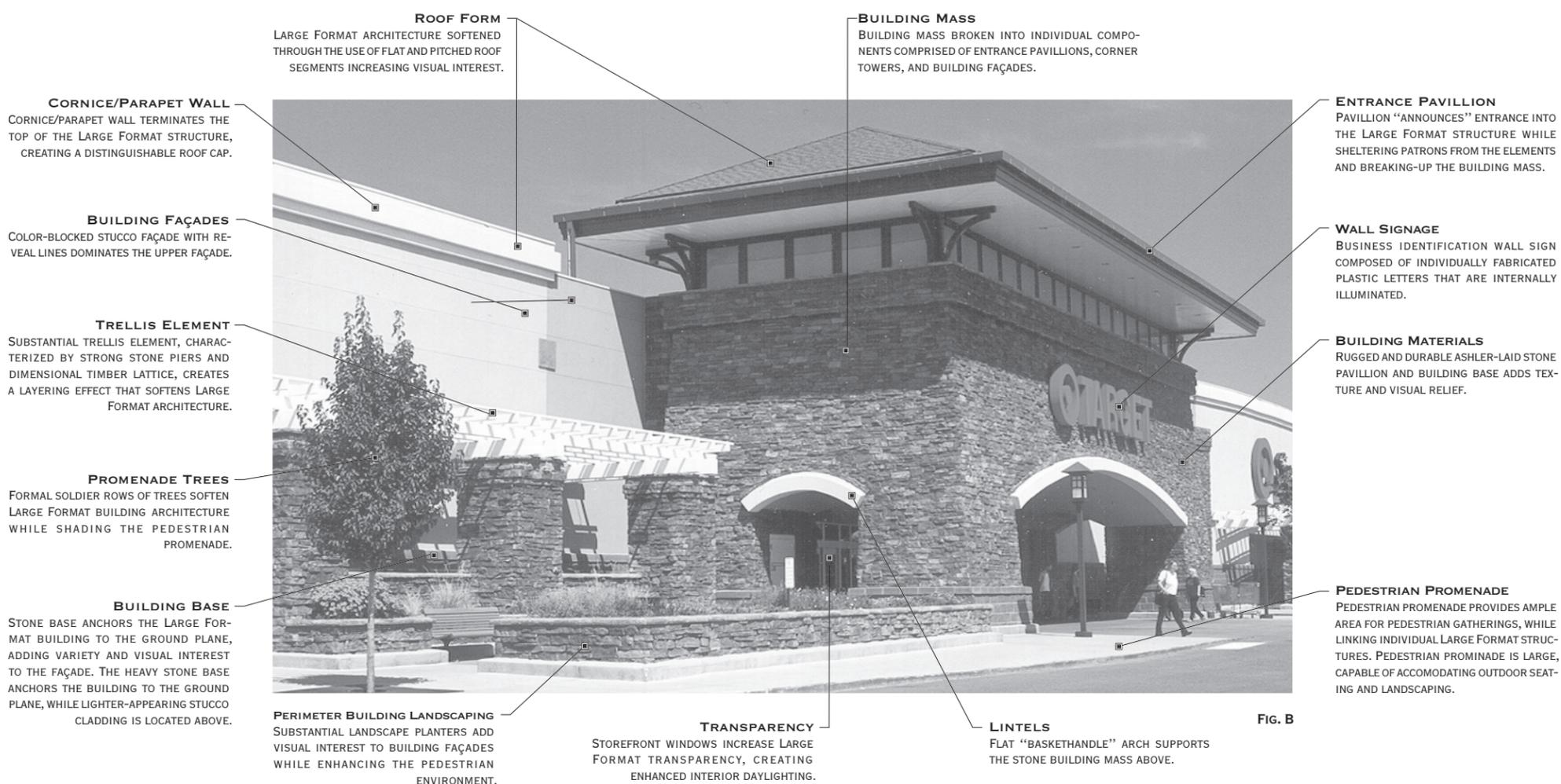


FIG. 11 - USE BUILDING MATERIALS TO ADD TEXTURE AND VISUAL INTEREST. NOTICE HOW THE RUGGED STONE BASE VISUALLY ANCHORS THE LARGE FORMAT BUILDING TO THE GROUND PLANE, WITH LIGHTER STUCCO WALLS OCCURRING ABOVE.



FIG. 12 - DEFINE LARGE FORMAT BUILDING ENTRANCES. NOTICE THE ENTRANCE PAVILLION COMPOSED OF SUBSTANTIAL STONE PIERS, DIMENSIONAL TIMBER BRACKETS, AND A DOMINANT ROOF CAP THAT "ANNOUNCES" ENTRANCE INTO THE STRUCTURE.

Prototypical Elevation



~Guidelines and Standards (S)~

~1.0 BUILDING MASSING~

- 1.1 - Use additive elements such as entrance pavillions to break-up Large Format architecture (fig. 12, B).
- 1.2 - Use tower elements to accentuate building corners (fig. 7, 11).
- 1.3 - Punctuate large building masses with tower elements designed as landmark icons (fig. 7, 11, B).
- 1.4 - Use covered arcades and trellis elements as single-story transitional elements to larger-scaled building masses (fig. 8, B).
- 1.5 - Shelter patrons from the elements at big box entrances (fig. B, 12).

~2.0 ROOF FORM~

- 2.1 - Crown Large Format buildings with a discernable roof cap (fig. 7, B).
- 2.2 - Terminate the top of Large Format flat roofs with a substantial roof parapet/cornice (corona) element (fig. 9, B).
- 2.3 - **S** Conceal rooftop mechanical equipment. All rooftop mechanical equipment shall be completely screened within a penthouse or hidden behind a roof parapet.

~3.0 FAÇADE ARTICULATION AND TRANSPARENCY~

- 3.1 - **S** Articulate Large Format façades. No façade shall exceed 50 linear feet without a façade articulation. Façade articulation techniques include the following:
 - o Structural piers (fig. 9, 10)
 - o Building corners with material changes (fig. 7)

- o Raised planters with landscaping adjacent to building façades (fig. B)
- o Faux window openings and awnings
- o Storefront windows
- o Wall plane projection or recess (fig. 7)
- o Colonades and trellis elements (fig. 8, 11, B)

3.2 - Design Large Format facades based upon the following guidelines:

- o **Minimum Percentage of Front Storefront Façade Window Area: 25 Percent**
- o **Minimum Percentage of Facades that are contain a Trellis Element or Colonade: 50 Percent**

~4.0 ACCESSORY STRUCTURES~

- 4.1 - Design Large Format accessory structures to reflect the architectural style of the entire shopping center.
- 4.2 - Design service station canopies with pitched roofs and substantial piers designed to reflect the architectural style of the primary Large Format building.

~5.0 BUILDING MATERIALS~

- 5.1 - Use consistent building materials and colors on Large Format architecture, reflecting the design of the shopping center as a whole.

- 5.2 - **S** The following building materials shall be permitted: All material transitions shall occur at inside corners.

Building Base:

- o Masonry, Brick (i.e., Face Brick, FBX)
- o Masonry, Stone Veneer (i.e., Brownstone, Sandstone, Slate)
- o Masonry, Stone (i.e., Ashler-laid)

Upper Façade:

- o Masonry, Brick (i.e., Face Brick, FBX)
- o Masonry, Split face or smooth face concrete block integrally colored
- o Masonry, Stone Veneer (i.e., Brownstone, Sandstone, Slate)
- o Masonry, Stone (i.e., Ashler-laid)
- o Stucco or EIFS, Smooth

Windows:

- o Glass, Transparent
- o Glass, Lightly tinted (Allowing 90 percent light transmission)

Roofs:

- o Standing Seam Metal (pitched roof sections, only)
- o Corten Steel (pitched roof sections, only)
- o Rolled metal or rubber membrane roofing (flat roof sections, only). Screened by a parapet wall and associated cornice
- o Tile, Concrete

Principles

1. REDUCE THE MASS AND BULK OF LARGE FORMAT RETAIL ESTABLISHMENTS.
2. TERMINATE THE TOP OF LARGE FORMAT ARCHITECTURE WITH A DISTINGUISHABLE ROOF CAP.
3. ARTICULATE LARGE FORMAT BUILDING ELEVATIONS TO INCREASE FAÇADE VARIETY AND VISUAL INTEREST.
4. SHELTER PATRONS FROM THE ELEMENTS AT LARGE FORMAT ENTRANCES.
5. CREATE LARGE FORMAT BUILDINGS AND ACCESSORY STRUCTURES THAT REFLECT THE ARCHITECTURAL STYLE OF THE SHOPPING CENTER.

Prototypical Elevation



Vignettes



FIG. 1 - PUNCTUATE BUILDING FAÇADES WITH TOWER ELEMENTS. EXTEND TOWER ELEMENTS ABOVE THE FLAT ROOF PLANE, ACCENTUATING THE ROOFSCAPE.



FIG. 2 - SOFTEN BUILDING FAÇADES WITH TRELLIS ELEMENTS. NOTICE HOW THE TRELLIS, CHARACTERIZED BY MASONRY PIERS AND DIMENSIONAL TIMBER LATTICE, CREATES A SHADY AND SHELTERED PEDESTRIAN PROMENADE.



FIG. 3 - USE TOWER ELEMENTS AND AWNINGS TO DEFINE AND ACCENTUATE IN-LINE RETAIL BUILDING ENTRANCES. NOTICE HOW THE TOWER ELEMENT SIGNALS AN END TO THE FAÇADE.



FIG. 4 - USE REFINED MATERIALS THAT REFLECT AN AGRARIAN IMAGE. NOTICE HOW THE USE OF ASHLER-LAID STONE REFLECTS A REFINED YET VERNACULAR IMAGE.



FIG. 5 - USE AWNINGS THAT CONFORM TO INDIVIDUAL STRUCTURAL BAYS WHILE ALLOWING LIGHT TO PENETRATE TRANSOM WINDOWS.



FIG. 6 - ANCHOR IN-LINE RETAIL STORE FRONTS TO THE GROUND PLANE. NOTICE HOW THE STONE VENEER BULKHEAD PROVIDES A SUBSTANTIAL BASE OR PEDISTAL FOR THE BUILDING TO REST UPON.

Principles

1. CREATE BUILDING MASSES AND ROOF FORMS THAT REFLECT THE ARCHITECTURAL STYLE OF THE IN-LINE RETAIL CENTER.
2. INCREASE BUILDING MASS AT AREAS OF HIGHER INTENSITY AND PEDESTRIAN CONCENTRATION
3. ARTICULATE FAÇADES TO REDUCE THE MASSIVE SCALE AND IMPERSONAL APPEARANCE OF LARGE IN-LINE RETAIL BUILDINGS.
4. DESIGN HUMAN-SCALED BUILDING MASSES. INCORPORATE ARCHITECTURAL FEATURES THAT CREATE VISUAL INTEREST AT THE PEDESTRIAN SCALE.
5. USE BUILDING MATERIALS THAT ARE HUMAN-SCALED. PERCEIVING THE SCALE OF A BUILDING IS IMPORTANT TO A PEDESTRIAN'S ABILITY TO RELATE TO IT COMFORTABLY.

~Guidelines and Standards (S)~

~1.0 BUILDING MASSING~

- 1.1 - Locate higher-intensity 'gatepost' satellite building masses at corners designed to 'announce' entrance into the retail center (fig. 12).
- 1.2 - Locate higher-intensity building masses towards the center of the building complex. Transition buildings height outward and down to adjacent developments (fig. A, B, 4).
- 1.3 - Punctuate large building masses with towers designed as landmark icons (fig. A, 1, 12).
- 1.4 - Segment buildings with a distinguishable base, middle, and cap (fig. 3, B).
- 1.5 - **(S)** Reduce building mass. Use the following techniques to diminish the size and scale of In-Line Retail buildings:
 - Variation of roof form and height (fig. A, 8)
 - Variation of building color and texture (fig. A, B)
 - Expression of building storefront structural bays characterized by columns/piers and spandrels (fig. 11)

~2.0 ROOF FORM~

- GENERAL:**
- 2.1 - Create roof forms that contribute to the unified appearance of each commercial center.
 - 2.2 - Design roof forms to correspond to building functions. Use roof forms to identify and accentuate building entrances and staircases (fig. A, 1, 4).

PITCHED ROOFS:

- 2.3 - Use a consistent roof pitch for all buildings within the retail center, designed to knit-together or unite the entire complex.
- 2.4 - **(S)** Avoid continuous roof planes. Sloping roof planes exceeding 60 linear feet shall incorporate one of the following elements:
 - A cross gable (fig. 8)
 - A cross hip
 - A vertical plane break (fig. 8)
 - Flat roof segment (fig. A, B)
- 2.5 - Terminate the top of pitched-roofed retail buildings with a distinctive cap. Design roof caps using the following techniques:
 - ~Provide ample roof overhangs accompanied by substantial eave fascias
 - ~Support pitched roof eave overhangs with corbels or brackets
 - ~Sheath sloped roofs with a roofing material that is complementary to the architectural style of the building
 - ~Discourage radical roof pitches that create overly prominent or out-of-character buildings.

- 2.6 - Enclose rooftop mechanical equipment completely within the interior of the pitched roof structure (fig. 8).

FLAT ROOFS:

- 2.7 - **(S)** Terminate the top of flat-roofed commercial buildings with a distinctive cap. Design roof caps using the following techniques:
 - Terminate the top of flat roofs with a distinctive cornice and parapet wall (fig. A, 9)
 - Distinguish the cornice from the building façade. Corbel-forward from the front plane of the building façade to articulate the cornice.
 - Top roof parapet walls with a distinctive cap or coping (fig. A, 9)
- 2.8 - **(S)** Screen rooftop mechanical equipment with a parapet wall from public view.(fig. A)

~3.0 STOREFRONT ELEVATIONS~

- 3.1 - Create pedestrian interest at storefront elevations. Use the following elements to provide storefront elevation variety and visual interest:
 - ~Arcades, Colonades, and Trellis Elements (fig. A, 1, 2, 4)
 - ~Awnings (fig. 5)
 - ~Bulkheads (fig. 6)
 - ~Canopies
 - ~Storefront display windows (fig. A, 3, B)
 - ~Transom windows (fig. 5)



Vignettes



FIG. 7 - Use secondary roof elements such as dormers to animate the roofscape, adding visual interest to the roofscape.



FIG. 8 - Use individual awnings to define structural bays. Notice how the shed-style awnings conform to each structural bay, sheltering patrons from the elements.



FIG. 9 - Terminate the top of flat roof structures with a distinguishable roof cap.



FIG. 10 - Reduce building mass by creating a variety of building shapes, and varied roof forms that add visual impact.

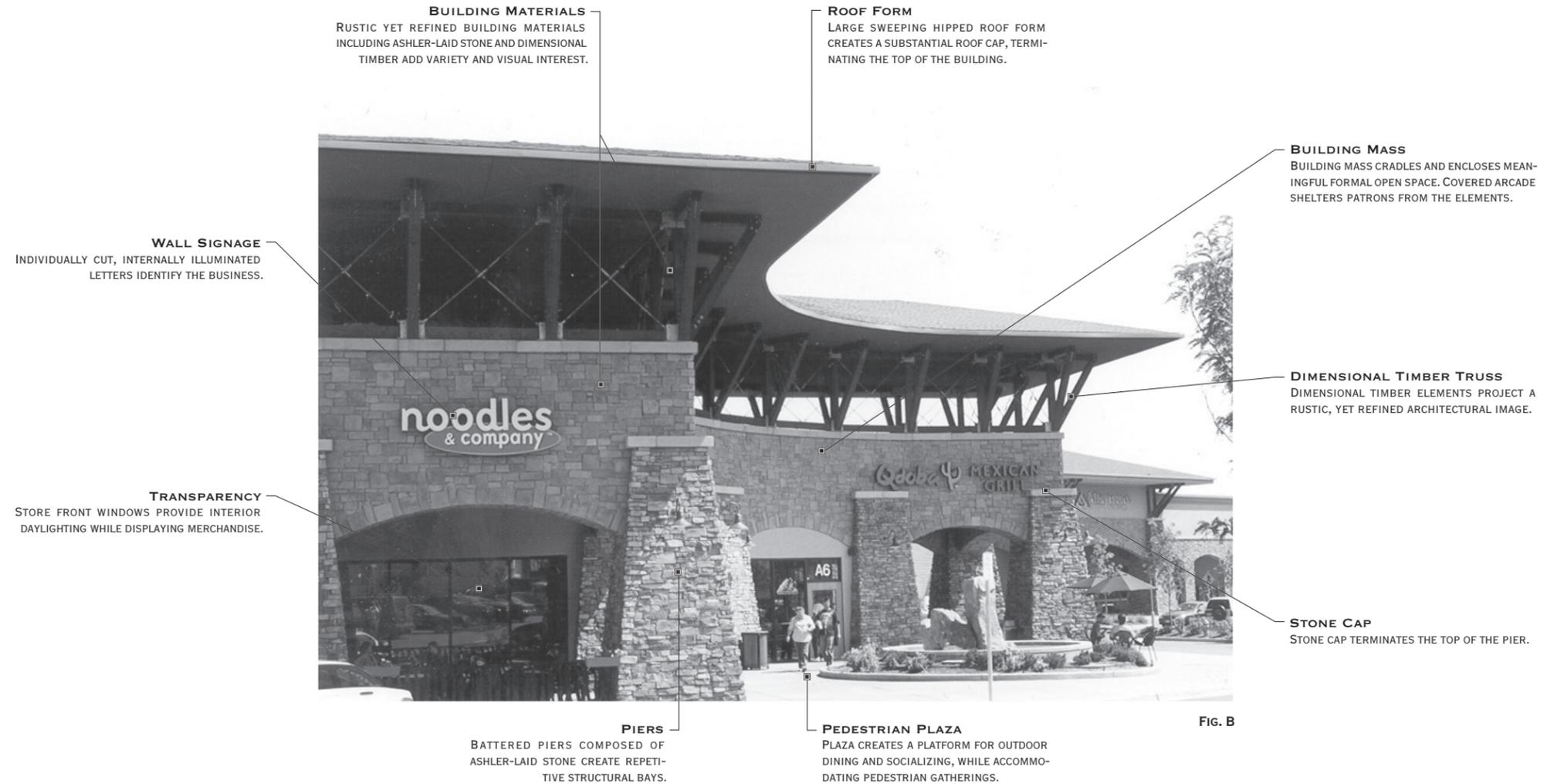


FIG. 11 - Segment retail storefronts into a series of structural bays composed of piers, spandrels, and bulkheads that define storefront windows and transoms.



FIG. 12 - Create satellite pad building architecture that is reflective of the shopping center as a whole.

Prototypical Elevation



3.2 - Create visual rhythms with structural bays that divide storefronts into a series of repetitive components. Storefronts should be segmented through the application of vertically repeating columns, piers, posts, and horizontal spandrels (fig. A, 4).

~4.0 SIDE AND REAR ELEVATIONS~

4.1 - Promote four-sided architecture. Use similar storefront elements on side and rear building elevations that are visible from public view (fig. 1, 2).

4.2 - Incorporate architectural elements designed to articulate large commercial building facades. Use the following techniques to provide side and rear façade variety and visual interest:

- ~Colonades: Projecting from the building (fig. A, B)
- ~Building Offsets: Changes in wall plane (fig. A, B)
- ~Color Change: Changes in building color
- ~Material Change: Changes in building material (fig. A, B)
- ~Projections: Protruding from the building (fig. A, 1, 4, 12, B)
- ~Reveals: Recessed into the building (fig. B)

4.3 - **[S]** Express structural piers. Side and rear facades shall express structural piers by projecting columns/piers a minimum of 12 inches from the building face.

~5.0 BUILDING MATERIALS~

5.1 - Use building materials that are familiar in their dimensions and can be repeated in understandable modules or units (human scale).

5.2 - Use materials such as brick and stone that help people interpret the size of a building.

5.3 - Combine building materials in modules that can be visually measured.

5.4 - **[S]** Avoid large, featureless building surfaces such as large all glass curtain walls and metal spandrel panels

5.5 - Use heavier materials such as brick and stone at the building base, designed to visually anchor the building to the ground plane.

5.6 - **[S]** The following building materials shall be permitted:

Storefronts:

- Glass, Lightly Tinted (Allowing 90 percent light transmission)
- Glass, Transparent
- Masonry, Brick (i.e., Face Brick, FBX)
- Masonry, Split face concrete block
- Masonry, Stone (i.e., Ashler-laid, Broken Rangework, Pitched Face, Quarry-faced)
- Masonry, Stone Veneer (i.e., Brownstone, Granite, Sandstone, Slate)
- Metal (structural metal such as I-beam spandrels and corrugated, subject to DRC review and approval)
- Tile (Bulkheads and decorative accents only) Use traditional semi-gloss glazed transparent 4 x 4" square Dal tile with deep colors such as Cobalt Blue, Vermilion,

Timberline Green, Sunflower, Grape, Black)

Side and Rear Façades:

- Concrete, sandblasted or textured (subject to DRC approval)
- Concrete, with light colored aggregate (subject to DRC approval)
- Masonry, Brick (i.e., Face Brick, FBX)
- Masonry, Split face concrete block
- Masonry, Stone (i.e., Ashler-laid, Broken Rangework, Pitched Face, Quarry-faced)
- Masonry, Stone Veneer (i.e., Brownstone, Granite, Sandstone, Slate)
- Metal, Corrugated
- Metal, Corten
- Metal (structural metal such as I-beam spandrels and corrugated, subject to DRC approval)
- Stucco, Smooth

Roofs:

- Metal, Standing Seam
- Flat Tile (modern slate)
- Rolled metal or rubber membrane roofing (flat roof sections, only. Screened from public view by a parapet and associated cornice)

Wood:

- Wood may be used as a minor structural element (posts, beams, corbels, and brackets)

On-Site Landscaping

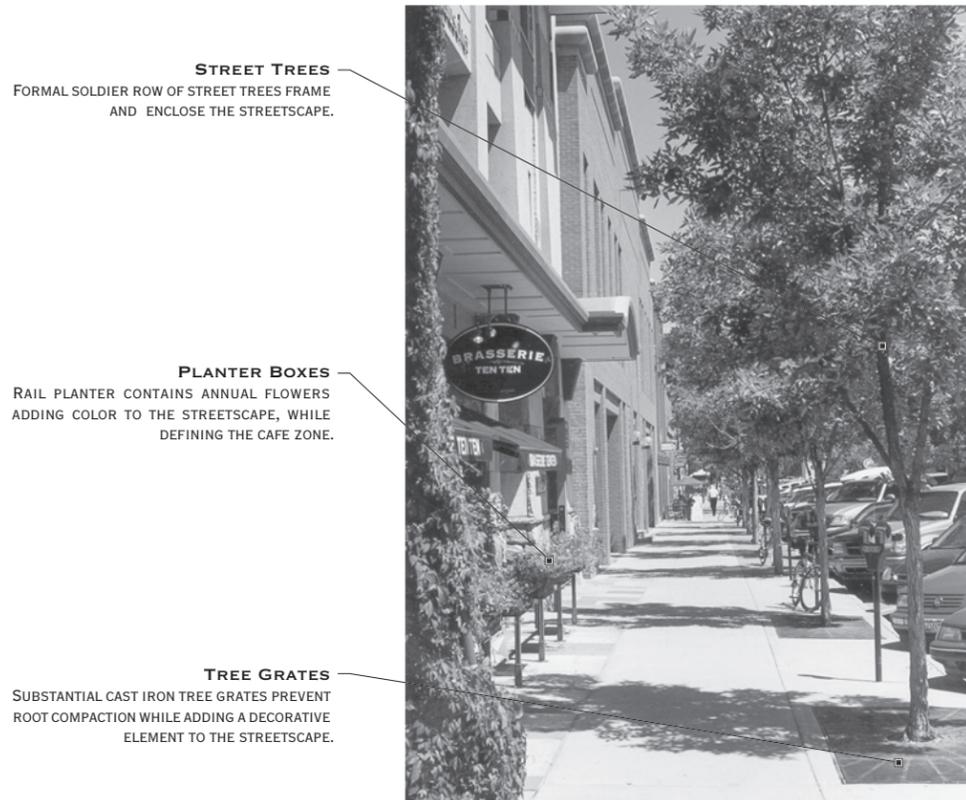


FIG. A



FIG. B

Vignettes



FIG. 1 - USE PLANT CONTAINERS TO ADD COLOR AND ANIMATION TO PEDESTRIAN PROMENADES AND SIDEWALKS.



FIG. 2 - USE CONSISTENT SOLDIER ROWS OF TREES TO FRAME AND DEFINE THE STREETScape. NOTICE THE FORMAL PLANTING PATTERN THAT PROMOTES STREETScape CONTINUITY WHILE PROJECTING AN URBAN STREETScape IMAGE.



FIG. 3 - USE PLANTERS TO SOFTEN THE PEDESTRIAN PROMENADE. NOTICE HOW THE COLORFUL ANNUALS ADD LIFE AND ANIMATION TO THE SIDEWALK.



FIG. 4 - USE LANDSCAPING TO FRAME AND ENCLOSE FORMAL OPEN SPACE. NOTICE THE CONSISTENT TREE ROWS AND SHRUBS THAT DEFINE AND ENCLOSE THE OUTDOOR PLAZA.



FIG. 5 - USE LANDSCAPING TO SOFTEN BUILDING ARCHITECTURE. NOTICE HOW THE DENSE PLANTING OF EVERGREEN TREES BUFFER THE BUILDING FROM THE STREETScape.



FIG. 6 - USE LANDSCAPE MEDIANS TO SEGMENT PARKING FIELDS INTO A SERIES OF INDIVIDUAL PARKING COURTS. NOTICE THE TREE ROWS THAT CREATE A DEFINED "OUTDOOR ROOM".

Principles

1. CREATE A COHESIVE LANDSCAPE/STREETScape DESIGN THAT UNIFIES DISTRICT 5.
2. CREATE FORMAL, URBAN ORIENTED LANDSCAPE STATEMENTS DESIGNED TO REINFORCE THE HIGHER-INTENSITY NATURE OF THE MIXED USE VILLAGE CENTER.
3. PROMOTE THE USE OF ON-SITE LANDSCAPING THAT PROVIDES SHADE, FRAMES VIEWS, AND SOFTENS BUILDING ARCHITECTURE.
4. CREATE LANDSCAPES THAT REINFORCE THE SPATIAL RELATIONSHIPS OF FORMAL OPEN SPACE FEATURES.
5. CREATE LANDSCAPE PATTERNS THAT BREAK-UP LARGE EXPANSES OF PAVEMENT.
6. USE A CONSIST PALETTE OF STREET FURNITURE ELEMENTS TO UNITY THE COTTONWOOD VILLAGE CENTER DISTRICT.

~Guidelines and Standards (S)~

~1.0 GENERAL~

- 1.1 - Overall requirements for landscaping are outlined in the General Landscape Design Guidelines section. Included is a Recommended Plant List tailored to the desired landscape image for District 5 - The Cottonwood Village District.
- 1.2 - As a major unifying element, the Master Developer will provide the design of all streetscape and common area landscape to provide structure and consistency to the district. Individual property owners / developers will be responsible for the installation and maintenance of the landscape.
- 1.3 - Refer to the Millennium GDP and City of Loveland Site Planning Performance Standards and Guidelines for detailed bufferyard performance standards.
- 1.4 - Coordinate on-site landscape design with the overall Landscape Master Plan for off-site roadway edge conditions and common areas. Provide a "seamless" transition to off-site landscape treatments.
- 1.5 - Use landscaping to soften parcel perimeter edges. Avoid harsh lines at property edges, such as abrupt changes in mulch type or plant materials placed in an obvious line.
- 1.6 - Use landscaping to soften Right-of-way edges. Provide a gradual transition of trees, shrubs, and ground covers designed to harmonize with off-site landscaping.
- 1.7 - Soften building facades visible from public areas or high use areas with trees, shrubs, and ground covers (fig. 5).

- 1.8 - Locate plant materials to shelter buildings and formal open spaces from winter winds, allow solar exposure in the winter, and provide summer shade (fig. 4).
- 1.9 - Use ornamental accent landscaping at site entrances designed to "announce" entrance.
- 1.10 - Use plant materials to create sheltered outdoor areas, designed to accommodate pedestrian gatherings (fig. 4).
- 1.11 - Create landscape medians and islands to break-up large expanses of pavement (fig. 5, 7, 8, 9).
- 1.12 - **S** Create formal tree plantings to frame and enclose formal open space features such as pedestrian sidewalks, plazas and forecourts (fig. A, B, 3, 4).
- 1.13 - Use plant containers and raised planters along street-adjacent sidewalks and within plaza areas designed to add annual color (fig. A, B, 3).

- 1.14 - Group plants with similar water requirements together.

~2.0 MIXED USE TOWN CENTER~

- 2.1 - Create formal street tree patterns to frame and enclose the streetscape (fig. A, B).
- 2.2 - Create uniformly spaced soldier rows of deciduous canopy-style street trees designed to shade street-adjacent sidewalks while enclosing the street (fig. A, B).

- 2.3 - Create formal landscape patterns designed to frame and enclose the Village Green.
- 2.4 - Use tree grates and guards to accommodate formal tree plantings along street-adjacent sidewalks and within plaza areas (fig. A, B).
- 2.5 - Hang planters from pedestrian-oriented streetlights, designed to add color and continuity to the streetscape (fig. 2).
- 2.6 - Create formal landscape statements at Mixed Use Town Center site entrances.
- 2.7 - Use a consistent palette of street furniture elements, including pedestrian lighting, tree grates, tree guards, trench drains, seating, trash receptacles, and bicycle racks designed to unify the Mixed Use Town Center.

~3.0 LIFESTYLE CENTER AND REGIONAL RETAIL~

- 3.1 - Create formal soldier rows of trees to accent the informal pedestrian/vehicular "Main Street" (fig. 3).
- 3.2 - Use plant containers and raised planters along the "Main Street" pedestrian promenade, at building entrances, within plaza areas, and pad site patios designed to add annual color (fig. 3).
- 3.3 - Use tree grates and guards to accommodate formal tree plantings along the "Main Street" pedestrian promenade and within plaza areas (fig. A).



Vignettes



FIG. 7 - USE PARKING LOT LANDSCAPE ISLANDS TO BREAK-UP LARGE EXPANSES OF PAVEMENT. NOTICE THE CANOPY-STYLE TREES THAT PROVIDE AMPLE SHADE.



FIG. 8 - USE TREE ROWS TO SEGMENT LARGE PARKING FIELDS INTO OUTDOOR ROOMS. NOTICE HOW THE WINDROW STYLE PLANTINGS BREAK-UP LARGE EXPANSES OF PAVEMENT.



FIG. 9 - USE LANDSCAPE ISLANDS AT THE ENDS OF PARKING AISLES TO DEFINE THE PARKING FIELD. NOTICE HOW THE GROUND PLANE INCLUDES FLOWERING PLANTS



FIG. 10 - PROVIDE A CONSISTENT PALLETTE OF STREET FURNITURE ELEMENTS DESIGNED TO UNIFY THE MIXED USE VILLAGE CENTER. NOTICE THE HANGING PLANTERS THAT ADD COLOR AND ANIMATION TO THE STREETScape.



FIG. 11 - USE FORMAL PLANTING PATTERNS TO DEFINE THE MIXED USE VILLAGE CENTER, VILLAGE GREEN. NOTICE HOW THE FORMAL PATTERNS PROJECT AN URBAN IMAGE.



FIG. 12 - PROVIDE ROUND "HOCKEY PUCK" LUMINARIES WITHIN PARKING LOTS, DESIGNED TO DIRECT LIGHT DOWNWARD (KIM LIGHTING CC/CCS SERIES).

Mixed Use Village Center Street Furniture



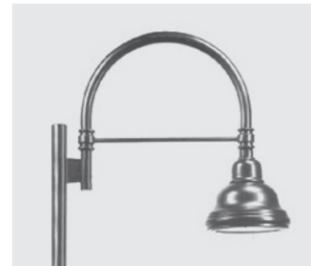
SEATING
LANDSCAPEFORMS - PLAINWELL BENCH



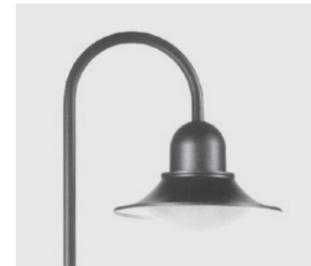
SEATING
BRP ENTERPRISES - MC103-72-MF



SEATING
LANDSCAPEFORMS - SCARBOROUGH - BACKED BENCH, WOVEN SEAT



PEDESTRIAN LIGHTING
HADCO LIGHTING - CF1



PEDESTRIAN LIGHTING
WE-EF LIGHTING - BSP504



TREE GRATE
URBAN ACCESSORIES - OT SERIES



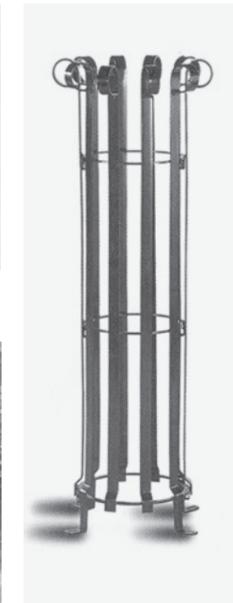
TRENCH DRAIN
URBAN ACCESSORIES - OT



BIKE RACK
BRP ENTERPRISES - HU-08-MF



TRASH RECEPTACLE
LANDSCAPEFORMS - SCARBOROUGH



TREE GUARD
WABASH VALLEY - TG1



SEATING
LANDSCAPEFORMS - PLAINWELL BENCH

3.4 - Arrange plant materials to harmonize with the architectural style of Lifestyle Center and Regional Retail establishments, accenting pedestrian promenades, softening facades, and screening loading and service areas.

3.5 - Use landscaping to soften large Lifestyle Center and Regional Retail buildings, reducing the perceived scale of these large commercial buildings (fig. 5).

3.6 - Divide parking fields with windrow-style median plantings designed to create and define "outdoor rooms" (fig. 8).

3.7 - Create a substantial landscape buffer adjacent to the Interstate 25 corridor, designed to soften Lifestyle Center and Regional Retail architecture while maintaining building identity and visibility.

3.8 - Use landscaping to enhance the natural drainage way that traverses the Lifestyle Center and Regional Retail site.

~4.0 HOTEL/CONFERENCE CENTER~

4.1 - Create formal soldier rows of trees to accent passenger drop-off areas.

4.2 - Create formal tree plantings to frame and enclose formal open space features such as pedestrian plazas, forecourts, and patios (fig. 4).

4.3 - Use tree grates and guards to accommodate formal tree plantings along pedestrian promenades and within plazas.

4.4 - Use plant containers and raised planters at building entrances and within plazas to add annual color (fig. 1).

4.5 - Arrange plant materials to harmonize with the architectural style of the Hotel/Conference building entrances, softening facades, and screening nuisances.

~5.0 IN-LINE AND LARGE FORMAT RETAIL~

5.1 - Create formal soldier rows of trees to accent linear pedestrian promenades (fig. 3).

5.2 - Use plant containers and raised planters at building entrances, along pedestrian promenades, and within plazas to add annual color (fig. 3).

5.3 - Use tree grates and guards to accommodate formal tree plantings along pedestrian promenades and within plazas.

5.4 - Arrange plant materials to harmonize with the architectural style of In-Line and Big Box Retail establishments, accenting pedestrian promenades, softening facades, and screening nuisances (fig. 3, 5).

5.5 - Use landscaping to soften In-Line and Big Box architecture, reducing the perceived scale of these large commercial buildings (fig. 5).

5.6 - Divide parking fields with windrow-style median plantings designed to create and define "outdoor rooms".

~6.0 STREET FURNITURE~

PEDESTRIAN LIGHTING:

6.1 - Use decorative pedestrian oriented light poles. Light poles shall have a discernible base, shaft, and capital that supports the luminary.

6.2 - **S** Provide decorative tree furniture. Street furniture shall be provided based upon the following standards:

Pedestrian Lighting:

• **Location:** Plazas and pedestrian walkways

• **Style:** Hadco Lighting - CF1
WE-EF Lighting - BSP504

• **Color:** TBD

• **Height:** 10-12 feet (maximum)

• **Maximum Illumination:** 4,800 Lumens

Seating:

• **Benches:** Landscapeforms - Plainwell Bench

BRP Enterprises - MC103-72-MF

Landscapeforms - Scarborough - Backed Bench, Woven Seat

Trash Receptacles:

• Landscapeforms - Scarborough

Tree Grates:

• Urban Accessories - OT Series

Tree Guards:

• Wabash Valley - TG1

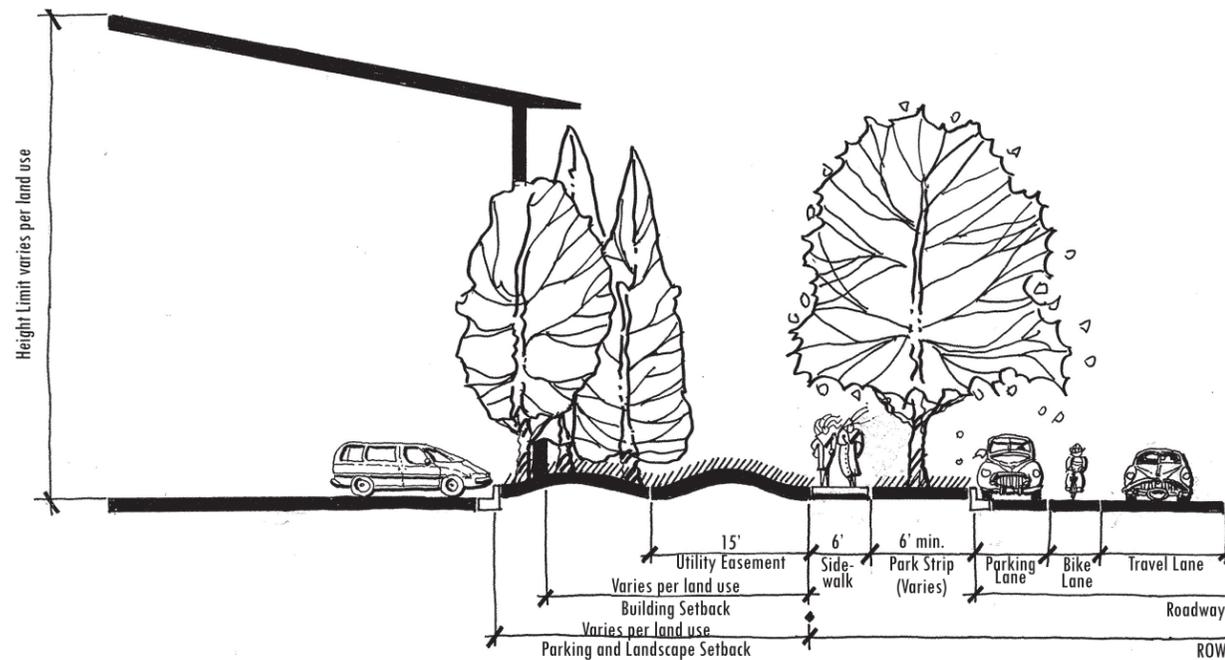
Trench Drains:

• Urban Accessories - OT Series

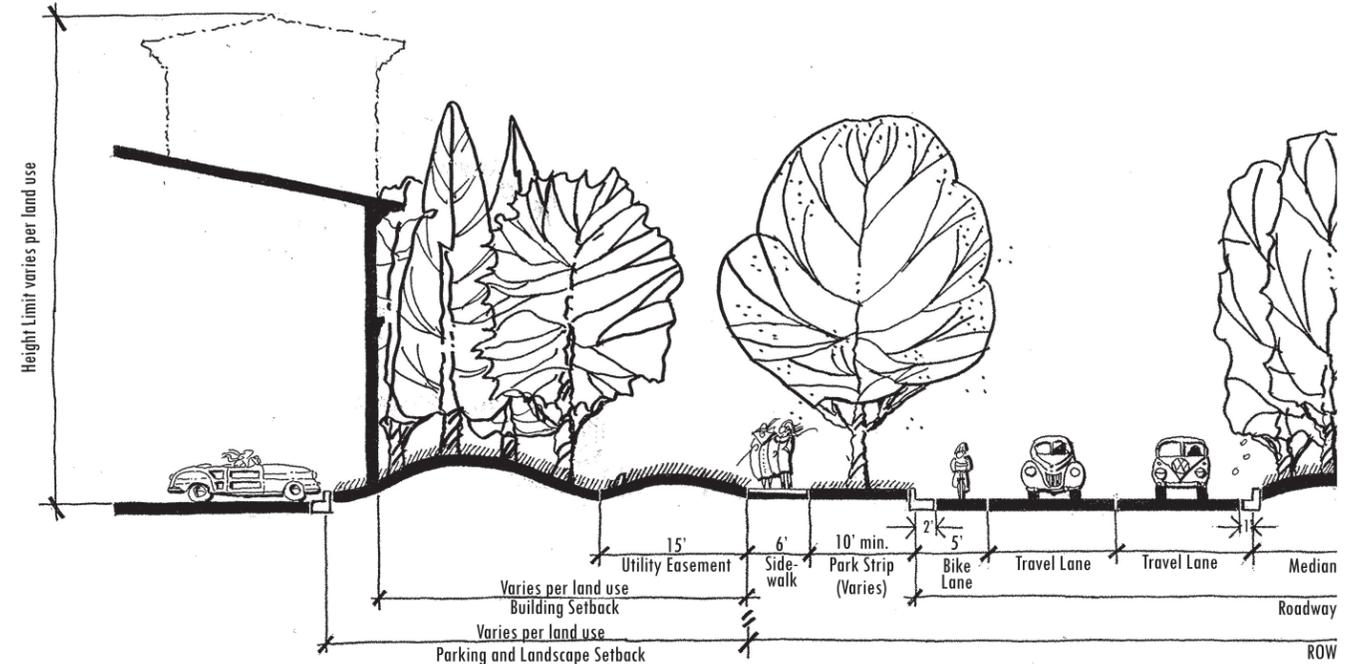
Bike Racks:

• BRP Enterprises - HU-08-MF

2-Lane Major Collector



4-Lane Arterial



Principles

1. DESIGN THE PUBLIC / PRIVATE INTERFACE TO CORRESPOND TO ADJACENT LAND USE TYPES.
2. DESIGN THE PUBLIC / PRIVATE INTERFACE TO FACILITATE PEDESTRIAN AND BICYCLE MOVEMENTS.
3. ENCOURAGE PEDESTRIAN MOVEMENTS BY CREATING PEDESTRIAN-FRIENDLY DETACHED SIDEWALKS.
4. CREATE A PEDESTRIAN-FRIENDLY ENVIRONMENT BY PROVIDING LANDSCAPED PARKSTRIPS THAT CORRESPOND TO THE SIZE AND CAPACITY OF ADJACENT STREETS.
5. CREATE AN INFORMAL STREETSCAPE IMAGE BY ORCHESTRATING DRIFTS OF DECIDUOUS AND EVERGREEN TREES.

~Guidelines and Standards (S)~

~1.0 GENERAL~

- 1.1 - **S** Coordinate streetscape landscaping with the overall Landscape Master Plan for off-site roadways, edge conditions, and common areas.
- 1.2 - **S** For additional setback and height standards, refer and verify with the Millennium GDP.

~2.0 2-LANE MAJOR COLLECTOR~

- 2.1 - **S** Design the Public / Private Interface based upon the following standards:
 - **Bike Lanes:** Two lanes, 5' wide adjacent to parking or turn lane.
 - **On-Street Parking:** Two lanes, 7' wide, except within 200' of intersections
 - **Parkstrip:** 6' wide minimum. Parkstrip width varies as it meanders.
 - **Sidewalks:** 6' wide minimum. Sidewalk meanders between the parkstrip and utility easement.
 - **Walls:** Walls shall be placed outside of the landscape buffer yard.
 - **Landscaping:** Informal clusters of deciduous and evergreen trees.
 - **Landscaping Responsibility:** Landscaping shall be the responsibility of the adjacent property owner HOA.
 - **Curb and Gutter:** Vertical curb and gutter.
 - **Building Setback:**
 - ~Light Commercial: 25'
 - ~Heavy Commercial: 30'
 - ~Urban Character Village: 0' (Build-to-Line)

- **Parking and Landscape Setback:**
 - ~Light Commercial: 30'
 - ~Heavy Commercial: 35'

~3.0 4-LANE ARTERIAL~

- 3.1 - **S** Design Public / Private Interface based upon the following standards:
 - **Bike Lanes:** Two lanes, 5' wide.
 - **On-Street Parking:** None
 - **Parkstrip:** 10' wide minimum. Parkstrip width varies as it meanders.
 - **Sidewalks:** 6' wide minimum. Sidewalk meanders between the parkstrip and utility easement.
 - **Walls:** Walls shall be placed outside of the landscape buffer yard.
 - **Landscaping:** Informal clusters of deciduous and evergreen trees.
 - **Landscaping Responsibility:** Landscaping shall be the responsibility of the adjacent property owner HOA.
 - **Curb and Gutter:** Vertical curb and gutter
 - **Building Setbacks:**
 - ~Light and Heavy Commercial: 35'
 - ~Urban Character Village: 40'
 - **Parking and Landscape Setback:** 40'

- 3.2 - **S** Regulate building height, based upon the following standards:

- **Light and Heavy Commercial:** 45 feet
- **Office:** 85 feet
- **Urban Character Village:** 40 feet
- **Other:** 45 feet

General Sustainable Development Design Guidelines

General Sustainable Development Design Guidelines

- SUS-2 · Certifications
- SUS-3 · General Criteria & Land Use and Site Design
- SUS-5 · Building Design
- SUS-9 · Job Site Practices

General Sustainable Development Design Guidelines

SUSTAINABLE DEVELOPMENT AND DESIGN

At Centerra, sustainable development and design is an important part of the community values and principles. Based upon the roots established by the United Nations World Commission on the Environment and Development and the Rio de Janeiro Earth Summit, the intentions of the founders of the community and Loveland's unique position in the country, Centerra has adopted the goal of being a sustainable community. This includes sustainable building practices as an important aspect of all future development. At the community level, the goal of sustainable development and design is to meet the needs of the present, without compromising the ability of future generations to meet their own needs. At individual project development and building design levels, it means environmentally sound planning and "better" building solutions, with special attention to construction materials and methods, energy-efficiency, daylighting/solar applications, recycling opportunities, etc. This entails looking at a Value-Added approach to development, not simply first cost.

It is important to understand, that sustainable development and design encompass a comprehensive approach and a commitment to ongoing environmental responsibility. There's no such thing as "adding" sustainable design features or incorporating a suitable number of "green" products as a means of fulfilling this responsibility to future generations. Projects must be designed as integrated solutions that consider all aspects of sustainability from the very beginning.

Sustainability concerns the way land is used and sites designed; where buildings are located, how buildings are designed; materials and equipment selections; jobsite practices; and the education and practices of people, the users of places and buildings, and the ultimate benefactors of sustainable design and development.

Centerra is committed to sustainable development at both community and individual building levels, and expects individual developers and builders to approach their projects with environmentally-sound planning and design solutions.

Applicants for individual projects within Centerra will be expected to develop strategies and specific design and development proposals that are consistent with the goals of sustainable communities and sustainable buildings. Sustainable design and development includes a significant concern for and recognition of Centerra as a particular place. An understanding of, and response to the unique conditions and characteristics of site within a local and regional context. Just because a prototypical design has worked in other locations doesn't mean it is appropriate for Centerra.

User requirements

The needs of the users/occupants of the building or community, including spatial, auditory, visual, comfort, safety, and the energy and environmental loads dictated by these requirements. Users' needs should be organized and balanced in such a manner as to encourage sustainable design solutions.

Climate

Wind, sun, temperature, and other meteorological factors as they influence site climate, building placement, pedestrian and vehicle movement, daylighting, and use of renewable energy.

Vegetation

The kind and location of vegetation in and around the site as it influences site climate, building exposures, water consumption, wildlife habitat, and site integration.

Topography

The undulation of the ground plane and how it relates to drainage, wind patterns, airflow, and building integration.

Materials

Indigenous materials available on or around the site or from the region that can be used in the construction of the facility without significant adverse environmental impacts, and the use of products made from recycled materials or re-use of materials and products

Water

Judicious use of water resources for site vegetation needs and building and community needs.

Socio-Cultural

The manner in which past, present, and future generations influence and view the site and region that have shaped their values and beliefs.

Architectural Traditions

The way past and present generations interpreted the site and regional influences in architectural forms and materials used. The way that architecture has evolved near the site and the region.

Economics

A place of vitality and commerce. Where people can conduct their daily lives in an economically sustainable way. Sustainable development and design should not be a burden, but create added value.

Certifications

As part of Centerra's ongoing commitment to Sustainable Design and Development, all applicants will be required to demonstrate their level of compliance with the appropriate third party program as part of their DRC Applications for each application from Schematic Design through completion. For non-residential and high-rise residential projects, the U.S. Green Building Council's "Leadership in Energy and Environmental Design" (LEED) Green building rating system shall be used. It is a goal of Centerra to have applicable projects meet or exceed the current minimum standards for LEED Certification, (26 points) whether actually certified or not. For residential projects, Centerra's goal is to achieve a "Built Green" designation by the Home Builders Association of Denver, utilizing its "Built Green Checklist". This checklist will be used whether the builder chooses to enroll in the program or not. While full participation in both these programs is highly encouraged, and will be acknowledged by the DRC, it will not be a requirement for final DRC approval of the project.

In addition to a number of local consultants who are well versed in assisting applicants in achieving these goals, the staff at Centerra's own High Plains Environmental Center (HPEC) is a close-in resource available to all applicants in Centerra.

In addition to owning and managing much of Centerra's

natural areas, the HPEC provides information and education to residents and users within Centerra regarding such things as environmentally sensitive lifestyle practices, wildlife cohabitation, local resources for building materials, local recycling programs, and landscape materials. The HPEC has a LEED accredited professional staff to assist applicants in their projects.

Resources

In addition to the following standards and guidelines, there are several good resources available to assist and guide the applicant in the design and development of their project. These resources were used in the development of these guidelines. Some resources and concepts are better suited for residential construction, while others are oriented to non-residential uses and construction. While not a comprehensive list of potential resources, they were consulted in the preparation of these guidelines and/or are a local resource to Centerra.

Architectural Energy Corporation
2540 Frontier Avenue, Suite 201
Boulder, Colorado 80301
(303) 444-4149
Contact: Michael Holtz, FAIA
www.archenergy.com

A Boulder based energy and sustainable design consultant specializing in assisting owners in creating environmentally sensitive projects.

Eco-Products, Inc.
3655 Frontier Avenue
Boulder, Colorado 80301
(303) 449-1876
www.ecoproducts.com

Provides a wide variety of environmentally friendly, non-toxic and sustainable products.

Ensar Group
2305 Broadway
Boulder, Colorado 80306
(303) 449-5226
Contact: Greg Franta
www.ensargroup.com

A Boulder based sustainable design consultant specializing in assisting owners in creating environmentally sensitive projects.

Environmental Protection Agency
 “Energy Star” Program
 Climate Protection Partnership Division
 Energy Star Programs Hotline &
 Distribution (MS-6202J)
 1200 Pennsylvania Avenue NW
 Washington, DC 20460
 (888) STAR-YESS
www.energystar.gov

High Plains Environmental Center
 1854 Piney River Drive
 Loveland, Colorado 80538
 (970) 622-9697
 Contact: Pat Waak
www.suborbitat.org

The owner and manager of the natural areas at Centerra. Also serves as an educational resource for users in Centerra and includes a LEED accredited professional on staff.

Home Builders Association of Metro Denver
 “Built Green Colorado” Program
 1400 S. Emerson
 Denver, Colorado 80210
 (303) 778-1400
www.builtgreen.org

Recommendations on Green Building for residential construction, including the “Built-Green Checklist.”

Institute for the Built Environment
 Guggenheim Hall
 Fort Collins, Colorado 80526-1584
 (970) 491-5041
 Contact: Brian Dunbar
www.ibe.colorado.edu
 Part of Colorado State University Department of Construction Management, the Institute for the Built Environment leads and promotes educational programs on sustainability and green building design.

Ka\$h or Kilowatts Electric Efficiency Program
 Plate River Power Authority
 Paul Warila, Customer Services Engineer
 970-229-5604
 2000 East Horsetooth Road
 Fort Collins, Colorado 80525-5721
www.prpa.org

This program can help select the best technology for lighting, cooling and manufacturing. Savings of 15-50% on lighting, 10-30% on cooling, and 10-50% on manufacturing. In addition, they provide funding through their lighting project plan.

Leadership in Energy and Environmental Design (LEED) Green Building Rating System.
 U.S. Green Building Council
 1015 18th Street, NW, Suite 508
 Washington, DC 20036
 (202) 828-7422
www.usgbc.org

The leading sustainable design evaluation system in the U.S. for non-residential and high-rise residential buildings.

Resource 2000
 2700 63rd Street
 Boulder, Colorado 80303
 (303) 419-5418
www.resource2k.org

Salvages used building material and re-sells them.

RMV Landscape and Maintenance
 Rod Bryner
 970-278-9150
 2138 East Jeffers Frontage Road
 Loveland, Colorado 80538

The company provides full irrigation and landscape installation and maintenance. Currently they manage Centerra’s central control system for irrigation.

The Sustainable Design Resource Guide
 AIA Denver
 1526 15th Street
 Denver, Colorado 80203
 (303) 446-2266
www.aiacolorado.org/SDRG

Published by AIA Denver, and the American Institute of Architects Committee on the Environment. A convenient resource that provides both general principles and guidance as well as specific, regional contacts and sources for services, materials, and equipment.

Waste-Not Recycling
 1065 Poplar Street
 Loveland, Colorado 80537
www.waste-not.com

The program can help set up recycling of construction waste, providing containers and collecting wood, metal and other material. There are also ongoing recycling programs available for the commercial business in Centerra.

The following guidelines are aimed at improving building and site occupant well-being, protection of water sources, reduction in energy use and atmospheric impacts, improvement of indoor environmental qualities (air quality, thermal comfort, access to daylight, views, etc.), and reduction of the creation of waste/increase the use of recyclable/renewable material. Every choice that is made during the design and development process has an environmental consequence. These guidelines will assist an applicant in making choices that will be consistent with Centerra’s guiding principles related to sustainability. The guidelines are organized in four overall categories: General Criteria, Land Use and Site Design, Building Design, and Job Site Practices. The general criteria introduce broad concepts while the remaining sections provide more specific recommendations for ease of use by the development, design and engineering team.

These standards and guidelines for sustainable development and design, in conjunction with nationally recognized resources (such as the LEED Rating System) define the sustainable design criteria that shall be considered, which, if followed in an integrated manner, will result in a sustainable solution.

I.0 GENERAL CRITERIA

Principles

1. Establish a team that has a consciousness about all aspects of sustainable design and development.
2. Adhere to sustainable design and development principles and practices in all decision making.

Criteria

- 1.1 Assemble a design team based upon sustainability credentials in addition to other criteria.
- 1.2 Approach each task with environmental responsibility and sensitivity.
- 1.3 Protect the biosphere against harmful emissions.
- 1.4 Reduce and/or eliminate wastes at every opportunity.
- 1.5 Utilize energy-conserving systems, products, and practices.
- 1.6 Integrate environmental considerations in design and operational decisions.
- 1.7 Enhance natural ecosystems and preserve and promote urban wildlife opportunities.
- 1.8 Restore the environment at every opportunity.
- 1.9 Deal with the public in an open manner regarding environmental concerns, issues, and problems.
- 1.10 Develop owner/developer/management commitment to goals regarding environmental responsibility.
- 1.11 If the nature of a business requires the generation or storing of hazardous wastes, provide annual environmental audits and “progress reports”, to be available for public review.

2.0 LAND USE AND SITE DESIGN

Principles

1. Control erosion to reduce negative impacts on water and air quality
2. Reduce the environmental impact of the location of a building on a site
3. Reduce pollution and land development impacts from vehicle use
4. Protect existing natural areas and restore damaged areas for wildlife habitat
5. Manage storm water run-off to limit disruption and pollution of natural water flows
6. Reduce heat island effects of buildings and pavement to minimize impact on the microclimate
7. Reduce water consumption through the use of water efficient landscapes
8. Eliminate light trespass from the building and site to improve night sky and reduce development impact on nocturnal environments.

2.1 Mix of Uses

- 2.1.1 Mix compatible land uses to promote pedestrian connection and reduce vehicular trips.
- 2.1.2 Provide shared parking opportunities for mixed-use projects to reduce total parking coverage.
- 2.1.3 Encourage development that allows people to live, work, shop, learn, gather, and play as part of their experience in the community.

2.2 Efficient Land Use

- 2.2.1 Increase density in compact, walkable centers.
- 2.2.2 Design facilities to use land efficiently and

preserve natural open space and wildlife habitat.

- 2.2.3 Concentrate or cluster buildings to minimize impact on the land.
- 2.2.4 Leave the most pristine areas “untouched”, developing primarily those areas which have already been impacted.
- 2.2.5 Utilize parking garages/structures to reduce the size of open parking fields and heat island effect.

2.3 Transportation

- 2.3.1 Locate buildings adjacent to existing roadways and trail systems and provide good connectivity.
- 2.3.2 Connect to and expand pedestrian and bike trail systems and provide connectivity for pedestrians and bikes internal to the site between buildings.
- 2.3.3 Locate near existing or proposed mass transit opportunities.
- 2.3.4 Provide secure bicycle storage and shower/changing facilities for building occupants to encourage bicycle and pedestrian commuting.
- 2.3.5 Organize carpools and shuttle systems to reduce reliance on single occupancy vehicles. Provide preferred parking for carpools and other incentives.
- 2.3.6 Provide and or encourage alternative fuel vehicles and provide preferred parking for these vehicles.

2.4 Building Siting and Orientation

- 2.4.1 Reduce energy use by orienting buildings to make optimal use of passive solar heating, daylighting, and natural cooling.
- 2.4.2 Situate buildings to benefit from existing vegetation, where possible. Trees on east or west sides can dramatically reduce cooling loads.
- 2.4.3 Organize buildings, roads and parking on their

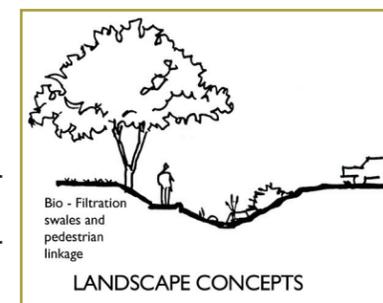
sites to minimize the amount of cut and fill which is energy intensive and minimizes import/export of material.

- 2.4.4 Limit site disturbance, including earthwork and clearing of vegetation to 40 feet beyond the building perimeter, 5 feet beyond primary roadway curbs, walkways and utility trenches, and 25 feet beyond constructed areas with permeable surfaces (such as detention areas and landscape areas).
- 2.4.5 Provide shade (within 5 years) and/or use light colored/high albedo materials (reflectance of at least 0.3) and/or open grid pavement for at least 30% of the site’s non-roof impervious surfaces, including parking lots, walkways, plazas, etc. to reduce heat island effects.
- 2.4.6 If possible, exceed the open space requirement for the site by 25% by reducing the building footprint and area for parking and drives.
- 2.4.7 If possible, place a minimum of 50% of parking spaces underground or covered by structured parking.

2.5 Storm Water Management (see also the General Landscape Section)

- 2.5.1 Develop grading and drainage designs that minimize run-off, impervious surfaces, and utilize storm drainage systems to meet basic engineering requirements.
- 2.5.2 Direct water from parking lots, roof drains and other areas into landscape areas that could benefit from additional water and/or improve the quality of the storm water.
- 2.5.3 Utilize porous pavement systems to minimize concentrated run-off and allow water to percolate through the pavement. Examples include modular pavers and porous asphalt.
- 2.5.4 Utilize flexible paving systems, which adapt more naturally to site variations and can function as a porous pavement system.

- 2.5.5 Convey drainage along dedicated streets, private drives and swales along property lines, or in open space corridors. Sheet flow and surface drain where possible.
- 2.5.6 Meet or exceed City of Loveland and Urban Drainage Best Management practices and standards for storm water management and erosion control.
- 2.5.7 Post development 1.5 year, 24 hour peak, run-off rates shall not exceed pre-developed 1.5 year, 24 hour, run-off rates.
- 2.5.8 Provide on-site storm water treatment systems designed to remove 80% of the annual post-development total suspended solids and 40% of the average annual post-development total phosphorous for all storms less than or equal to 2-year/24-hour storm by implementing either EPA or local Best Management Practices documents, whichever is more stringent.



2.6 Wetlands and Open Water

- 2.6.1 Wetlands provide multiple benefits to an ecosystem, including enhancing wildlife diversity functions as a part of the storm drainage system, and assist in water quality and flood control. Strict Federal regulations apply to both existing, natural wetlands and to those created. Any modifications to existing wetlands are likely to require permitting and involve the Army Corps of Engineers. The following should be considered when creating or modifying wetlands:
 - a. Proposed wildlife use
 - b. Proposed recreation use

- c. Filtration zones
- d. Hydraulics
- e. Wildlife linkages
- f. Management practices
- g. Water quality
- h. Aesthetics

2.6.2 Approach open water areas with piers and docks to avoid degrading water edges.

2.6.3 Provide biofiltration for all surface drainage entering open waters, allowing lateral zones to dominate wetland edges.

2.6.4 Within the western portion of Centerra, do not incorporate islands in wetland areas, as they invite large avian species which may interfere with the adjacent Fort Collins/Loveland airport.

2.6.5 Provide appropriately designed drop structures pond aeration, and fountains for aerating water bodies, subject to DRC approval.

2.6.6 Provide vegetation, native to Colorado and appropriate to the location, that enhance the habitat and its food sources for wetland species.

2.6.7 Avoid impacting existing wetlands. When impacts are necessary, mitigation shall be provided in appropriate manners. Plans involving any potential impacts or mitigation – or creating new wetlands – must be approved by the DRC and possible the Army Corps of Engineers.

2.6.8 When dealing with wetlands and considering wetland modifications, retain qualified specialists to assess the existing conditions and develop mitigation plans.

2.7 Landscape Design and Management Practices

2.7.1 Effective landscape design and management yields many benefits, including such environmental benefits as water conservation, erosion control, wildlife habitat enhancement, and increasing the

public's general appreciation for the surroundings. At Centerra, beneficial landscape design and management practices are intended to be used to the maximum extent possible.

2.7.2 See the General and Specific Landscape sections for additional details and guidelines.

2.7.3 Use high efficiency irrigation technology in compliance with the specific Irrigation sections of the Design Guidelines.

2.7.4 Utilize water-efficient, low maintenance landscaping in compliance with the Landscape sections of the Design Guidelines with a goal of reducing potable water consumption for irrigation by 50% over conventional means.

2.8 Wildlife Cohabitation

2.8.1 Preserving and enhancing desirable wildlife habitat within Centerra are encouraged. This should be accomplished through thoughtful planning and design and consultation with the High Plains Environmental Center.

2.8.2 Identify each site's opportunities to sustain ecosystems, both macro and micro, in perpetuity. Do not introduce exotic species or unnatural solutions for maintaining or introducing species.

2.8.3 Use existing and proposed land forms to complement planting and water designs.

2.8.4 Consider long-term impacts and user loads relative to the site and habitats. It's unrealistic, for example, to expect appreciable levels of wildlife involvement in areas exposed to high human traffic. In such areas of high pedestrian and human involvement, appropriately scaled infrastructure must also be incorporated to minimize environmental damage. Docks and bridges or hard-surfaced nodes and pathways, for example, should be used for relating human traffic to pods and water, rather than via fragile natural areas.

2.8.5 When selecting target species to be introduced

to an area, consider in the landscape/site design food sources; reproductive habitat requirements; and security. Many avian species are excellent choices, however targeting large, flocking birds should be limited to areas in the eastern portion of Centerra, and is discouraged in the western portion because of airport fly zones.

2.8.6 Incorporate linkages between open space and recreational corridors as part of individual site designs. Such linkages are critical for improving the wildlife system, and an important enhancement element for urban design. Primary target species for the area are small birds, and proposed uses for recreation areas are generally compatible with creating avian habitat. Increase and/or allow maximize edges between various structures' boundaries (e.g. water and shore, meadow and trees, etc.)

2.8.7 Separate compatible uses relative to wildlife habitats (e.g. a circulation path conflicting with an animal's reproductive habitat).

2.8.8 Incorporate specific habitat requirements for target species in the landscape/site design. In avian species, this means plant materials that provide winter cover and food. Birdhouses and shelter structures should also be incorporated. Interpretive signs should be considered for explaining objectives and identifying wildlife.

2.8.9 For control purposes, incorporate specific habitat-limiting elements (e.g. prairie dogs enjoy long, unobstructed views – eliminating such views with plantings or structures is a limiting element for the prairie dog; ducks and geese enjoy larger ponds with islands and significant open water – limiting such features helps control the large flocks of birds, which are considered a nuisance to aviation at the nearby airport).

2.8.10 Provide clear corridors for wildlife movement. Many types of wildlife (especially small mammals) will resist crossing paved surfaces.

3.0 BUILDING DESIGN

A significant challenge to Sustainable Design and Development is finding suitable and available sources for material, products, and systems that are consistent with the goals of sustainability. The following guidelines are organized following Construction Specification Institute (CSI) Division Sections for ease of use by the specifiers of materials and systems by identifying the important concepts and options that should be considered in the project. More detailed information, particularly for local and regional sources, are available from the resources identified earlier, especially the AIA Committee on the Environment's Sustainable Design Resource Guide. The following are some of the questions that should be asked when selecting materials, products, and systems. They become The Foundations for the Principles associated with building development.

- Is the raw material renewable/recyclable?
- Does the harvesting/extraction/manufacturing process cause environmental degradation?
- What happens to waste/pollution during the process?
- Is it an energy intensive process?
- What is the payback period for energy/water saving systems and products – the time in which initial costs are recouped through lower long-term operating and maintenance costs?
- What is the recycled percentage for resource conserving materials?
- Is it more durable than competitors/alternatives?
- Does it off-gas toxins, and if so, for how long?
- Has the minimum amount of packaging been used and is it recyclable?
- How is the product disposed?
- Is it easily recycled and into what?
- What are its maintenance requirements?

Principles

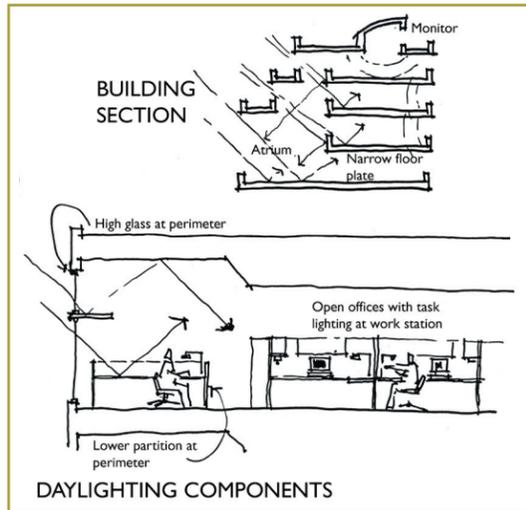
1. Create energy and environmentally responsive buildings.
2. Enhance the quality and performance of the workplace environment, thus contributing to improved

employee productivity, satisfaction, comfort, health, and morale.

3. Enhance the quality and performance of the retail environment, thus contributing to improved customer comfort and purchasing.
4. Enhance the quality and performance of the residential environment, thus contributing to improved residential comfort, satisfaction, and health.

3.1 General

- 3.1.1 Design buildings with optimum use of interior space in mind to keep overall building sizes – and operating demands on natural resources – to a minimum.
- 3.1.2 Orient buildings to make optimal use of passive solar heating, daylighting, and natural cooling opportunities.
- 3.1.3 Maximize daylighting opportunities, but when additional lighting is required use zoned and task lighting. To reduce energy consumption and cooling loads.
- 3.1.4 Utilize open interior planning to promote access to light, views, and ventilation.
- 3.1.5 Utilize energy-efficient building envelope techniques, specifying high levels of insulation, high-performance windows, tight construction, etc.
- 3.1.6 Design structures “to last”, in terms of adaptability to other uses, as well as materials and methods. Choose materials and components that can be reused or recycled when changes are required.



- 3.1.7 Design buildings to use renewable energy. Consider incorporating photovoltaics in the structure, or incorporate opportunities for future installation.
- 3.1.8 Optimize material use. Minimize waste by designing for standard sizes.
- 3.1.9 Avoid potential health and indoor air quality hazards, including radon, EMF, off-gassing, and pesticides by careful selection of materials and details.
- 3.1.10 Avoid ozone depleting chemicals in mechanical equipment and insulation.
- 3.1.11 Use durable products and materials. A product that lasts longer or requires less maintenance usually saves energy. Durable products also contribute less to solid waste issues.
- 3.1.12 Choose building materials with low embodied energy, the energy required to produce the material.
- 3.1.13 Buy locally (within 500 miles) produced building materials to reduce transportation impacts (energy use and pollution).
- 3.1.14 Use building products made from recycled materials, including:
 - a. Concrete
 - b. Asphalt
 - c. Metals
 - d. Wood
 - e. Glass
 - f. Certain plastics
 - g. Cellulose insulation

tion

- 3.1.15 Use salvaged building materials when possible.
- 3.1.16 Minimize use of old-growth timber or tropical hardwoods, unless the seller can document that the wood come from well-managed forests.

- 3.1.17 Minimize use of pressure treated lumber because of the toxins present in the product and used in its production.
- 3.1.18 Purchase items that minimize packaging waste, and recycle the packaging materials.
- 3.1.19 Install high-efficiency heating and cooling equipment to reduce energy consumption.
- 3.1.20 Install high-efficiency lights and appliances to reduce energy consumption.
- 3.1.21 Install water-efficient equipment.
- 3.1.22 Install mechanical ventilation equipment.
- 3.1.23 Fully commission all buildings. Major portions of the commissioning process include specifications, Operations and Maintenance manuals, operator training, and functional testing of all building systems to ensure that they are operating according to the design intent.
- 3.1.24 Choose materials, components, and systems based upon the following:
 - a. Indoor air quality
 - b. Operating energy
 - c. Resource depletion
 - d. Building durability and maintenance
 - e. Embodied energy
 - f. Embodied CO₂
- 3.1.24 Plan for future expansion without demolition of built facilities.

3.2 Site Work

(Now Divisions 31-35 in current CSI Format - See also other sections of the guidelines including the Specific and General Landscape Guidelines for additional site work and landscape details and guidelines)

- 3.2.1 Cut and fill should be balanced to minimize reliance on imported or exported material and maintain sustainable earthwork practices.
- 3.2.2 Use of flexible paving systems should be maximized since they adapt themselves more naturally to site variations than rigid paving systems. The use of porous paving systems should be maximized since they allow water to percolate through the pavement, thus minimizing concentrated run-off. Flexible paving systems include gravel surfaces, modular systems, and grass paving systems.
- 3.2.3 Reuse construction pallets or grind up to produce landscaping mulch material.
- 3.2.4 Use native Colorado materials whenever possible to minimize transportation costs, conserve energy, and reduce pollution.
- 3.2.5 Where feasible, fly ash should be used in place of Portland cement in the concrete mixes.
- 3.2.6 Use plantings to provide wind and solar protection for both the building and occupants.
- 3.2.7 Radon control and mitigation should be considered in building design and construction. The site should be tested for radon prior to construction so that radon mitigation systems can be designed for the building to prevent indoor air quality problems.
- 3.2.8 Choose vegetation that is native to the area and minimizes water use.
- 3.2.9 Utilize natural mulchers to control weeds and moisture.

3.3 Concrete

- 3.3.1 Concrete should be specified with as high a pozzolan (fly ash) content as possible (15-30%) while still maintaining the appropriate strength and structural characteristics. Fly ash is a useful

by-product of coal-fired power plants and can be a substitute for Portland cement.

3.3.2 Locally mined and produced aggregates and concrete products shall be specified from local manufacturers.

3.3.3 Concrete specifications should prohibit the use of toxic concrete additives and shall include a clause prohibiting the use of unapproved additives.

3.3.4 Use of precast concrete should be maximized due to the increased efficiency associated with the forming, batching, and casting at a central location.

3.3.5 When cast-in-place concrete is required, repetitive shapes should be used so that formwork can be reused; avoid one-off configurations; and when plywood forming is essential, plan flat surfaces in modules of plywood dimensions to reduce waste.

3.3.6 Where practical, concrete using recycled materials should be used.

3.3.7 Utilize stay-in-place insulating formwork when possible.

3.3.8 Residential foundations should include insulation levels that meet an R-10 rating.

3.4 Masonry

3.4.1 When brick is used, specify locally made bricks using indigenous materials.

3.4.2 When concrete masonry units are required:
a. Specify locally manufactured units;
b. Specify units manufactured using a maximum amount of fly ash (when possible).

3.4.3 Use masonry appropriate for the application, exploiting at least two of masonry's positive qualities (ease of design and construction, durability, load bearing capacity, potential for thermal performance).

3.4.4 When stonework is required, the following guidelines should be used in specifying stone with the

lowest embodied energy.

a. Use loose stones found on or near the surface.

b. Use stone from a local source (within 75 miles.)

c. Allow for dimensional variation in size / thickness of stone.

d. Specify a rougher surface finish whenever possible, since it requires less energy to produce.

3.4.5 Carefully select chemical treatments for mortar to minimize their environmental effects. Specify non-toxic additives, and include a clause in the specifications prohibiting the use of unapproved additives.

3.4.6 Consider masonry made with recycled and waste materials.

3.4.7 Specify masonry using locally mined and produced materials.

3.4.8 Utilize straw bale construction technology when allowed by building codes.

3.5 Metals

3.5.1 Specify metals with a high recycled content.

a. Structural steel should have a recycled content in excess of 66%.

b. Steel joists and girders should have recycled content in excess of 80%.

c. Cold-formed metal framing should utilize the highest recycled content possible. Products shall be specified with recycled contents in excess of 50% (100% recycled content if possible).

3.5.2 Recycle all construction waste.

a. Provide job site separation for the different types of metals being used on the project.

3.5.3 Whenever possible, specify materials from local manufacturers.

3.6 Wood, Plastics, and Composites

3.6.1 Engineered lumber products should be used to minimize use of old growth timber. Engineered lumber uses low density, fast-growing varieties of trees in combination with plastic resins. Engineered lumber includes truss-joists, I-joists, laminated veneer lumber (LVL), parallel strand lumber (PSL), glue-laminated beams, oriented strand board (OSB), waferboards, and particleboards.

3.6.2 Waste lumber on the site shall be recycled for blocking, engineered lumber, mulch, etc.

3.6.3 Formaldehyde emissions should be minimized by specifying low-emitting UF-bonded panel products or phenol-bonded products.

3.6.4 Materials from local manufacturers should be specified whenever possible.

3.6.5 Waste plastic on the job site should be recycled.

3.6.6 Use woods originating from known sustainable or well-managed sources.

3.6.7 When rare woods are required, use veneers instead of solid wood.

3.6.8 When wood preservatives are required:

a. Use preservatives sparingly and develop standard details, which do not rely on preservatives. Less toxic preservatives should be used whenever possible. These include copper naphthenate, copper-8-quinolinate, and borax salt for indoor use.

b. Have treated wood sealed whenever possible.

3.6.9 Recycled plastic products should be specified whenever possible.

3.6.10 Avoid plastic foams which use CFC's or HCFC's as blowing agents.

3.6.11 Minimize the use of materials which use PVC's in their makeup.

3.6.12 Use easily recycled plastics (avoid composites, which are difficult to recycle).

3.6.13 Avoid using plastics for coating, bonding, and sealing.

3.6.14 Avoid petroleum-based plastics.

3.6.15 Utilize salvaged lumber for flooring, trim, heavy timbers, and framing when possible.

3.7 Thermal and Moisture Protection

3.7.1 Sealants shall be of a "neutral curing" with no solvent release format.

3.7.2 When waterproofing, damp-proofing, and/or water repellents have to be used. Products shall be specified which minimize the use of volatile organic compounds (VOC's). The following minimum requirements shall be met.

a. General primers, sealers, and undercoaters must not have VOC concentrations exceeding 2.9 lbs./gal.

b. Waterproofing mastic coatings must not have VOC concentrations exceeding 2.5 lbs./gal.

c. Waterproof sealers must not have VOC concentrations exceeding 3.3 lbs./gal.

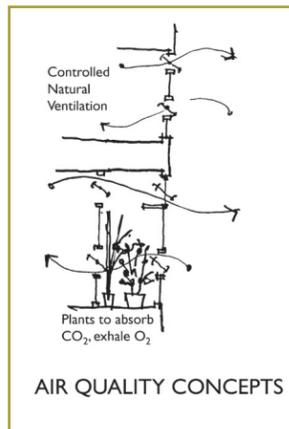
3.7.3 Avoid using isocyanurate, urethane, and phenolic rigid foam insulation manufactured using CFC's or HCFC's. If rigid boardstock is required, choose rigid fiberglass or expanded polystyrene (often called EPS or beadboard) which is formed using pentane.

3.7.4 Whenever possible, only products and materials with high recycled content should be used.

- 3.7.5 When loose-fill mineral fiber insulation is used, carefully seal the insulation from inhabited spaces to minimize carcinogenic potential.
- 3.7.6 Where possible, maximize use of cellulose for insulation.
- 3.7.7 Lead-coated roofing and flashing should be avoided.
- 3.7.8 When coal and petrochemical roofing systems are required, care should be taken to use products with a high percentage of recycled material.
- 3.7.9 Utilize manufactured roofing and siding systems that include; fiber cement, recycled metals, recycled plastics, and wood-waste by-products.
- 3.7.10 Explore the use of Green Roof technology www.greenroofs.org.

3.8 Openings

- 3.8.1 Solar heat gain from glazings shall be minimized for non-residential projects through use of shading devices.
- 3.8.2 Passive solar heating strategies should be utilized for residential applications through appropriate building/window orientations.
- 3.8.3 Exterior glazing materials adjacent to occupants shall be selected which maximize occupant comfort, usually incorporating high performance films or coatings.
- 3.8.4 Use of recycled materials shall be maximized where appropriate.



- 3.8.5 Use high performance glazing (low 'e' and/or suspended plastic film heat mirror) appropriate to the exposure.
- 3.8.6 U-values should be appropriate for the wall section. Doors and windows should not be expensively over-insulated.
- 3.8.7 To ease future recycling of building components, avoid using complicated material combinations.

3.9 FINISHES

- 3.9.1 Low toxic content finishing materials should be used to ensure better indoor air quality.
- 3.9.2 Latex paints should be used instead of alkyd-based paints to minimize toxic fumes.
- 3.9.3 Do not select finishes only on the basis of low first cost. More durable materials with less out-gassing may have a higher initial cost, but can be more economically viable over the life of a building.
- 3.9.4 Install carpets with natural fibers (jute, cotton, wool) and which do not contain formaldehyde, or select carpets, which utilize recycled content.
- 3.9.5 Wherever possible, use drywall systems that contain recycled material. These new systems behave like a combination of standard drywall systems and old-style lathe and plaster and are not difficult to apply.
- 3.9.6 Avoid materials with volatile organic compounds (VOC's) and ureaformaldehyde to improve indoor air quality.
- 3.9.7 Flooring materials containing PVC, which is a VOC, should be avoided. Sheet vinyl and vinyl tile are often composed mainly of PVC material, whereas linoleum, which is biodegradable and emits no toxic gases, does not. Rubber sheet goods and certain tiles are also good candidates for flooring; many of these products contain recycled materials.

- 3.9.8 When using wood wall or floor finishes, wood should be selected from sustainably managed, preferably regional, forests.
- 3.9.9 When using wall coverings, utilize biodegradable papers with recycled content of paper or fiber. Avoid vinyl wall coverings that are manufactured from PVC.
- 3.9.10 Explore wall coverings made of alternative materials, such as pressed sunflower seeds as an alternative to wood or other materials.
- 3.9.11 Utilize ceiling tiles that do not promote indoor air quality problems, such as those made from perlite.
- 3.9.12 Utilize non-solvent adhesives such as yellow and white glues.
- 3.9.13 Avoid butyl sealants as they emit VOC's and other toxic compounds.

3.10 SPECIALTIES

- 3.10.1 Whenever possible, use specialty products that use recycled material. Examples include: recycled plastic toilet partitions, vanity tops, locker room benches, tack boards, shelving, display panels, and partitions.
- 3.10.2 Avoid use of wood burning stoves/fireplaces unless they comply with State and EPA clean burning standards

3.11 EQUIPMENT

- 3.11.1 High-efficiency office equipment should be used to minimize thermal loads on the building.
- 3.11.2 Consider refurbished products. Examples include: refrigerators, stoves, copiers, fax machines, printers, and computers.
- 3.11.3 Refer to EPA's ENERGY STAR logo indicating a

power-down feature during periods of inactivity.

- 3.11.4 Consider the indoor air quality issues associated with office equipment. Of particular concern are copiers, fax machines, computer monitors, and printers.
- 3.11.5 Provide convenient recycling equipment and facilities for all users and occupants.
- 3.11.6 Provide Carbon Monoxide (CO) sensors with alarms.

3.12 FURNISHINGS

- 3.12.1 Furnishings should be selected which use natural and recycled materials and which minimize the use of materials containing toxic substances. (Note: Life safety issues sometimes require the use of substances such as fire retardants which contain some toxic elements).
- 3.12.2 Whenever possible, foam products made without CFC's shall be used.
- 3.12.3 Whenever possible, mats, and rugs made with recycled materials, such as recycled tires, should be used. Note: mats and rugs made from natural materials (wool, cotton, or jute) are not as durable as synthetic products but should still be considered.
- 3.12.4 All wood furnishings should be of indigenous materials, not exotic species.
- 3.12.5 Manufactured casework should be selected that include non-toxic finishes and adhesives.
- 3.12.6 To reduce heat gain, provide shades and blinds made of natural or recycled materials to the extent possible. Avoid plastic blinds.
- 3.12.7 Utilize refurbished and reconditioned furnishings to the extent possible.

3.13 SPECIAL CONSTRUCTION

3.13.1 Provide alternative energy systems (especially photovoltaics) for water heating, exterior lighting, pumping systems, etc.

3.13.2 Utilize light shelves at windows to enhance daylighting applications.

3.14 CONVEYING EQUIPMENT

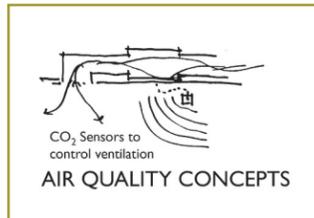
3.14.1 Utilize the minimum amount of elevators, escalators, and people movers possible to encourage walking and climbing of stairs as a means to promote a healthy lifestyle.

3.15 PLUMBING AND HVAC

(Now Divisions 22 & 23 In CSI Format)

3.15.1 The mechanical systems shall be designed using energy efficient equipment for heating, cooling, and ventilation.

3.15.2 The mechanical systems shall be sized to account for the use of daylighting or passive solar heating within the building.



3.15.3 Indoor air quality issues shall be addressed when designing the ventilation system.

3.15.4 All cooling systems shall be CFC-free.

3.15.5 Select equipment that will not have high maintenance problems and beware of commonly overlooked interactions between conservation measures that undermine overall efficiency of building operation.

3.15.6 Use salvaged materials when possible, buy locally produced products, and avoid ozone-depleting chemicals in mechanical equipment.

3.15.7 Take maximum advantage of ventilation as a

cooling strategy (air economizer) to minimize mechanical cooling requirements. Water economizers, which require a cooling tower, may be used instead of an air economizer. The relative economic benefits of air vs. water economizers should be explored for a given application.

3.15.8 The HVAC system should be commissioned prior to building occupancy and periodically diagnosed for proper operation. An independent commissioning agent should be retained to monitor the work of contractors and to oversee the operation of a building over the long term.

3.15.9 During the heating season, mechanical heating needs can be offset by the use of heat recovery devices in the ventilation system for non-residential uses.

3.15.10 Passive solar heating strategies should be used to reduce mechanical heating needs in residential uses.

3.15.11 Consider evaporative cooling as a highly cost-effective strategy in the dry Colorado climate to augment mechanical cooling.

3.15.12 Given the cost of electricity, gas cooling may be a viable alternative.

3.15.13 Thermal storage systems should be considered to improve the performance of electric and gas cooling equipment.

3.15.14 Energy management systems (EMS) are a highly effective means to ensure the efficient operation of an HVAC system. Major strategies to consider are: nighttime temperature setback, optimizing supply air temperature based on individual zone requirements, shutting off fans at night, and so forth.

3.15.15 Heat recovery from hot water use should be considered.

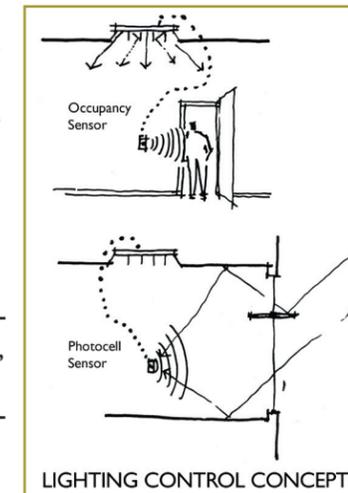
3.15.16 Install water conservation devices: low flow toilets,

showerheads, and faucets with infrared sensors to sense user presence, greywater use devices, etc.

3.16 ELECTRICAL AND LIGHTING

(Now Divisions 26 & 27 in Current CSI Format)

3.16.1 Efficient lighting fixtures using compact fluorescent lamps, T8 fluorescent lamps, and electronic ballasts should be used to meet the required illumination levels, and to reduce electrical energy use and demand.



3.16.2 Occupancy sensors and EMS should be used to turn off lights when they are not needed.

3.16.3 For office spaces, the luminous environment shall be designed for a visual display terminal (VDT) intensive environment, including consideration of indirect lighting.

3.16.4 Occupant override of automatic lighting controls should be provided.

3.16.5 All lighting controls and equipment should be selected and optimized to take full advantage of the daylighting systems designed into the building.

3.16.6 All lighting control equipment shall be commissioned prior to building occupancy.

3.16.7 Cogeneration, which generates electricity (usually by a gas-fired system) and utilizes a heat-recovery system, should be considered for the building.

3.16.8 Electromagnetic fields (EMF's) generated by electrical conductors and equipment should be diagnosed and treated by appropriate shielding to protect human health.

3.16.9 Use renewable energy when available, including power from "wind farms."

4.0 JOB SITE PRACTICES

The practices of the Contractor during construction is a key influence on sustainable building. Up to 25% of an average landfill is construction and demolition waste. Minimizing site disturbance and grubbing practices can make a big difference in site bio-diversity and protection of habitat. All construction at Centerra will incorporate a wide variety of sustainable building techniques.

4.1 Protect trees from damage during construction by fencing off the "drip line" around them and avoiding major changes to surface grade.

4.2 Avoid use of pesticides, herbicides, and other chemicals that may leach into groundwater.

4.3 Do not bury any construction debris.

4.4 Centralize cutting operations to reduce waste and simplify sorting.

4.5 Set up clearly marked bins for different kinds of usable or recyclable waste (wood scraps, metals, cardboard, etc.). Educate all workers on recycling procedures.

4.6 Arrange carpools to job sites. Schedule site related errands to minimize unnecessary driving.

4.7 Set up break/lunch areas to discourage workers from leaving the job site at lunch.

4.8 Minimize the use of disposable cups, etc. on the job site. Recycle all materials possible.

4.9 Utilize recycled office paper and supplies and recycle after use.

General Landscape Design Guidelines

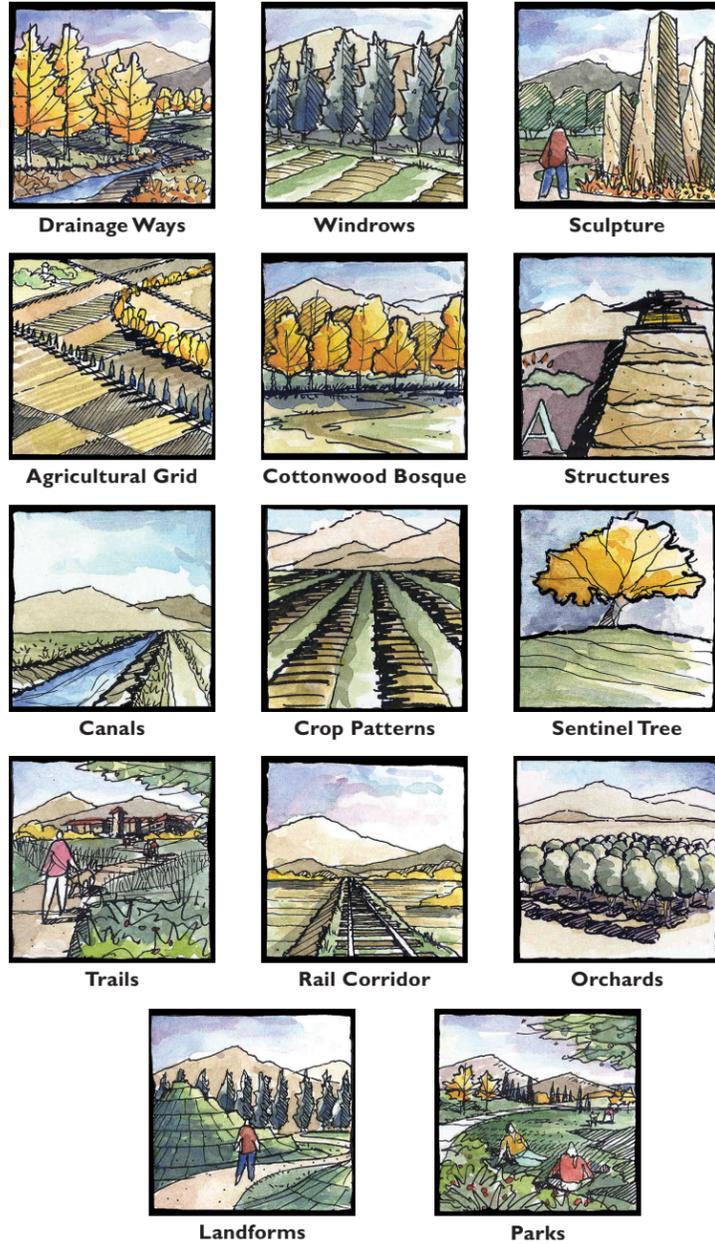
General Landscape Design Guidelines

- LAN-2 · Landscaper Master Plan
- LAN-3 · Landscaping
- LAN-4 · Landscape Performance Standards
- LAN-5 · Parking Lot (field) Landscaping
- LAN-6 · Parking Lot Screens
- LAN-6 · Parking Structures
- LAN-6 · Landscape Maintenance
- LAN-7 · Landscape Materials
- LAN-7 · Residential Landscape (Residential Lots)
- LAN-7 · Office / Employment Landscape
- LAN-8 · Commercial Landscape
- LAN-8 · Grading and Drainage
- LAN-9 · Existing Vegetation and Preservation
- LAN-10 · Parks, Open Space, and Natural Areas
- LAN-11 · Streetscape Design
- LAN-12 · Centerra Plant List

Irrigation Design and Construction Criteria

- LAN-18 · Irrigation Design Criteria for Water Supply and Distribution
- LAN-18 · Irrigation Design Criteria for Control System
- LAN-18 · Irrigation Design Criteria for Planting Areas
- LAN-19 · Irrigation Design Criteria for Turfgrass Areas
- LAN-19 · System Management Guidelines
- LAN-20 · Operation Manual
- LAN-21 · General Operation
- LAN-21 · Routing General Monitoring
- LAN-22 · Adjustment, Maintenance, and Troubleshooting of Equipment
- LAN-25 · Spray Zone Example Base Schedule Worksheet

Landscape Design Elements

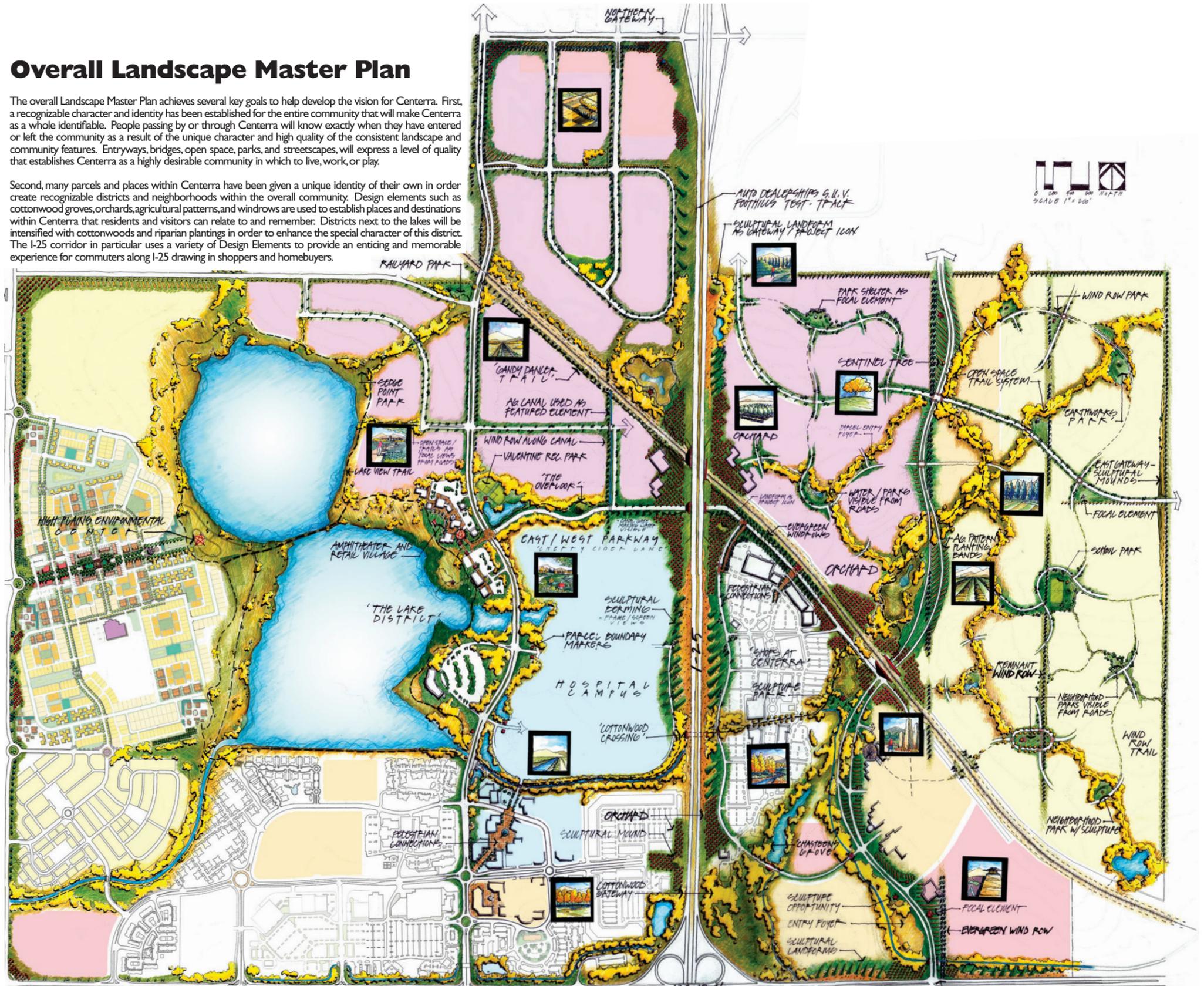


By acknowledging the unique character of Northern Colorado and the Loveland area, a series of Landscape Design Elements have been developed to create the vision for Centerra's Landscape Master Plan. Influences such as agriculture, mountain views, irrigation canals, railroad lines, and sculpture are recognized and celebrated in order to achieve a community that expresses the Front Range Colorado character.

Overall Landscape Master Plan

The overall Landscape Master Plan achieves several key goals to help develop the vision for Centerra. First, a recognizable character and identity has been established for the entire community that will make Centerra as a whole identifiable. People passing by or through Centerra will know exactly when they have entered or left the community as a result of the unique character and high quality of the consistent landscape and community features. Entryways, bridges, open space, parks, and streetscapes, will express a level of quality that establishes Centerra as a highly desirable community in which to live, work, or play.

Second, many parcels and places within Centerra have been given a unique identity of their own in order to create recognizable districts and neighborhoods within the overall community. Design elements such as cottonwood groves, orchards, agricultural patterns, and windrows are used to establish places and destinations within Centerra that residents and visitors can relate to and remember. Districts next to the lakes will be intensified with cottonwoods and riparian plantings in order to enhance the special character of this district. The I-25 corridor in particular uses a variety of Design Elements to provide an enticing and memorable experience for commuters along I-25 drawing in shoppers and homebuyers.



General Landscape Design Guidelines

INTRODUCTION: LANDSCAPE MASTER PLAN VISION AND GUIDELINES

Northern Colorado has a character all its own; majestic mountain views, expansive rolling hills of agriculture, winding waterways, one hundred year old cottonwood groves, and historic lakes and reservoirs teeming with wildlife. It is this character that inspired the Landscape Vision for Centerra. Special attention has been paid to preserving and enhancing the natural amenities within Centerra. Additionally, a new and complementary palette of landscape elements has been developed, such as bridges, signage, water features, sculptural landforms, agricultural patterns, and orchards, that reflect the Front Range Colorado character. Centerra has also made a commitment to express the historic culture of Loveland by integrating a number of parks and special landscape areas dedicated to the display of sculpture and public art.

Applicants for individual projects within Centerra will be expected to develop a landscape for individual projects that is in harmony with the overall Landscape Master Plan; building upon the established landscape framework. This will include edge conditions that take direction from and complement the Master Plan. Components interior to individual sites will utilize the basic landscape design principles and icons appropriately. These landscape design principles and icons include:

- ☞ Utilizing cottonwoods and other riparian plant materials and design strategies in and around drainageways, wetlands, and other natural and sensitive areas designed to support wildlife habitat.
- ☞ Building upon Northern Colorado’s agricultural heritage by using the agricultural grid, crop patterns, irrigation canals, windrows, and orchards in an appropriate manner.
- ☞ Celebrating Loveland’s relationship to environmental art by incorporating sculptural landforms and sculpture in the landscape.
- ☞ Connections to and enhancing Centerra’s overall trail, park, and open space system. This is the system that is the primary unifying element in Centerra.
- ☞ Incorporate the “Sentinel Tree” as the focus of key vistas, especially along roadways.

- ☞ Embracing the iconic architectural features and other man-made elements such as the rail line and bridge structures in the design character of the project.
- ☞ Utilize a palette of plant material (see Centerra Plant List) that incorporates native plantings when the landscape strategy supports native plantings. Group plants with similar water requirements together to reduce irrigation water consumption, and incorporate a drought tolerant approach.

Beyond these general concepts and principles, there are parcels and places within Centerra that have been given a unique identity of their own in order to create recognizable districts and neighborhoods within the overall community. These unique places will be characterized by appropriate landscape treatments designed to help them be memorable destinations.

Please refer to the following figures, the District Guidelines, and the Millennium General Development Plan for additional information.

I.0 Landscaping

I.1 General

- I.1.1 Create a landscape that is sustainable, attractive, comfortable, and complementary to the natural and man-made environment.
- I.1.2 Refer to the Master Landscape Plan for appropriate patterns along development edges, major roadways, in open space and natural areas.
- I.1.3 In less urban areas, define collectors and local streets with crop patterns, windrows, informal masses of trees and shrubs, and orchards at corners. In more urban areas, define these streets with uniform placement of deciduous shade and ornamental trees, either in turf grass strips between the street and sidewalk, or near the back of the sidewalk.
- I.1.4 Use plant materials that are massed and placed to provide variety and focal points at strategic locations.

- I.1.5 Where appropriate to the intent of the Landscape Master Plan, use large-scale plantings with the intent of creating thickets of shrubs and broad sweeps of flowers in meadows that occur naturally in the Colorado plains and foothill regions.
- I.1.6 Plant evergreen trees on uplands, while locating cottonwoods, willows, and other riparian plants in drainages.
- I.1.7 Locate ornamental trees in groves and as specimens on uplands and side slopes.
- I.1.8 Create windrows and orchard-style plantings, designed to reflect the agrarian heritage of Centerra.
- I.1.9 Use ordered planting patterns to mark community wide architectural elements and special areas, such as at bridge crossings, public areas, and along interior streets within tree lawns, designed to project an organized artful landscape expression.
- I.1.10 Use structured landscape statements, such as formal windrow and orchard-style plantings in strategic and limited locations, so as not to lose their effect.
- I.1.11 All development shall demonstrate adherence to the following landscape design criteria:
 - a). Provide bio-diversity that relates to the area’s natural systems.
 - b). Design to provide an attractive, comfortable environment for users while minimizing maintenance needs, irrigation water requirements, and the use of herbicides and pesticides.
 - c). Use environmentally friendly “green” materials, where possible.
 - d). Except where agricultural character is desired, design landscape to create a naturalized appearance. Use plant materials that are indigenous to Northern Colorado, where possible (see plant list).
 - e). Use only introduced species in order to achieve design objectives that cannot be

achieved with the use of native species (see Recommended Plant List).

- f). Locate plants in microclimate conditions that are appropriate for that species. Only use high water-requiring plants in areas where they will naturally benefit from runoff or available ground water.
- g). Do not rely solely upon an irrigation system to provide water to high water-requiring plants.
- h). Group plant materials of similar water needs and arrange in concentric circles or layers of progressively less water use in order to maximize the efficiency of applied irrigation.
- i). Use plant materials to provide buffering of structures and outdoor formal open space areas from extreme climate.
- j). Use plant materials to soften building architecture.
- k). Coordinate the design of the landscape with site erosion protection, storm drainage, and water quality improvement systems.

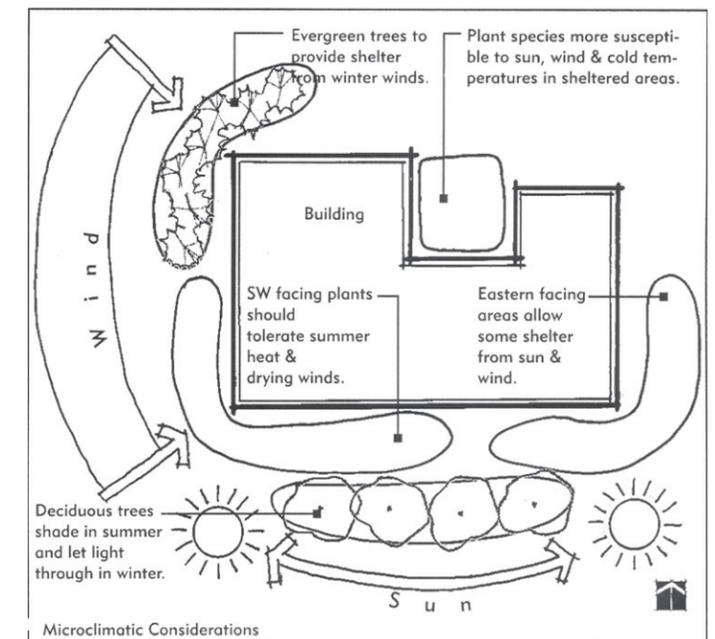


fig.1 Microclimatic Conditions

- l). Use a minimum three-inch deep mulch to

reduce soil moisture loss and moderate soil temperatures.

- m). Improve soil structure by the addition of composted organic material, where natural soils are not of high quality.
- n). Design and manage irrigation systems to achieve peak efficiency.

2.0 Landscape Performance Standards

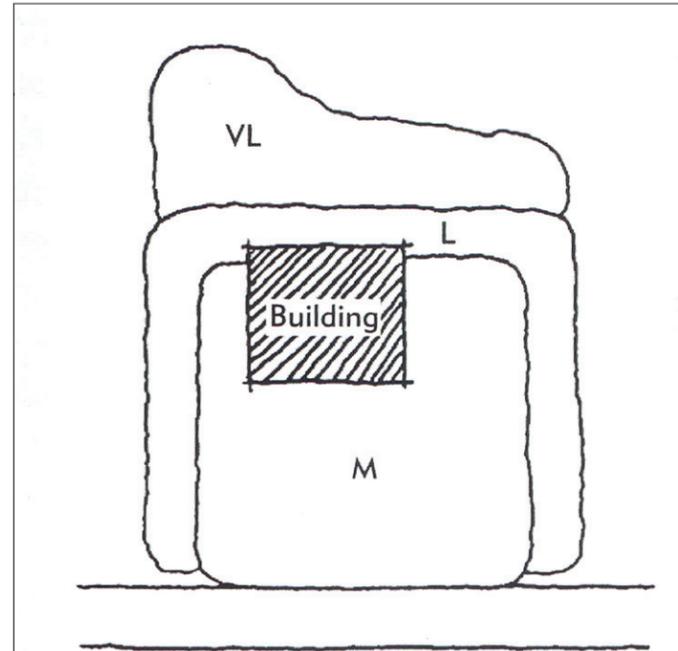
2.1 Irrigation Water Use

(See also Irrigation Design and Construction Criteria sub-section, which follows, for more detailed information regarding irrigation system design)

- 2.1.1 Public areas and private parcels shall have a specified maximum amount of water that is available for irrigation, based upon the landscape prototype for the type of use and size of parcel.
- 2.1.2 The following table lists the maximum irrigation water use per square foot, per year, based upon gross lot size for each type of land use. Landscape and irrigation system designs shall demonstrate that they will not exceed the water allotment assigned to the specific parcel by submitting a water budget with the landscape plan.

Land Use	Allowable Metered Gallons Per Square Foot of Gross Lot Area Per Year
Business Park	4.5
Commercial	3.5
Residential	5.5
Parks/Irrigated Open Space	12.0
Naturalized Open Space	3.0*

* Use based on drip irrigation to trees and shrubs. Temporary irrigation for the purposes of seed establishment is allowed for up to three years.



Design for very low water use where a parcel abuts an open space in detention areas.

Limit moderate water use to heavily used areas, i.e.: employee courtyards, entrances.

Design for low water use at site perimeter or low-use areas.

fig. 2 Water Use Zones

- 2.1.3 All irrigation improvements shall allow for the option of using non-potable water if it becomes available.
- 2.1.4 Separate zones for turf, shrubs, perennials, annuals, etc. are required.
- 2.1.5 Separate zones for landscape in easement areas to be maintained by the Centerra Master Association or Metropolitan District are required.

2.1.6 The amount of irrigation water actually applied shall be the minimum amount necessary to result in plant life of acceptable health and vigor.

2.1.7 The irrigation application shall be in accordance with the local historical evapotranspiration (ET) rate curve and modified in response to recent ET rates. Although during periods of extreme ET, the amount of water applied will need to be greater than the historical ET value, at no time shall it exceed the historical ET by more than 30%. ET data is available from an on-site weather station, which will download weather data to the irrigation central control system.

2.1.8 Irrigation systems shall be designed to prevent run-off, over-spray, or ponding on sidewalks, streets, paved areas, fences, walls, buildings, or structures.

2.1.9 Sidewalks shall not be "overthrown" or receive direct over spray.

2.1.10 Sidewalks less than five feet wide may be "overthrown" if located within open space areas.

2.1.11 All common area irrigation shall be connected to the Centerra central control system, which is capable of communicating with all field satellite units as well as assessing and downloading environmental data from on-site weather stations. Communication method shall be in compliance with control system manufacturer's instructions and the current Centerra irrigation master plan.

2.1.12 All irrigation control systems on individual building sites shall utilize technology compatible with Centerra's central control system and shall connect to it. The site system shall be capable of addressing individual landscape water requirements and appropriate scheduling needs to maximize water conservation potential. Utilize Toro Sentinel Central Controller with flow sensor for each point of connection and two wires back to the controller.

2.1.13 Use drip irrigation for plant material whenever possible. Plant material irrigated with overhead spray shall be minimized.

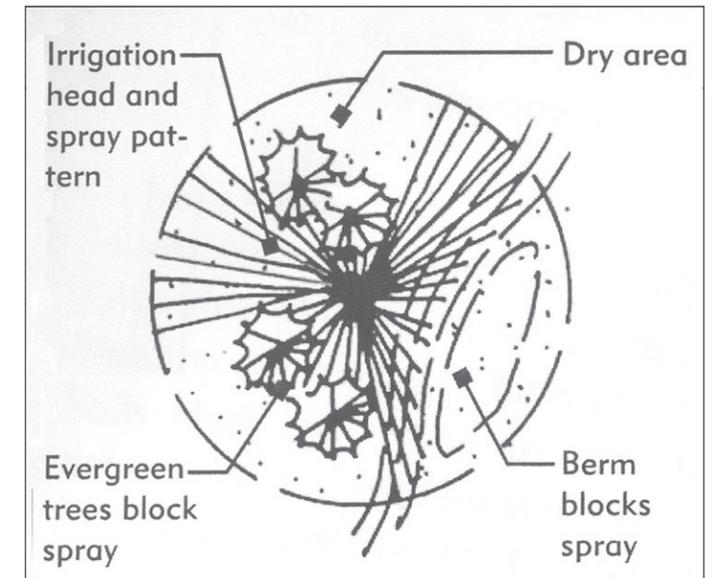


fig. 3 Irrigation Obstructions

2.1.14 Tree and shrub planting in low water or non-irrigated grass areas shall be supplemented with a permanent drip irrigation system.

2.1.15 Design all overhead irrigation to create a uniform water distribution pattern, taking into account wind velocity, slopes, berms, landforms, and tree obstructions.

2.1.16 Design laterals to allow for plant zoning according to varying plant water needs, exposure and slopes, mowing heights, turf maintenance practices, topography, building shade, and paving reflection.

2.1.17 Avoid any direct or wind blown spray onto any roadways, parking lots, hardscape surfaces, or structures. Wind sensor technology shall be used with the central control system to adjust watering schedules during periods of high winds. Low trajectory nozzles and subsurface irrigation shall be used as necessary.

2.1.18 All head spacing shall be adjusted for constant

ten MPH wind conditions.

- 2.1.19 Border roadways with pop-up spray heads or low trajectory pop-up rotors to better control potential over spray.
- 2.1.20 Provide pressure regulating control valves on all zones that should be reduced by 20 PSI or more to allow heads/emitters on that zone to operate at the manufacturer's recommended operation pressure. For spray sprinkler laterals, a pressure-compensating device integral to the sprinkler head is acceptable.
- 2.1.21 Laterals shall be designed so that all heads on that zone shall operate within a ten percent pressure differential.
- 2.1.22 Provide sprinkler head check valves where required to prevent low head drainage.

2.2 Installation Period

- 2.2.1 Install landscaping and irrigation within the first available planting season, or as soon as weather conditions permit.
- 2.2.2 Complete areas to be landscaped within nine months of the date of occupancy.
- 2.2.3 For all land uses except individual residential buildings on separate lots, the City of Loveland shall require escrow in the amount of 125 percent of the value of the installed landscaping and irrigation (at the time of a temporary Certificate of Occupancy) until the landscaping is installed.
- 2.2.4 A professional landscape architect or landscape designer shall prepare all landscape plans for non-residential uses.

2.3 Soil Amendment

- 2.3.1 Provide soil amendments to improve the permeability, water holding capacity, and nutrient value

of the soil.

- 2.3.2 Soils shall be tested by an approved soil-testing agency to determine appropriate soil amendment needs.
- 2.3.3 Peat moss shall not be used as a soil amendment.

2.4 Shrub and Tree Sizes and Placement

- 2.4.1 Tree and shrub sizes shall comply with the following minimum standards (except on private residential lots and in open space areas where native landscapes are being restored or created, or where specifically approved by the DRC):
- 2.4.2 Provide streetscape variety and visual interest by providing a wide range of evergreen tree heights

Plant Type	Typical Minimum Sizes	Minimum Sizes within the Special Improvement District
Deciduous Shade Trees	2" Caliper	3" Caliper
Ornamental Trees	1 1/2" Caliper	3" Caliper
Evergreen Trees	6' Height	8' Height
Shrubs	5 Gallon	5 Gallon

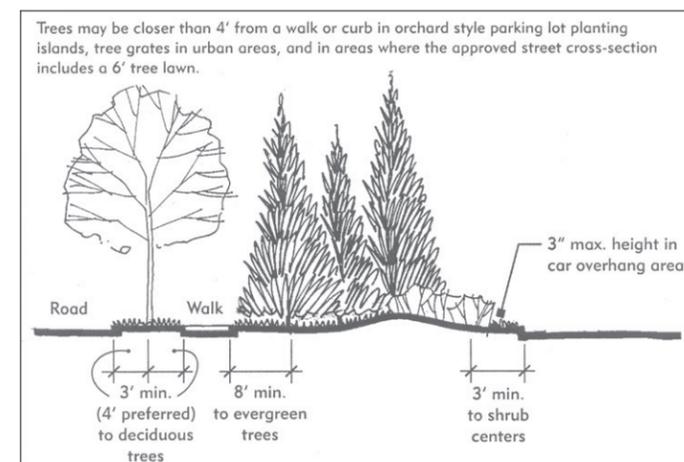


fig. 4 Plant Spacing Criteria

within the road ROW or setback area. Provide evergreen trees that are at least one-to-three feet higher than the minimum specified.

- 2.4.3 Canopy shade trees shall constitute a minimum 50 percent of all tree plantings, except as otherwise noted.

3.0 Parking Lot (field) Landscaping

3.1 General

- 3.1.1 Landscape areas within the perimeter of the parking lot to minimize the feeling of large expanses of pavement, improve parking lot appearance, and to reduce heat build-up.

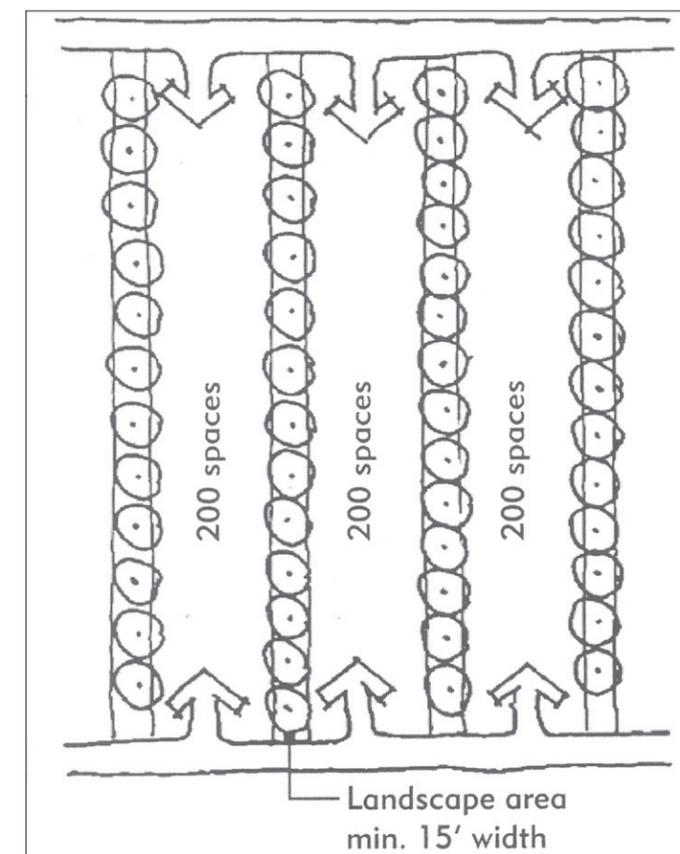


fig. 5 Breaking Up Large Parking Lots

- 3.1.2 Divide large parking lots into smaller sections or parking courts. Each section or court shall contain a maximum of 200 parking spaces.

- 3.1.3 Landscape areas used to break-up large expanses of pavement shall be a minimum of 15 feet wide.

- 3.1.4 For parking lots with more than 40 parking spaces, parking bays shall extend no more than 15 spaces without an intervening tree, landscape island, or landscape peninsula.

- 3.1.5 Parking lots containing 15 or more parking spaces shall provide a minimum six percent interior parking lot landscaping, as measured within an area drawn around the exterior limits of the lot.

- 3.1.6 Parking lots containing more than 50 spaces shall provide a minimum 10 percent interior parking lot landscaping, as measured within an area drawn around the exterior limits of the lot (back of curb).

- 3.1.7 A minimum 75 percent of the landscape area should be covered with living materials within three years of installation.

- 3.1.8 Additional internal landscaping shall be provided in parking lots that exceed the recommended parking ratios. Fifty square feet of internal landscaping shall be provided for each parking space, which exceeds the recommendation. The additional landscaping may be distributed throughout the entire parking lot.

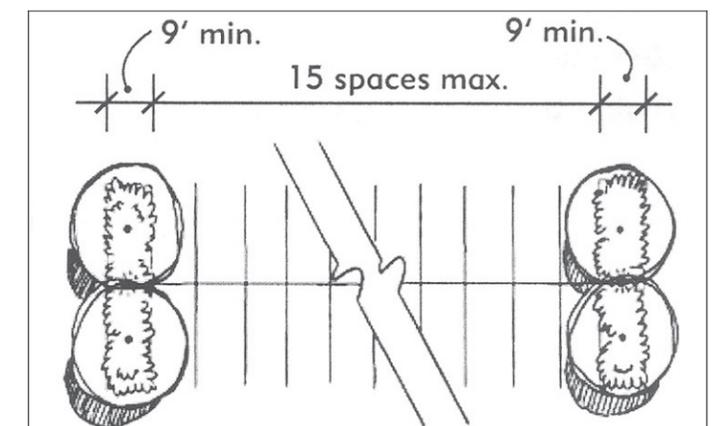


fig. 6 Parking Lots with 40 or More Spaces

- 3.1.9 Turf grass shall not be planted in parking lot islands or medians unless the turf area is a minimum ten feet wide.
- 3.1.10 Shade trees shall be planted in parking lots at a minimum rate of one tree and five shrubs for every 15 parking spaces.
- 3.1.11 Plant materials shall be placed on end islands; entry drives, pedestrian walks, and along islands, which separate parking from internal, drives.
- 3.1.12 Landscape islands shall be a minimum nine feet in width from back of curb (net available area) and the same length as adjacent parking spaces.

4.0 Parking Lot Screens

4.1 General

- 4.1.1 Screen parking lots from surrounding public streets, sidewalks, trails, parks, and other properties that are used by the public.
- 4.1.2 Exceptions to parking lot screening requirements may be made in portions of Districts (e.g., District 5 - Town Center) where a more urban image is desired, at the discretion of the DRC.

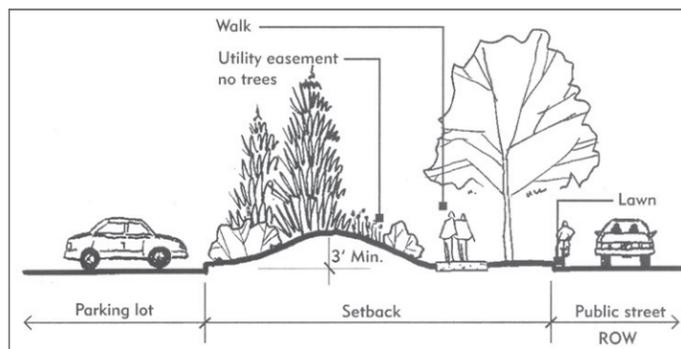


fig. 7 Parking Lot Screens with Berms

- 4.1.3 Use berms, low decorative garden walls, plant material, and planters to screen parking lots.
- 4.1.4 Use plant material to soften low decorative garden screen walls, which are visible from adjacent streets, sidewalks, trails, parks, and other

properties that are used by the public.

- 4.1.5 Use parking lot setbacks to mitigate the visual impacts of parking lots from adjacent parcels and ROW. Provide parking lot screening, based upon the following standards:
 - a). A minimum three-foot high screen shall be provided between parking lots and the public ROW.
 - b). Provide four-to-six foot high screens between parking lots and the I-25 and US 34 ROW.
 - c). Parking lot screens may be composed of one or a combination of the following: Berms, plant materials, or decorative wall.
 - d). The height of the screen shall be measured from the adjacent parking surface.
 - e). Landscaping shall not be planted as a straight hedge. Instead, informal planting patterns shall be used to accomplish screening objectives.

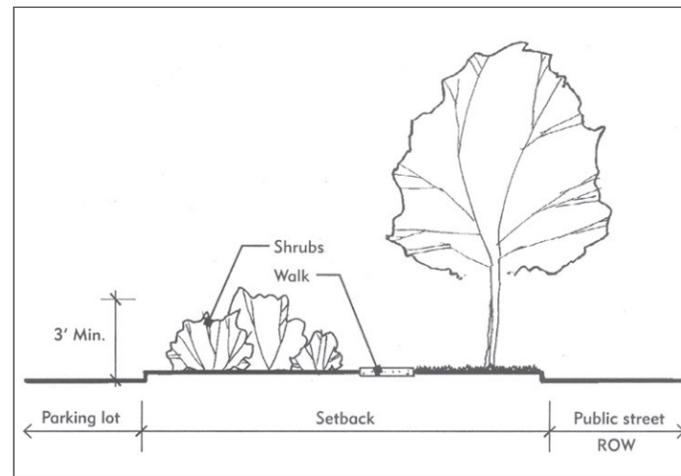


fig. 8 Parking Lot Screening with Shrubs

- 4.1.6 Parking lot screens shall be a minimum three feet higher than the surface of the parking lot. When plant material is used as a screen, plants should create a three-foot high screen within three years.

5.0 Parking Structures

5.1 General

- 5.1.1 Minimize the impact of stand-alone parking structures with landscaped earth berms and by limiting the overall height of the structure to 45 feet.
- 5.1.2 Plant materials and planter boxes on the exterior facades of stand-alone parking structures to reduce their visual impact is encouraged.

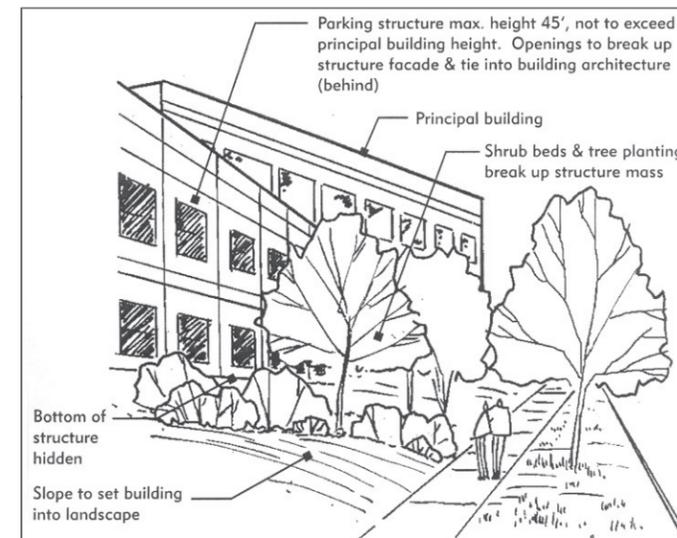


fig. 9 Parking Structure Design

6.0 Landscape Maintenance

6.1 General

- 6.1.1 Limit the use of pesticides and fertilizers to the minimum required to establish and sustain plant growth.
- 6.1.2 Rely on adequate soil growing medium preparation, aeration, top-dressing with compost, deep and slow watering, variation in species, mulches, and other design and maintenance practices, and less on chemical applications.
- 6.1.3 Minimize the need for mowing by minimizing the amount of turf grass used in landscape areas that receive the most use.

- 6.1.4 Eliminate noxious weeds and hazards per City of Loveland standards.
- 6.1.5 Mow turf grasses to maintain a uniform appearance unless otherwise approved by the DRC (e.g., crop row plantings).
- 6.1.6 Do not mow naturalized grass or meadow areas, except as desired to control weeds or distribute seed heads.
- 6.1.7 Maintain irrigation systems to prevent unnecessary waste of water. Connect irrigation systems, except private residential lots, to the Centerra central irrigation control system (See 2.1 Irrigation Water Use, above).
- 6.1.8 Tree lawns, sidewalks along arterial roadways, and common open space shall be maintained by the Centerra Master Association, Metro District, High Plains Environmental Center, or applicable homeowners association. Maintenance of all other landscape areas shall be the responsibility of the adjacent property owner unless special agreements are made with others.
- 6.1.9 Provide for snow storage and removal on each nonresidential site. Pushing snow into the street or street medians shall not be permitted.

7.0 Landscape Materials

7.1 Edging, Weed Barriers, and Mulches

- 7.1.1 Provide steel edging, minimum four-inches deep, with a non-sharp edge (rolled or protected with plastic strip).
- 7.1.2 No plastic may be used as a weed control barrier under mulches.
- 7.1.3 Weed barriers are discouraged in conjunction with wood mulch.
- 7.1.4 Provide a three-to-four inch mulch depth to prevent weed growth.

7.1.5 Permitted mulch types include the following:

- Crushed granite river rock, river cobble (Colors: tan, brown, and slate gray)
- Sandstone quarry tailings
- Wood mulch (Types: local pine/fir, red cedar, and other regionally produced products)
- No white, black, pink, red, green, or other color rock, or dyed wood mulch is permitted.

7.0 Residential Landscape (Residential Lots)

7.1 General

7.1.1 Provide arrangement of plant materials that complement building architecture, accent entries, frame windows, and offer a setting for the height and mass of structures.

7.1.2 Mass plant materials to create sheltered outdoor rooms associated with patios, porches, and sitting areas.

7.1.3 Principles of sustainability and xeriscape should be incorporated in selection of materials, design and maintenance of landscapes.

7.2 Environmental Considerations

7.2.1 Strategically place landscape materials to buffer structures from winter winds (predominantly north, northwest) allowing solar exposure in the winter, and shade in the summer.

7.3 Irrigation and Water Use

7.3.1 Limit turf grass to areas that are most heavily used and which are central organizing spaces. A maximum of 45 percent of the landscape area on any parcel shall be irrigated turf grass.

7.3.2 Arrange the landscape in zones of progressively less water use. This allows for the maximum efficiency of applied irrigation water, with the drier zone benefiting from potential over spray,

runoff, and ground moisture of the adjacent higher water use zone.

7.3.3 Design landscape zones to reduce water consumption. No landscape zone should require more than 22 inches of supplemental irrigation in an average year, which is equivalent to what turf type Tall Fescue grasses need to thrive in Loveland.

7.3.4 Place hydric, or moisture-loving plants in depressions and other areas where they will naturally receive more moisture.

7.3.5 Irrigate all landscape areas greater than 100 square feet that require irrigation, with an automatic irrigation system. Private courtyards, culinary gardens, and small landscape areas with unusual constraints are excepted.

7.3.6 Irrigation systems shall be automatically controlled and operated only between the hours of 10 pm to 10 am. Exception: Culinary Gardens.

7.4 Landscape Edges

7.4.1 Blend landscape edges of residential parcels with adjacent properties. Harsh lines at the edges of properties, such as abrupt changes of mulch type, or plant materials placed in obvious lines shall be avoided.

7.4.2 Vary landscaping in height and density adjacent to common open space areas, so as to avoid a hedge or total screen appearance. Instead, the landscape treatment should provide view corridors between the private yard and common open space.

7.5 Fences

7.5.1 All fence design and construction shall be subject to DRC review and approval.

7.5.2 Picket fences, or other low (30 - 42 inch high) "open" fencing, as approved by the DRC, may be used in private yards as long as the fence does not affect sight triangles.

7.5.3 In rear yards, side yards (behind the front yard setback), and other areas where privacy and noise mitigation are desirable, fences up to a maximum height of five feet shall be permitted as approved by the DRC. The lower four-foot portion of such fences may be solid, while the upper one-foot shall be an "open" design.

8.0 Office / Employment Landscape

8.1 General

8.1.1 Provide arrangement of plant materials that complement building architecture, accent entries, frame windows, and offer a setting for the height and mass of structures.

8.1.2 Mass plant materials to create sheltered outdoor rooms associated with plazas and forecourts.

8.1.3 Select xeriscape plant materials that promote sustainability.

8.2 Building Landscaping

8.2.1 Provide five-foot wide planting beds adjacent to building elevations visible from public areas or high use areas a minimum of 50 percent of the length of the wall.

8.2.2 Plant trees within 50 feet of a building at a quantity of one tree per 40 linear feet of building frontage. Exact location and spacing may be adjusted at the option of the applicant and approved of the DRC to support patterns of use, views, and circulation as long as the minimum tree-planting requirement is met.

8.3 Environmental Considerations

8.3.1 Strategically place landscape materials to buffer structures from winter winds (predominantly north, northwest) allowing solar exposure in the winter, and shade in the summer.

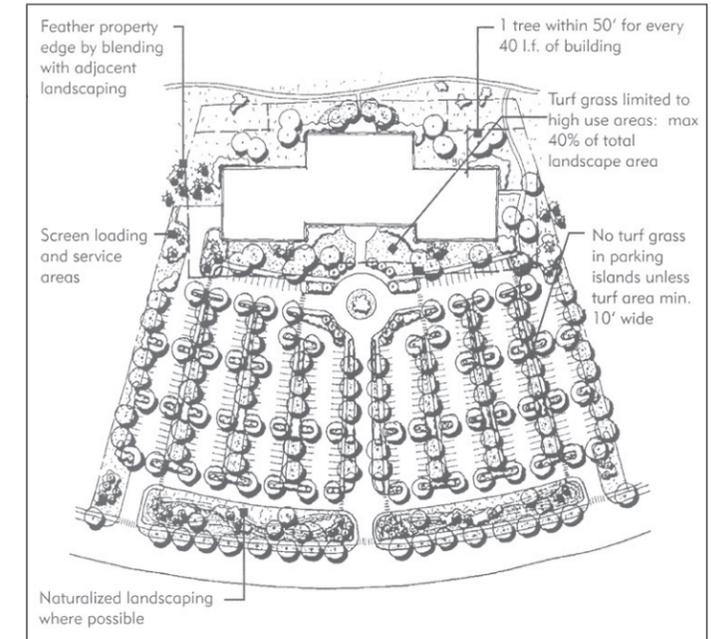


fig. 10 Example; Office / Employment Landscape

8.4 Irrigation and Water Use

8.4.1 Limit turf grass to areas that are most heavily used and which are central organizing spaces. A maximum of 40 percent of the landscape area on any parcel shall be irrigated turf grass.

8.4.2 Arrange the landscape in zones of progressively less water use. This allows for the maximum efficiency of applied irrigation water, with the drier zone benefiting from potential over spray, runoff, and ground moisture of the adjacent higher water use zone.

8.4.3 Design landscape zones to reduce water consumption. No landscape zone should require more than 22 inches of supplemental irrigation in an average year, which is equivalent to what turf type Tall Fescue grasses need to thrive in Loveland.

8.4.4 Place hydric, or moisture-loving plants in depressions and other areas where they will naturally receive more moisture.

8.4.5 Irrigate all landscape areas greater than 100 square feet that require irrigation, with an automatic irrigation system. Private courtyards, culinary gardens, and small landscape areas with unusual constraints may be excepted at the discretion of the DRC.

8.4.6 Irrigation systems shall be automatically controlled and operated only between the hours of ten pm to ten am.

8.5 Landscape Edges

8.5.1 Blend landscape edges of office / employment parcels with adjacent properties and Rights of Way, in conformance with the Landscape Master Plan. Harsh lines at the edges of properties, such as abrupt changes of mulch type, or plant materials placed in obvious lines shall be avoided.

8.5.2 Vary landscaping in height and density adjacent to open space areas, so as to avoid a hedge or total screen appearance. Open space areas should appear to flow into the site and blur the property edge.

8.5.3 Locate low water use landscape zones on the perimeter of property designed to blend with adjacent offsite open space.

8.5.4 Blend on-site perimeter landscapes with off-site tree and shrub masses within the public ROW. Grass and ground plane landscape treatments shall also harmonize with the streetscape design, and transition gradually to the internal on-site landscape.

8.6 Landscape Screening/Bufferyards

8.6.1 Refer to the Millennium General Development Plan (GDP) and City of Loveland Site Performance Standards and Guidelines for detailed bufferyard performance standards.

9.0 Commercial / Retail Landscape

9.1 General

9.1.1 Provide arrangement of plant materials that complement building architecture, accent entries, frame windows, and offer a setting for the height and mass of structures.

9.1.2 Mass plant materials to create sheltered outdoor rooms associated with plazas, courtyards, and greens.

9.1.3 Select xeriscape plant materials that promote sustainability.

9.2 Building Landscaping

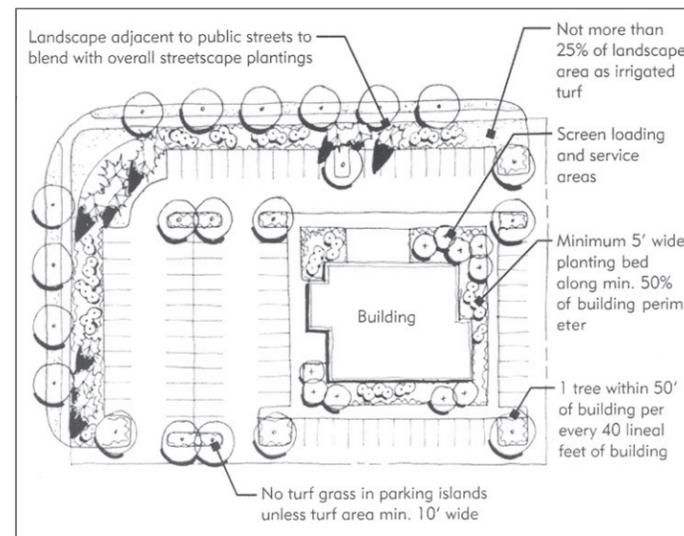


fig. 11 Commercial Landscape

9.2.1 Provide five-foot wide planting beds or raised planters adjacent to building elevations visible from public areas or high use areas a minimum of 50 percent of the length of the wall.

9.2.2 Plant trees within 50 feet of a building at a frequency of one tree per 40 linear feet of building frontage. Exact locations and spacings may

be adjusted at the option of the applicant and approval of the DRC to support patterns of use, views, and circulation as long as the minimum tree-planting requirement is met.

9.3 Environmental Considerations

9.3.1 Place landscape materials strategically to buffer structures from winter winds (predominantly north, northwest) allowing solar exposure in the winter, and shade in the summer.

9.4 Irrigation and Water Use

9.4.1 Limit turf grass to areas that are most heavily used and which are central organizing spaces. A maximum of 25 percent of the landscape area on any parcel shall be irrigated turf grass.

9.4.2 Arrange the landscape in zones of progressively less water use. This allows for the maximum efficiency of applied irrigation water, with the drier zone benefiting from potential over spray, runoff, and ground moisture of the adjacent higher water use zone.

9.4.3 Design landscape zones to reduce water consumption. No landscape zone should require more than 22 inches of supplemental irrigation in an average year, which is equivalent to what turf type Tall Fescue grasses need to thrive in Loveland.

9.4.4 Place hydric, or moisture-loving plants in depressions and other areas where they will naturally receive more moisture.

9.4.5 Irrigate all landscape areas greater than 100 square feet that require irrigation, with an automatic irrigation system. Culinary gardens and small landscape areas with unusual constraints may be excepted at the discretion of the DRC.

9.4.6 Irrigation systems shall be automatically controlled and operated only between the hours of ten pm to ten am.

9.5 Landscape Edges

9.5.1 Blend landscape edges of commercial parcels with adjacent properties and Rights of Way. Harsh lines at the edges of properties, such as abrupt changes of mulch type, or plant materials placed in obvious lines shall be avoided.

9.5.2 Vary landscaping in height and density adjacent to open space areas, so as to avoid a hedge or total screen appearance. Open space areas should appear to flow into the site and blur the property edge.

9.5.3 Locate low water use landscape zones on the perimeter of property designed to blend with adjacent offsite open space.

9.5.4 Blend on-site perimeter landscapes with off-site tree and shrub masses within the public ROW. Grass and ground plane landscape treatments shall also harmonize with the streetscape design, and transition gradually to the internal on-site landscape.

9.6 Landscape Screening/Bufferyards

9.6.1 Refer to the Millennium General Development Plan (GDP) and City of Loveland Site Performance Standards and Guidelines for detailed bufferyard performance standards.

10.0 Grading and Drainage

10.1 General

10.1.1 Develop grading and drainage designs that minimize runoff and utilize storm drainage systems to meet basic engineering requirements.

10.1.2 Improve the quality of storm water before it reduces natural systems.

10.1.3 Site drainage shall be compatible with adjacent property drainage and in accordance with the overall master drainage plan for Centerra.

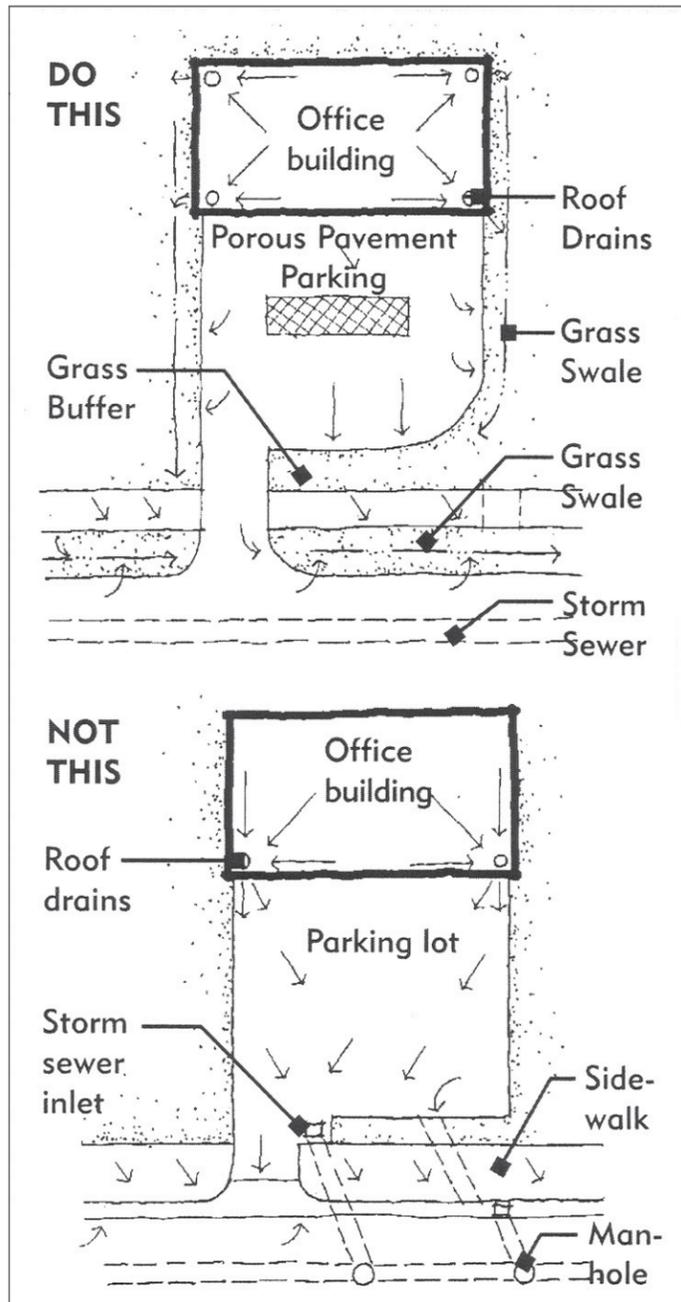


fig. 12 Water Quality Enhancement Examples
(Source: Urban Storm Drainage Criteria Manual, vol. 3)

10.1.4 Storm drainage shall not run on an adjacent property at rates higher than historic rates prior to construction of the project, unless otherwise approved by the DRC and the City of Loveland.

10.1.5 Minimize excess runoff from the site and provide positive drainage away from all foundations and buildings.

10.1.6 Direct water from parking lots, roof drains and other areas into landscape areas that could benefit from additional water and/or improve the quality of the storm water.

10.1.7 Convey drainage along dedicated streets, private drives and swales along property lines, or in open space corridors. Sheet flow and surface drain where possible.

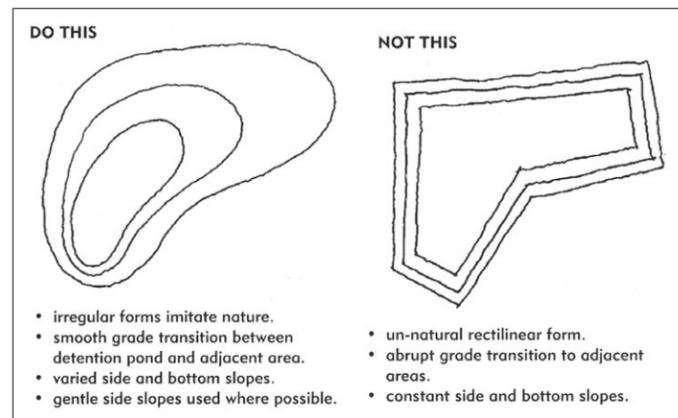


fig. 13 Detention Pond Landforms

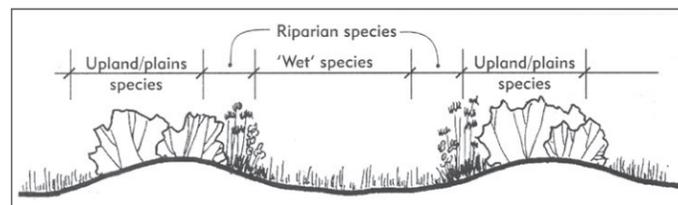


fig. 14 Detention Area Plantings

10.1.8 Grade surface drain systems and detention ponds in irregular shapes, in an aesthetically pleasing character. Vary side slopes.

10.1.9 Place drainage structures that occur in sidewalks and bike paths flush with the surface. Grate patterns shall not have openings greater than 3/8".

10.1.10 Surface storm water or irrigation shall not be discharged across sidewalks; and there should

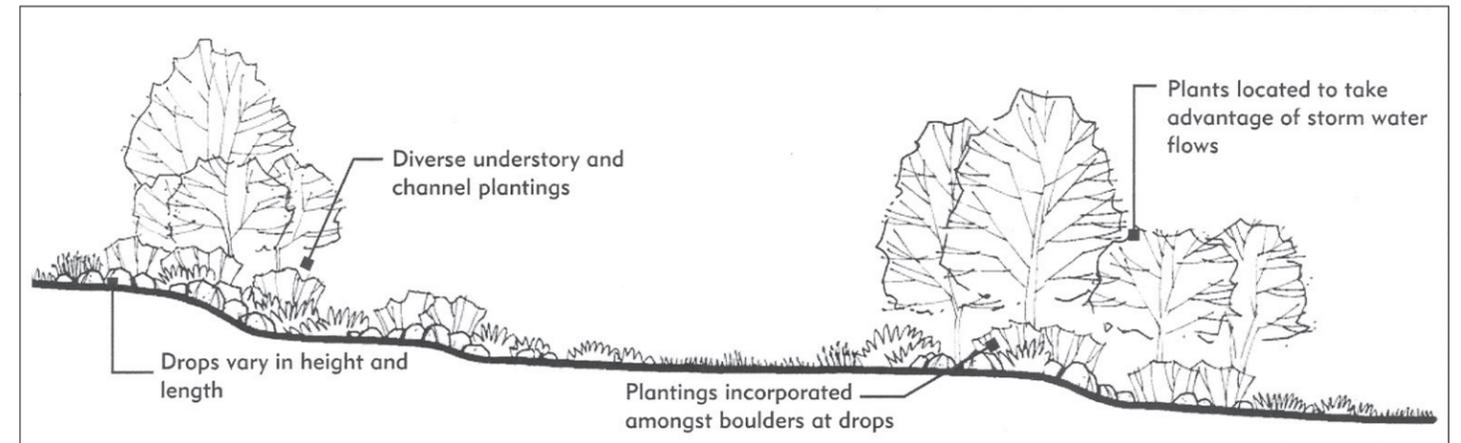


fig. 15 Drainage Channel Plantings

be no point discharges into curbs to prevent traffic-impeding surges into the street.

10.1.11 Utilize Urban Drainage Best Management Practice as a guide for all storm drainage systems.

10.1.12 No plain concrete drainage pans are allowed in landscaped areas. If hardened drainage swales must be used, they shall be designed to complement and enhance the adjacent area rather than detract from its appearance. No hardened surface is preferred in order to decrease run-off, increase infiltration, and improve water quality.

10.1.13 Site building to minimize cut & fill.

10.1.14 There shall be no grading beyond the limits of each property except as agreed upon by adjacent owners and the DRC.

10.1.15 Maximum slopes 3:1. Maximum 4:1 slopes for areas that require mowing.

11.0 Existing Vegetation and Preservation

11.1 General

11.1.1 Grading shall not occur within the buffer zone areas that are determined to have good quality existing natural vegetation as determined by a qualified biologist/ecologist.

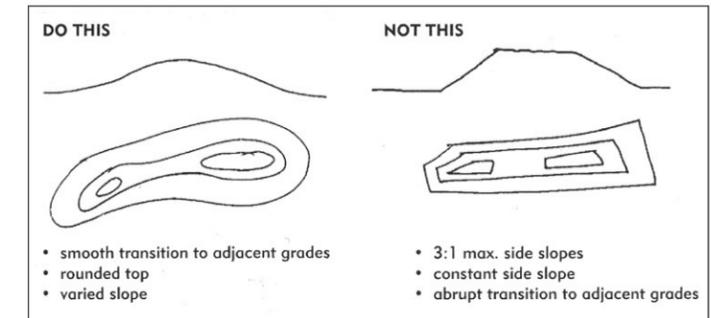


fig. 16 Berm Topography

11.1.2 When development occurs adjacent to natural areas, limits of construction shall be identified and approved by the DRC. A temporary barrier fence shall be installed and maintained for the duration of the construction period.

11.1.3 Grading and site design shall protect existing trees to the greatest extent possible. Existing trees that cannot remain shall be moved to another location on-site, moved to another location within Centerra, or replaced in-kind with additional tree plantings according to the formula that follows:

Tree Removed	Replace With
24" or larger caliper tree	(3) 4" min. caliper trees
12" to 24" caliper tree	(2) 4" min. caliper trees
12" to 24" caliper tree	(1) 4" min. caliper tree
0" to 6" caliper tree	(1) 3" min. caliper tree

- 11.1.4 Vegetation that is an undesirable species as determined by the DRC or the City of Loveland shall not be protected.
- 11.1.5 Vegetation that is seriously diseased or near the end of its lifespan may be removed at the discretion of the DRC.
- 11.1.6 Existing good quality trees and shrubs within areas that can be developed (excluding river setbacks/buffer zones, floodways and wetland areas) may be used to satisfy the landscaping requirements. All required grading plans shall accurately identify the locations, species, size, condition and proposed disposition of all existing vegetation.
- 11.1.7 Existing trees that will remain and their root systems shall receive adequate water to ensure survival, and shall be protected from damage, soil contamination and compaction with the drip line during construction through the use of barricades or fencing.

12.0 Parks, Open Space, and Natural Areas

12.1 Parks

- 12.1.1 Design parks to serve the active and passive needs of people on-site and on nearby properties.
- 12.1.2 Amenities such as picnic shelters, playgrounds, amphitheaters, gardens, etc. should be appropriate to the project.
- 12.1.3 Irrigated turf grass should dominate parks subject to human activity.
- 12.1.4 Parks in residential areas:
 - a). Provide more than 50% street frontage
 - b). At the discretion of the DRC, visibility and access from public trails or public properties (e.g., schools, civic buildings, etc.) may be an alternative to the street frontage requirement
 - c). Types and locations of parks will be based upon accessibility to all residents; needs accord-

ing to the City of Loveland Standards; and classification according to who the park serves (e.g., Community Park, Neighborhood Park, Pocket Park, etc.)

12.1.5 Parks in commercial and mixed-use areas:

- a). Provide more than 25% street frontage
- b). At the discretion of the DRC, visibility and access from public trails maybe an alternative to the street frontage requirements.

12.2 Open Space

- 12.2.1 Provide open space as a transition between development parcels and natural areas.
- 12.2.2 Provide open space as trail corridors, drainage areas, and as relief from the built environment.
- 12.2.3 Plan open space areas with native or regionally adapted plant materials, primarily unirrigated after being established.
- 12.2.4 Trees and shrubs that are not expected to receive enough water through natural precipitation may be irrigated.
- 12.2.5 Temporary irrigation systems for the establishment of grasses will be allowed for up to three (3) years.
- 12.2.6 Coordinate open space with the design of stormwater conveyance and water quality systems.

12.3 Natural Areas

- 12.3.1 Refer to Sensitive Areas reports on file with Centerra for sites that include or are adjacent to the existing reservoirs, mapped wetlands, and identified sensitive areas.
- 12.3.2 Sensitive Areas and Buffer Zones around the reservoir will be owned and maintained by the High Plains Environmental Center.

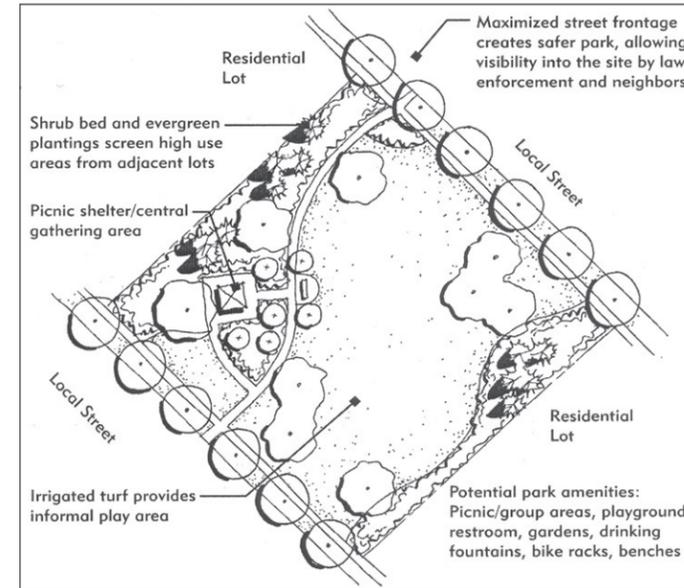


fig. 17 Typical Residential Park Plan

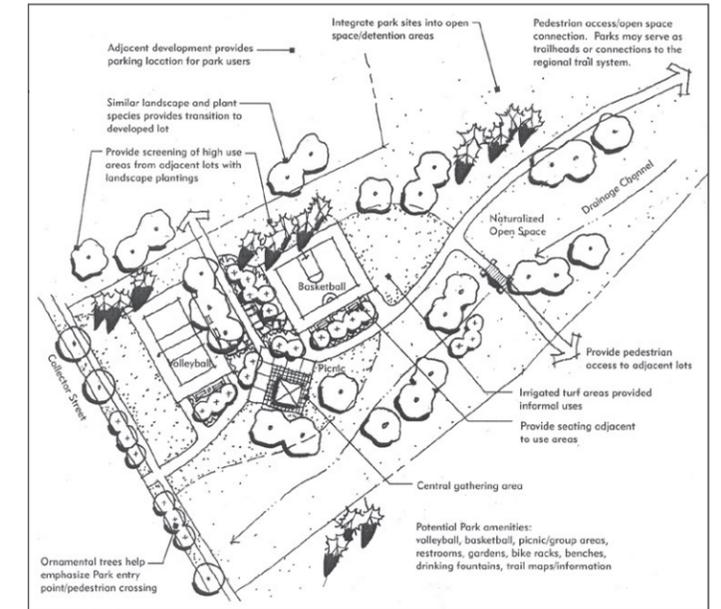


fig. 18 Typical Park in Business Park or Commercial Area, Plan

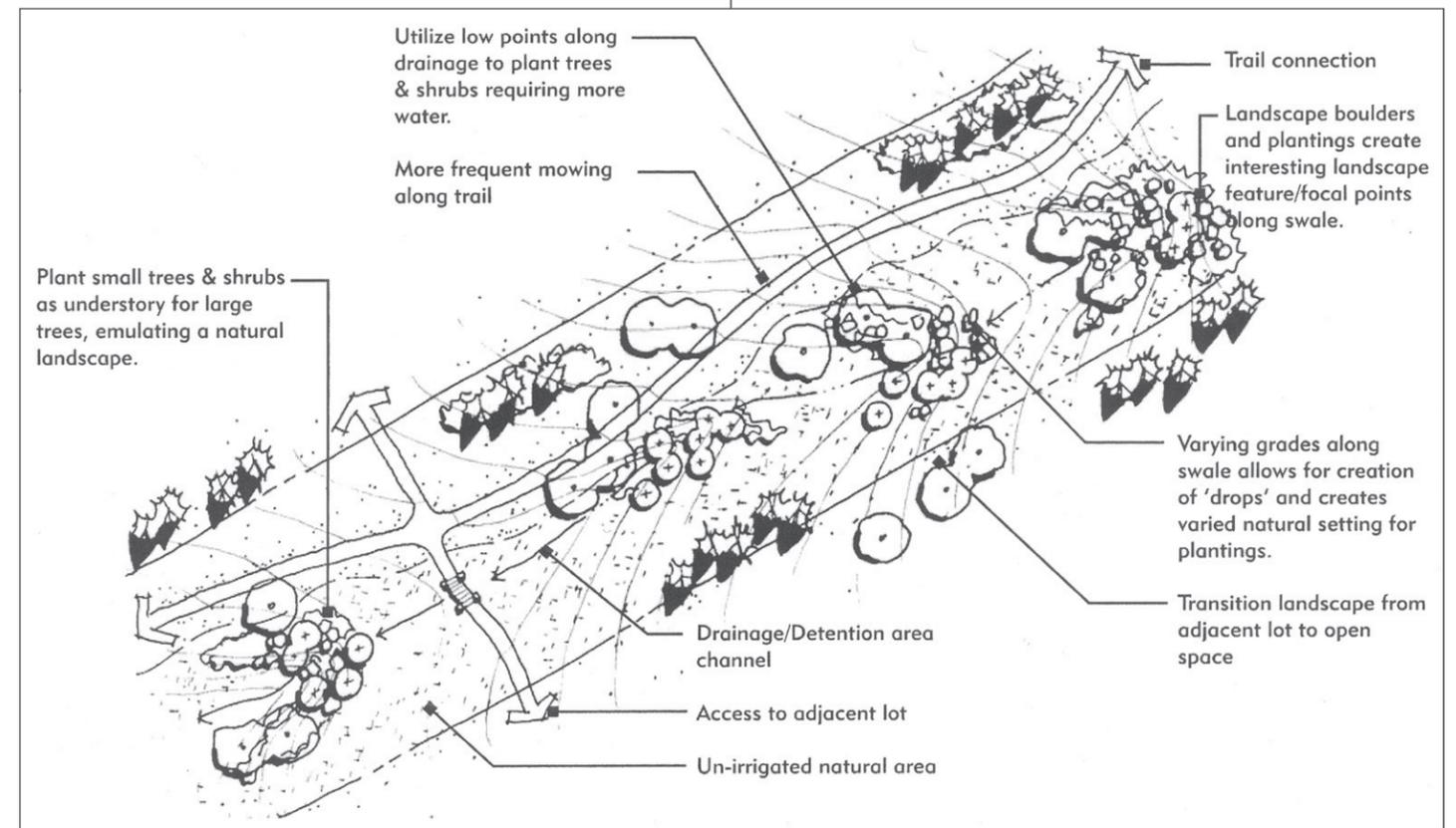


fig. 19 Natural Areas / Open Space / Detention

12.3.3 Identified Natural Areas and their buffer zones will be protected from disturbance unless the following conditions exist.

- a). The buffer zone would benefit from enhancements to mitigate adjacent development activities.
- b). Restoration of previously degraded natural landscapes or incompatible existing vegetation is needed.
- c). Need for public safety improvements.
- d). Utilities cannot be reasonably located elsewhere.
- e). Trails and other passive public uses that provide recreational or educational opportunities are compatible with the level of sensitivity of the natural resource.

12.3.4 Landscaping and other enhancements to natural areas and their buffer shall follow the recommendation of a qualified biologist/ecologist approved by the DRC.

13.2.2 The 80' landscape buffer adjacent to the R.O.W. will be dominated by sculptural landforms, supported by irrigated and unirrigated grasses, tree groupings, and banks of ornamental grasses, shrubs, and perennials (see figure 20).

13.2.3 The combined I-25 R.O.W. and 80' landscape buffer shall be designed as a unified concept.

13.2.4 A Type C buffer yard, as defined in the Millennium GDP shall be provided continuously along I-25, unless otherwise approved by the DRC and the City of Loveland.

13.2.5 Visual impacts of buildings shall be softened.

13.2.6 Views to parking areas shall be screened.

13.2.7 All property owners will be expected to participate in maintenance agreements developed between Centerra, CDOT, and the City of Loveland for areas within and adjacent to the I-25 R.O.W.

13.3 US 34

13.3.1 The US 34 Right of Way (R.O.W.) will be largely unirrigated grasses, with occasional bands of shrubs/trees that meander just inside the R.O.W. to the private property and back, to avoid a straight line treatment at the edge of the R.O.W. (see figure 21).

13.3.2 The 80' landscape buffer adjacent to the R.O.W. will be dominated by informal berms, and unirrigated grasses. These will be supported by tree groupings and bands of ornamental grasses, shrubs, and perennials (see figure 21).

13.3.3 The combined US 34 R.O.W. and 80' landscape buffer shall be designed as a unified grouping.

13.3.4 A Type C buffer yard, as defined by the Millennium GDP shall be provided continuously along US 34, unless otherwise approved by the DRC and the City of Loveland.



fig. 20

13.3.5 Visual impacts of buildings shall be softened.

13.3.6 Views to parking areas shall be screened.

13.3.7 All property owners will be expected to participate in maintenance agreements developed between Centerra, CDOT, and the City of Loveland for areas within and adjacent to the US 34 R.O.W.

13.4 Major Streets

13.4.1 Landscape of major streets (arterials and collectors) are dependent on specific location relative to The Landscape Master Plan. (fig. 22)

13.4.2 Refer to the Landscape Master Plan for specific direction on design intent



fig. 21



fig. 22

13.0 Streetscape Design

13.1 General

13.1.1 Projects that include streetscapes that are not provided by the Master Developer shall be in conformance with the intent of the Landscape Master Plan and be guided by the following sections.

13.2 I-25

13.2.1 The I-25 right-of-way (R.O.W.) will be primarily unirrigated grasses with occasional bands of shrubs/trees that meander just inside the R.O.W. to the private property and back, to avoid a straight line treatment at the edge of the R.O.W. (see figure 20).

CENTERRA GENERAL DESIGN GUIDELINES

Centerra Plant List 6-28-04

EXPOSURE	WATER USE	COMMENTS
S FULL SUN	VL VERY LOW	D REQUIRES GOOD DRAINAGE
PS PART SHADE	L LOW	P REQUIRES PROTECTION
SH FULL SHADE	M MEDIUM	L LIMITED AVAILABILITY
	H HIGH	N* NATIVE TO CENTERRA
		C NATIVE TO COLORADO

EVERGREEN TREES

COMMON NAME	BOTANICAL NAME	Height	Spread	Exposure	Water Use	Comments
Austrian Pine	<i>Pinus nigra</i>	60'	30'	S	L	Performs well in Kty bluegrass lawn
Cologreen Juniper	<i>Juniperus scopulorum</i> 'Cologreen'	15-20'	4-6'	S	VL	Uniform pyramidal shape; light green color
Colorado Spruce	<i>Picea pungens</i>	40'-60'	20'-30'	S - PS	M	C, D - Avoid wet feet; OK in Kty bluegrass
Hillspire Juniper	<i>Juniperus virginiana</i> 'Cupressifolia'	15-20'	4-6'	S - PS	L	Uniform pyramidal shape
Limber Pine	<i>Pinus flexilis</i> 'Vanderwolf's Pyramid'	30-50'	15-30'	S - PS	L	D - Picturesque pyramid - not in Kty blue
Ponderosa Pine	<i>Pinus ponderosa</i>	70'-80'	30'	S	L	C, D, N* - Keep dry, out of Kty bluegrass
Pinion Pine	<i>Pinus edulis</i>	20'-30'	10'-20'	S	VL	C, D - Keep dry, out of Kty bluegrass
Rocky Mountain Juniper	<i>Juniperus scopulorum</i>	20-30'	8-12'	S	VL	N* - Native to Loveland
Wichita Blue Juniper	<i>Juniperus scopulorum</i> 'Wichita Blue'	15-20'	4-6'	S	VL	Uniform pyramidal shape; silver blue
White Fir	<i>Abies concolor</i>	40'-60'	20'-30'	S	M	D - Symmetrical form

RIPARIAN / WETLAND TREES

COMMON NAME	BOTANICAL NAME	Height	Spread	Exposure	Water Use	Comments
Lanceleaf Cottonwood	<i>Populus x acuminata</i>	40-60'	30-40'	S	M	C -Uniform growth, less suckering than NC
Narrowleaf Cottonwood	<i>Populus angustifolia</i>	30-50'	20-30'	S	M	C -Pyramidal - suckers
Native Cottonwood	<i>Populus deltoides</i>			S	M	L, N* - Native; male is cottonless
Plains Cottonwood	<i>Populus sargentii</i>	60-80'	50-60'	S	M	N* - Native to Loveland; Irregularly rounded
Peachleaf Willow	<i>Salix amygdiloides</i>	25-40'		S	H	L, N* - For naturalizing, not drought tolerant
Western Hackberry, Native	<i>Celtis reticulata</i>			S	L	L, N* - Native high plains tree

STREET TREES

COMMON NAME	BOTANICAL NAME	Height	Spread	Exposure	Water Use	Comments
Autumn Blaze Maple	<i>Acer x freemanii</i> 'Jeffersred'	40-50'	30-40'	S - PS	M	Silver/Red maple hybrid - limb breakage
Autumn Purple Ash	<i>Fraxinus americana</i> 'Autumn Purple'	40-60'	40-50'	S	M	Fall purple/red color -
European Hornbeam	<i>Carpinus betulus</i> 'Fastigiata'	25'-35'	15-25'	S - PS	M	Columnar form
Green Mountain Sugar Maple	<i>Acer saccharum</i> 'Green Mountain'	60'	45'	S - PS	M	Not as reliable as honeylocust or ash
Imperial Honeylocust	<i>Gleditsia triacanthos inermis</i> 'Imperial'	35'	35'	S - PS	L	Tight round crown, seedless
Littleleaf Linden	<i>Tilia cordata</i> 'Greenspire'	35'	25'-35'	S	M	Uniform conical crown
Mancana Manchurian Ash	<i>Fraxinus mandshurica</i> 'Mancana'	45'	25'		M	Seedless
Patmore Ash	<i>Fraxinus pennsylvanica</i> 'Patmore'	45'	35'	S	M	Seedless; conical to rounded form
Skyline Honeylocust	<i>Gleditsia triacanthos inermis</i> 'Skyline'	45'	35'	S - PS	L	Pyramidal form
Summit Ash	<i>Fraxinus pennsylvanica</i> 'Summit'	55'	35'	S	M	Upright branches, oval crown; seedless

Centerra Plant List

EXPOSURE	WATER USE	COMMENTS
S FULL SUN	VL VERY LOW	D REQUIRES GOOD DRAINAGE
PS PART SHADE	L LOW	P REQUIRES PROTECTION
SH FULL SHADE	M MEDIUM	L LIMITED AVAILABILITY
	H HIGH	N* NATIVE TO CENTERRA
		C NATIVE TO COLORADO

DECIDUOUS TREES

COMMON NAME	BOTANICAL NAME	Height	Spread	Exposure	Water Use	Comments
Bur Oak	<i>Quercus macrocarpa</i>	50-80'	50-80'	S	L	Slow growth, drought tolerant; acorns
English Oak	<i>Quercus robur</i>	50'	50'	S	M	Holds leaves thru winter; prefers acid soil
Kentucky Coffee Tree	<i>Gymnocladus dioica</i>	50-60'	40-50'	S	L	Stark silhouette in winter; fat "bean" pods
Goldenrain Tree	<i>Koelreuteria paniculata</i>	25'	25'	S	L	Small tree; yellow flowers, "lantern" pods
Northern Red Oak	<i>Quercus rubra 'Borealis'</i>	50'	50'	S	M	L - Not as reliable as Bur or Swamp Oak
Swamp White Oak	<i>Quercus bicolor</i>	50'	50'	S - PS	L	Slow growth, drought tolerant' acorns
Western Catalpa	<i>Catalpa speciosa</i>	40-60'	30-50'	S	L	Coarse silhouette; long pods
Western Hackberry	<i>Celtis occidentalis</i>	55'	45'	S	L	C - Similar to C. reticulata
White Oak	<i>Quercus alba</i>	40-60'	30-40'	S	M	Sensitive to compaction + alkaline soil

ORNAMENTAL TREES

COMMON NAME	BOTANICAL NAME	Height	Spread	Exposure	Water Use	Comments
Autumn Brilliant Serviceberry	<i>Amelanchier x grandiflora 'Autumn Brilliance'</i>	15'-25'	15'-20'	S - PS	L	Usually clump form; wht flowers, red fall
Adams Crabapple	<i>Malus 'Adams'</i>	15-25'	15-20'	S	M	CSU pick for disease resistance; pink flwr
Amur Chokecherry	<i>Prunus mackii</i>	20-30'	20-25'	S - PS	M	Tree or clump form; white flowers
Amur Maple	<i>Acer ginnala 'flame'</i>	15'-20'	15'-20'	S	L	Irregular rounded form; seeds, red fall
American plum	<i>Prunus americana</i>	10-20'	8-12'	S	L	N* - Tall thickety shrub; use in groups
Brandywine Crabapple	<i>Malus 'Brandywine'</i>	15'-20'	15'-20'	S	M	Pink flowers; mod resist blight, big 'apples'
Centurian Crabapple	<i>Malus 'Centurian'</i>	15-25'	15-20'	S	M	CSU pick for disease resistance; pink flwr
Chokecherry	<i>Prunus virginiana melanocarpa</i>	12'		S	L	N* - White flowers, suckers; use in groups
Canada Red Cherry	<i>Prunus virginiana 'Shubert'</i>	25'	20'	S	L	Green leaves turn burgundy in summer
Dolgo Crabapple	<i>Malus Dolgo</i>	20-30'	20-30'	S	M	White flowers, lg red fruit; CSU pick
Newport Plum	<i>Prunus cerasifera 'Newport'</i>	15'-25'	15'-20'	S	M	Purple red leaves and edible plums
Japanese Tree Lilac	<i>Syringa reticulata</i>	15'-25'	15'-25'	S - PS	L	Creamy flower clusters + gold fall color
Radiant Crabapple	<i>Malus 'Radiant'</i>	25'	20'	S	M	Pink/red flowers, fruits; CSU recommends
Royalty Crabapple	<i>Malus 'Royalty'</i>	12-18'	12-18'	S	M	CSU pick for resistance to fire blight
Saskatoon Serviceberry	<i>Amelanchier alnifolia</i>	12'	12'	S - PS	L	N* - Native to Loveland, clump or tree
Shadblow Serviceberry	<i>Amelanchier canadensis</i>	15'-25'	15'-20'	S	L	Clump or tree form - upright, rounded
Spring Snow Crabapple	<i>Malus 'Spring Snow'</i>	25'	15'		M	Fruitless variety - white flowers
Thinleaf Alder	<i>Alnus tenuifolia</i>	15'-30'	15'-20'	S - PS	M - H	C - Clump or tree form - catkins thru winter
Thornless Cockspur Hawthorn	<i>Crataegus crus-galli 'inermis'</i>	25'	25'	S	L	Globe form; white flowers; red fruit
Vanguard Crabapple	<i>Malus 'Vanguard'</i>	12-15'	10-15'	S	M	CSU pick for resistance to fire blight
Washington Hawthorn	<i>Crataegus phaenopyrum</i>	20-25'	20'	S - PS	L	Clump or tree form - red fruits thru winter

CENTERRA GENERAL DESIGN GUIDELINES

Centerra Plant List

EXPOSURE	WATER USE	COMMENTS
S FULL SUN	VL VERY LOW	D REQUIRES GOOD DRAINAGE
PS PART SHADE	L LOW	P REQUIRES PROTECTION
SH FULL SHADE	M MEDIUM	L LIMITED AVAILABILITY
	H HIGH	N* NATIVE TO CENTERRA
		C NATIVE TO COLORADO

EVERGREEN SHRUBS

COMMON NAME	BOTANICAL NAME	Height	Spread	Exposure	Water Use	Comments
Bar Harbor Juniper	<i>Juniperous horizontalis 'Bar Harbor'</i>	8"-12"	6'	S	L	Blue green foliage; wine color in winter.
Blue Chip Juniper	<i>Juniperous horizontalis 'Blue Chip'</i>	8-12"	6-8'	S	L	Slate blue foliage turns plum in winter
Buffalo Juniper	<i>Juniperus sabina 'Buffalo'</i>	12-18"	6-8'	S	L	Bright olive green
Big Sage	<i>Artemesia tridentata</i>	3-12'	3-6'	S	VL	Silver/gray aromatic vergreen foliage
Blue Star Juniper	<i>Juniperous squamata 'Blue Star'</i>	15"-18"	2-3'	S - PS	L	Dense + irregular with bluish-white foliage
Broadmoor Juniper	<i>Juniperous sabina 'Broadmoor'</i>	12"-18"	6-8'	S - PS	L	Dense mounding habit, dark green foliage
Calgary Carpet Juniper	<i>Juniperous sabina 'Calgary Carpet'</i>	12"-18"	6-8'	S - PS	L	Nest-like habit, feathery soft green foliage
Compact Oregon Grape Holly	<i>Mahonia aquifolium 'Compacta'</i>	2'-3'	2-3'	PS - SH	L	P - Broadleaf evergreen; can winter burn
Compact Pfitzer Juniper	<i>Juniperous x media 'Pfitzeriana Compacta'</i>	3-4'	4-6'	S	L	Blue-green foliage, irregularly round habit
Creeping Grape Holly	<i>Mahonia repens</i>	12"-18"	12-18"	PS - SH	L	D, N* - leaves may burn in winter sun/wind
Gnome Firethorn	<i>Pyracantha angustifolia 'Gnome'</i>	4'-6'	4'-6'	PS - SH	L	Dense, thorny branches + orange berries
Manhattan Euonymus	<i>Euonymus kiautschovica 'Manhattan'</i>	4'-5'	5'-6'	SH	M	Spreading habit broadleaf for full shade
Mountain Mahogany	<i>Cercocarpus montanus</i>	4-10'	4-8'	S-PS	VL	C - Open habit, small gray-green leaves
Mountain Mahogany, Curleaf	<i>Cercocarpus ledifolius</i>	10-25'	10-20'	S	VL	C - Loose tree/shrub, small dk grn leaves
Mountain Mahogany, Littleleaf	<i>Cercocarpus intricatus</i>	2-4'	2-4'	S	VL	C L - Dense, rounded with tiny leaves
Seagreen Juniper	<i>Juniperous x media 'Sea Green'</i>	5'-6'	6-8'	S	L	Dark green evergreen shrub
Soapweed	<i>Yucca glauca</i>	2'-4'	2'-4'	S	VL	N* - Native to Loveland
Tammy Juniper	<i>Juniperous sabina 'Tamariscifolia'</i>	4'-6'	6-8'	S - PS	L	Dark green foliage on blocky form

DECIDUOUS SHRUBS

COMMON NAME	BOTANICAL NAME	Height	Spread	Exposure	Water Use	Comments
Alpine currant	<i>Ribes alpinum</i>	3'-5'	3'-5'	S - PS	L	Globe form
Arrowwood Viburnum	<i>Viburnum dentatum 'Autumn Jazz'</i>	6-8'	8'	S - PS - SH	M	Uniform branching habit, or/red/purple fall
Antelope Bitterbrush	<i>Purshia tridentata</i>	5'			VL	C - Light yellow flowers; scrubland shrub
Anthony Waterer Spirea	<i>Spirea japonica 'Anthony Waterer'</i>	2-3'	3'	S	M	Rose red flower clusters; over-used
Burning Bush	<i>Euonymus alatus</i>	8'-12'	8'-12'	S	M	Flat-topped round shrub, bright pink/red fall
Blue Mist Spirea	<i>Caryopteris x clandonensis</i>	3'-4'	3'	S	L	Often cut back in spring; blue flower; bees
Blue Stem Willow	<i>Salix irrorata</i>	4'-12'	4-8'	S - PS	M	Silver blue branches, green foliage
Compact American Cran. Viburnum	<i>Viburnum trilobum 'Compactum'</i>	4'-5'	4'-5'	S - PS	M	Dwarf sized viburnum
Compact Butterfly Bush (Lavender)	<i>Buddleja davidii 'Petite indigo'</i>	4'-6'	4'-5'	S	M	Compact shrub with lavender flowers
Crimson Pygmy Barberry	<i>Berberis thunbergii 'Crimson Pygmy'</i>	18"	18"	S	L	Purple red leaves on spiny branches
Cranberry Cotoneaster	<i>Cotoneaster apiculatus</i>	18"-24"	3'	S - SH	L	D - stiff arching branches, red fruit
Coyote Willow	<i>Salix exigua</i>	6'-12'	4'	S	M	N* - Taller with moisture, reddish stems

CONTINUED ON NEXT PAGE

Centerra Plant List

EXPOSURE	WATER USE	COMMENTS
S FULL SUN	VL VERY LOW	D REQUIRES GOOD DRAINAGE
PS PART SHADE	L LOW	P REQUIRES PROTECTION
SH FULL SHADE	M MEDIUM	L LIMITED AVAILABILITY
	H HIGH	N* NATIVE TO CENTERRA
		C NATIVE TO COLORADO

DECIDUOUS SHRUBS cont'd

COMMON NAME	BOTANICAL NAME	Height	Spread	Exposure	Water Use	Comments
Dwarf Arctic Willow	<i>Salix purpurea nana</i>	3'-5'	3'	S - PS	M	Blue green leaves, fine textured
Dwarf Burning Bush	<i>Euonymus alatus 'Compactus'</i>	8'-10'	8'-10'	S	M	Watermelon red fall color
Dwarf Blue Rabbitbrush	<i>Chrysothamnus nauseosus nauseosus</i>	1'-4'	1'-4'	S	VL	N* - Blue gray leaves, fine textured
Dwarf Korean Lilac	<i>Syringa meyeri 'Palibin'</i>	4'-6'	4'-6'	S	L	Lavendar pink blooms on flat round shrub
Dwarf Ninebark	<i>Physocarpus opulifolius 'Nanus'</i>	4'-5'	4'	S - PS	L	C - Gray green leaves on rounded shrub
Fernbrush	<i>Chamaebatiaria millefolium</i>	3-5'	3-5'	S	VL	C Gray green aromatic rounded shrub
Grow Low Sumac	<i>Rhus aromatica 'Gro-Low'</i>	2'-3'	3'-6'	S	L	C - low spreading shrub, orange fall color
Mountain Mahogany	<i>Cercocarpus montanus</i>	4'-6'	4'-6'	S	VL	C - Rigid branches, small gray/grn leaves
Mohican Wayfaring Tree	<i>Viburnum lantana 'Mohican'</i>	6-8'	6-8'	S-PS	L	Large shrub with thick gray green leaves
New Mexico Privet	<i>Forestiera neomexicana</i>	8-12'	6-8'	S	L	L - Limited availability -grey/green leaves
Nannyberry Viburnum	<i>Viburnum lentago</i>	8-15'	6-8'	S-PS-SH	L	Upright arching branches, dark fruit
Purple Butterfly Bush	<i>Buddleja davidii 'Black Knight'</i>	6-12'	6'	S	M	Irregular rounded form Dark purple flowers
Pawnee Buttes Sandcherry	<i>Prunus besseyi 'Pawee Buttes'</i>	18"	5'	S	L	Ground covering - cascades over walls
Purple Common Lilac	<i>Syringa vulgaris 'Ludwig Spaeth'</i>	8-12'	6-8'	S	L	Deep purple blossoms, dark green leaves
Red Coralberry	<i>Symphoricarpos orbiculatus</i>	4'	4'	PS	L	Tiny pink flowers, purple/red fruits in fall
Russian Sage	<i>Perovskia atriplicifolia</i>	3'-4'	3'	S	VL	Long-lasting lavender blooms, xeric
Regent Serviceberry	<i>Amelanchier alnifolia 'Regent'</i>	15-25'	15-20'	S - PS	L	N* White flowers, red fall color
Red Twig Dogwood	<i>Cornus stolonifera coloradense</i>	6-8'	8-12'	S - SH	M	Reddish stems
Staghorn Sumac	<i>Rhus typhina</i>	10'-20'	Colony	S	L	Colonizes, red fall color
Sweet Mockorange	<i>Philadelphus x Buckley's Quill'</i>	3'-4'	3'-4'	S	M	White quill-like flowers, deep green foliage
Smooth Sumac	<i>Rhus glabra</i>	8'-15'	Colony	S	L	N* - Coarse outline, mass, red fall
Silver Sage	<i>Artemesia cana</i>	3'-5'	5'	S	VL	N* - Silver-gray foliage, drought tolerant
Tall Blue Rabbitbrush	<i>Chrysothamnus nauseosus albicaulis</i>	2'-6'	2'-6'	S	VL	N* - Gray/blue leaves on open shrub
Tall Green Rabbitbrush	<i>Chrysothamnus nauseosus graveolens</i>	2'-6'	2'-6'	S	VL	N* - Deep green leaves on open shrub
Three Leaf Sumac	<i>Rhus aromatica spp. trilobata</i>	2'-5'	colony	S-SH	VL	N* - Native, use in masses; or/red fall
Tangerine Potentilla	<i>Potentilla fructicosa 'Tangerine'</i>	2-3'	2-3'	S	L	Tangerine orange summer flowers
White Common Lilac	<i>Syringa vulgaris alba</i>	10'-20'	6-12'	S	L	Upright vase-shaped shrub
Wax Currant	<i>Ribes cereum</i>	2-4'	2-4'	S	L	N* - Native, use in masses; or/red fall
Western Snowberry	<i>Symphoricarpos occidentalis</i>	3-4'	3-4'	S - PS	L	L, C, N* - Open form, blue-green leaves
Western Sand Cherry	<i>Prunus (Cerasus) pumila ssp. Besseyi</i>	4-6'	4-6'	S	L	Profuse white flowers, black fruit
Winterflat	<i>Ceratoides lanata</i>	1'-3'	4'-5'	S	VL	C - Tolerates heat, drought, wet; Gray

CENTERRA GENERAL DESIGN GUIDELINES

Centerra Plant List

EXPOSURE	WATER USE	COMMENTS
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PS PART SHADE	L LOW	P REQUIRES PROTECTION
SH FULL SHADE	M MEDIUM	L LIMITED AVAILABILITY
	H HIGH	N* NATIVE TO CENTERRA
		C NATIVE TO COLORADO

PERENNIALS

COMMON NAME	BOTANICAL NAME	Height	Spread	Exposure	Water Use	Comments
Autumn Joy Sedum	<i>Sedum 'Autumn Joy'</i>	18"-24"	24"	S	L	Blue green foliage with pink flowers
Petite Delight Bee Balm	<i>Monarda 'Petite Delight'</i>	12-15"	18-24"	S - PS	M	Very hardy, Lavender-rose bloom
Bearded Iris	<i>Iris x germanica</i>	3'-4'	18"	S	L	Sword-like leaves
Bloody Cranesbill	<i>Geranium sanguineum</i>	12"-24"	18"	S - PS	M	Rich magenta flowers in early summer
Black Eyed Susan	<i>Rudbeckia fulgida 'Goldstrum'</i>	18"-24"	18-24"	S	L	Golden yellow flowers with dark centers
Blanket Flower, Native	<i>Gaillardia aristata</i>	18-24"	18-24"	S	L	C - Grey green leaves, red/yellow blooms
Blanket Flower	<i>Gaillardia x grandiflora</i>	18"-24"	18"	S	L	Tolerates heat, neglect; daisy-like blooms
Coral Bells	<i>Heuchera sanguinea</i>	12"-18"	12"	PS -SH	M	Showy red flower spikes through summer
Creeping Phlox	<i>Phlox subulata</i>	4"-6"	12-18"	S	L	Low creeping, cascading groundcover
Daylily	<i>Hemerocallis ssp.</i>	8-48"	12-30"	S - PS	L	Height + flower color varies by hybrid
Dotted Gayfeather	<i>Liatris spicata 'Kobold'</i>	18"-24"	12"-18"	S	L	Lavender florets
Dianthus (Pink)	<i>Dianthus gratianopolitanus</i>	6"-8"	9"	S	M	White spotted red flowers in early Summer
Golden Banner	<i>Thermopsis divaricarpa</i>	18"-24"	12"	PS	M	Showy yellow wildflower
Gray Santolina	<i>Santolina chamaecyparissus</i>	12-18"	12-18"	S	L	Fragrant grey foliage, yellow button flowers
Golden Spur Columbine	<i>Aquilegia chrysantha</i>	2-3'	24"	S - SH	L	Long blooming yellow flowers
Hardy Ice Plant	<i>Delosperma cooperi</i>	6"	24"	S	L	Ground cover plum in winter; pink flowers
Monch Aster	<i>Aster x frikartii</i>	24"	24"	S-PS	M	Long blooming purple flowers
Moonbeam Coreopsis	<i>Coreopsis verticilla 'Moonbeam'</i>	18"-24"	18"	S	L	Soft yellow flower clusters all summer
Mexican Hat	<i>Ratibida columnifera</i>	18"	18"	S	VL	N* - Yellow blooms all summer
Pineleaf Penstemon	<i>Penstemon pinifolious</i>	6-8"	12-15"	S	L	C - Long blooming; somewhat evergreen
Prairie Coneflower	<i>Ratibida columnifera</i>	18"-24"	18"-24"	S	L-VL	N* - pale yellow flower
Purple Coneflower	<i>Echinacea purpurea</i>	2'-3'	30"	S	L	Tall with purple daisy-like flowers
Purpleleaf Wintercreeper	<i>Euonymus fortunei 'Coloratus'</i>	12-18"	3-6'	S-PS-SH	L	Broadleaf evergreen; purple in winter
Purple Poppy Mallow	<i>Callirhoe involucrata</i>	6-12"	2-3'	S	L	Red flowers on trailing, spreading plant
Rocky Mountain Columbine	<i>Aquilegia caerulea</i>	18"-24"	18"-24"	PS - SH	M	C - Colorado state flower
Shasta Daisy	<i>Leucanthemum x superbum 'Alaska'</i>	24-30"	18-24"	S	M	Long blooming white daisy flowers
Snow-in-Summer	<i>Cerastium tomentosum</i>	6"-12"	9"	S	L	Aggressive, silvery-gray ground cover
Sweet Woodruff	<i>Galium odoratum</i>	6"-8"	15"+	PS - SH	M	Aggressive spreader; small white flowers
Veronica	<i>Veronica spicata</i>	12-18"	12-18"	S	M	Flower spikes
Vervian	<i>Verbena bipinnatifida</i>	3-6"	12-18"	S	L	Groundcover with rose-purple flowers
Zagreb Coreopsis	<i>Coreopsis verticillata 'Zagreb'</i>	18"	18"	S	L	Dark gold flowers all summer

Centerra Plant List

EXPOSURE	WATER USE	COMMENTS
S FULL SUN	VL VERY LOW	D REQUIRES GOOD DRAINAGE
PS PART SHADE	L LOW	P REQUIRES PROTECTION
SH FULL SHADE	M MEDIUM	L LIMITED AVAILABILITY
	H HIGH	N* NATIVE TO CENTERRA
		C NATIVE TO COLORADO

ORNAMENTAL GRASSES

COMMON NAME	BOTANICAL NAME	Height	Spread	Exposure	Water Use	Comments
Blue Avena Grass	<i>Helictotrichon sempervirens</i>	2'-3'	24"	S - PS	L	Blue-gray 'evergreen' with seed spikes
Big Bluestem Grass	<i>Andropogon gerardii</i>	4-6'	2-3'	S	L	N* - Warm season, large clumps, fall color
Blue Fescue	<i>Festuca glauca</i> 'Elijah Blue'	6-8"	6-8"	S	L	Powdery blue foliage with seed spikes
Feather Reed Grass	<i>Calamagrostis acutiflora</i> 'Karl Foerster'	3'-4'	2'	S-PS	L	Upright clump, often cut back in spring
Hameln Grass	<i>Pennisetum alopecuroides</i> 'Hameln'	1-2'	12-18"	S	L	Small fountain form with showy flowers
Indian Grass	<i>Sorghastrum nutans</i> 'Indian Steel'	4-7'	2'-3'	S	L	Coarse clumps of steel blue 1/2" blades
Indian Rice Grass	<i>Achnatherum (Oryzopsis) hymenoides</i>	15-18"	12-18"	PS	VL	L, N* - Airy cool-season bunch grass
Little Blue Stem	<i>Schizachyrum scoparium</i>	3-4'	24-30"	S	L	N* - Blue gray clump, copper red winter
Maiden Grass	<i>Miscanthus sinensis</i> 'Morning Light'	4'-5'	4'-5'	S	M	Graceful narrow arching foliage
Prairie Dropseed	<i>Sporobolus heterolepsis</i>	8-24"		S	L	N* - Arching low clump
Plume Grass	<i>Erianthus ravennae</i>	8'-10'	4'-5'	S	M	Tallest ornamental grass
Purple Maiden Grass	<i>Miscanthus sinensis</i> 'Purpurascens'	3-4'	2-3'	S	M	Upright clump, green; burgundy in winter
Red Switch Grass	<i>Panicum virgatum</i> 'Shenandoah'	3'-4'	3'	S	L	N* - Burgandy-wine fall color
Switch Grass	<i>Panicum virgatum</i> 'Heavy Metal'	3'-4'	2'	S	L	N* - Stiff upright habit, metallic blue leaves
Thread Grass	<i>Stipa tenuissima</i>	2'-3'	18"-24"	S	L	Soft fine texture, great movement

Irrigation Design and Construction Criteria

Centerra is intended to be developed in a manner which is responsive to many environmental considerations, one of the most important being water conservation. This concern for water conservation must be reflected in efficient application and effective management of landscape irrigation.

Efficient irrigation is first made possible through proper evaluation of project requirements and appropriate irrigation design, utilizing current technology and methods for determining the most effective irrigation approach. It is also vital for water conservation to incorporate proper management tools within the irrigation system design, to maximize the ability to fine tune water applications specific for individual landscape water requirements.

1.0 Irrigation Design Criteria For Water Supply And Distribution

1.1 Policy

Irrigation Design shall be submitted with Landscape Plans to DRC for approval. Zone precipitation rates and irrigation zone run times must be included on the Irrigation Plans. Irrigation run times shall be based upon providing 1-1/2 inches of water per week. All irrigation improvements shall allow for the option of utilizing non-potable water as provided by a separate entity of **Centerra**. All systems shall be capable of applying peak water requirements during optimum night time period with no daytime watering allowed, except during establishment. As-Builts Irrigation Plans shall be submitted upon completion of construction.

1.2 Criteria

1.2.1 Water Demand Analysis – Complete the worksheet for each designed landscape and submit with landscape and irrigation plans to the DRC for review (see figure 23).

1.2.2 Irrigation Water Supply/Point of Connection

- a). Provide tapped connection to the City of Loveland potable water system and extend

service line to road right-of-way.

- b). Provide either a turbine type or compound water meter downstream of tapped connection for total volume water use readings.
- c). Provide FEBCO 825 YA reduced pressure assembly with a downstream blowout
- d). A solenoid operated master valve is required equipment for tenant sites as added protection against continuous water discharge in the event of a mainline break. Master valve is to be connected immediately downstream of water meter, or backflow preventer for potable water systems, and make control wire connection to tenant control system.
- e). A Data Industrial Flow Meter, or approved equal, is to be installed after the master valve per manufacturer's recommended volumetric flow for various pipe sizes. Two additional blue control wires, 14 gauge or larger, shall be run to the irrigation controller.
- f). Provide curb ball stop valve and a 3/4-inch brass blow out assembly for winterization purposes (not inverted).

1.2.3 Distribution Piping System (Mainline Pipe)

- a). Determine routing of distribution piping system so as to not conflict with common area irrigation, tree locations, and paved surfaces. Maintain a minimum distance from any structures of ten (10) feet, or greater if required by soil engineer recommendations.
- b). Size distribution piping system to allow peak demand flows as determined by the Water Demand Analysis worksheet. Do not exceed velocities of 5 F.P.S. Allow for simultaneous controller or remote control valve operation as necessary.
- c). Provide quick coupling valves at point of connection and dead ends of piping runs (minimum) to facilitate expelling water from distribution piping system for winterization of system. In addition, quick coupling valves shall be located at every 300 feet of continuous mainline runs.

2.0 Irrigation Design Criteria for Control System

2.1 Policy

2.1.1 All common area irrigation shall be integrated and compatible with Centerra central control system, which is capable of communicating with all field satellite units via radio, as well as assessing and downloading environmental data from on-site weather station. Communication method shall be in compliance with control system manufacturer's instructions and current Centerra's master plan.

2.1.2 All irrigation control systems on individual building sites are to utilize current technology compatible with Centerra's central control system, and capable of addressing individual landscape water requirements and appropriate scheduling needs to maximize water conservation potential.

2.2 Criteria

2.2.1 Common Area Control Systems

- a). All field satellite control units shall be Toro Sentinel, with keypad operation and data flow interface housed in locking stainless steel enclosure. No wall mount units are acceptable.
- b). Field satellite units are to be located in discreet positions within right-of-way, screened from road view but readily accessible from front and top to maintenance personnel. Locate behind signage and/or berming whenever possible.
- c). Ground field units to maximum level recommended by manufacturer, with output surge boards and protected switches.

2.2.2 Individual Building Site Control Systems

- a). All individual building site controllers shall be Toro Sentinel field satellites with keypad operation and data flow interface. Control-

ler must be located at an outside location, approved by the Centerra Design Review Committee.

- b). Controllers shall be sized and configured as needed in order to not exceed the maximum instantaneous flow calculated on the Water Demand Analysis Worksheet and to not exceed the maximum watering window of 9 hours. Design drawings must contain note indicating that the controllers are to operate valves either sequentially or simultaneously as necessary to complete the required water application in the appropriate "window", without exceeding the maximum tap and system flow rates.

3.0 Irrigation Design Criteria For Planting Areas

3.1 Policy

The Centerra site's exposure to wind and interest in water conservation. Necessitate the use of drip irrigation for plant material whenever possible. Plant material irrigated with overhead spray should be minimized. Tree and shrub planting in low water or non-irrigated grass areas are to be supplemented with a permanent drip irrigation system.

3.2 Tree Planting

- a). Provide drip emitters equally spaced around root ball edge a maximum of 18 inches on center.
- b). Use 1.0 GPH emitters on 2-inch caliper and smaller deciduous trees, and 8 feet and smaller evergreen trees. Use 2.0 GPH emitters on deciduous trees greater than 2-inch caliper size and evergreen trees over 8 feet.
- c). Zone trees separately based on exposure to wind, building shade, and paving reflection.

- d). Do not permanently drip irrigate material located in regularly watered and mowed cool season turf grass areas. Supplement trees with drip irrigation if located in areas of low water (warm season grass) or no water (native grass).
- e). All drip and emitter tubing to be buried a minimum of 8 inches below finish grade in grass areas, and under landscape fabric and mulch in planting beds.
- f). Provide quick coupling valves as necessary to reach all drip irrigated plant material with maximum 300-foot hose.

3.3 Shrub Planting

- a). Provide drip irrigation to all plant material 1 gallon and larger in size, or plant material spaced 18 inches on center or greater.
- b). Use 1 GPH emitters on all shrub material, 2 per plant unless 1 gallon or smaller spaced less than 24 inches on center.
- c). Zone shrubs separately based on hydrozone (low, medium, high water req.), exposure to wind, building shade, and paving reflection.
- d). All drip and emitter tubing to be buried below landscape mulch.

3.4 Groundcover, Annual, Perennial Planting

- a). All groundcover spaced 18 inches or greater to be drip irrigated. Perennial plantings to be reviewed by species for capability of being drip irrigated.
- b). All annuals as well as appropriate perennials and groundcover are to be spray irrigated with 6-inch or 12 inch pop-up spray heads. Low precipitation nozzles are allowable if bed width is 5 feet or less, except in street medians which have a 10' minimum dimension for plantings.
- c). Zone annual areas separate from groundcover and perennials.

- d). Zone separately based on hydrozone, building shade, and paving reflection.
- e). No direct spray on signage, structures, or paved surfaces is allowable.

4.0 Irrigation Design Criteria for Turfgrass Areas

4.1 Policy

Turf grass irrigation is the largest consumptive water use element of landscape irrigation at Centerra. As such, it is essential to utilize the most sophisticated design techniques and methods practical to maximize application efficiency. The design goal for all overhead turf grass irrigation is to create a uniform water distribution pattern, taking into account wind velocity, landforms, and tree obstructions.

4.2 Criteria

4.2.1 Turfgrass Species

- a). Areas of turf grass species mix must be irrigated separately through valve zoning from pure species or species blends, e.g.: blue rye fescue mix to be separate from a bluegrass blend.
- b). Areas of turf grass, which are intended to receive differing maintenance and/or varying mowing heights, are to be separated through valve zoning, to allow for different water applications and scheduling even though turf grass type is identical.

4.2.2 Design Approach

- a). Roadways are to be bordered with pop-up spray heads or low trajectory pop-up rotors equipped with built in check valves to prevent low head drain down along roadways.
- b). No public sidewalk is to be overthrown or receive direct overspray. Only walkways less than 5' wide, which meander through open space areas, may be overthrown.

- c). Care is to be taken to avoid any direct or wind blown spray onto any roadways, parking lots, hardscape surfaces, or structures. Wind sensor technology will be utilized with the central control system to adjust watering schedules during periods of high wind. Additionally, low trajectory nozzles and subsurface irrigation shall be used as necessary.
- d). Large turf areas may be irrigated with rotors.
- e). Native grass may be irrigated with impacts.
- f). Design irrigation to adequately address landforms through zoning and head placement, to allow tops of berming and areas of slope to receive individualized water applications and scheduling.
- g). Illustrate location of evergreen and large deciduous trees on irrigation design drawings. Select irrigation equipment, space heads, and zone accordingly to allow uniform water distribution in and around obstructive plant material.
- h). Design laterals to allow for zoning according to varying exposure, topography, building shade, and paving reflection.
- i). All head spacing to be adjusted for constant 10 MPH wind condition.
- j). Provide adjustable pressure regulating control valves or individual pressure regulation valve downstream of control valve, on all zones that should be reduced by 20 PSI or more to allow heads on that zone to operate at the manufacturer's recommended operating pressure. For spray sprinkler laterals, a pressure compensating device integral to the sprinkler head is acceptable.
- k). Laterals shall be designed so that all heads on that zone shall operate within a 10% pressure differential. Provide sprinkler head check valves with pressure reducing capability on all sprinklers to reduce low head drainage.
- l). All piping is to be PVC.

- m). Drip zones serving multiple beds shall be zone controlled using ball valves to isolate individual planting beds.

5.0 System Management Guidelines

5.1 It is the Owner's responsibility to supply all construction documents in their entirety, including the plans, specifications, details, these notes, and the Contractor-drawn "as-built" plans, to any future Owner, maintenance company, or Homeowner's Association.

5.2 The purpose of this irrigation system is to provide water to supplement natural precipitation, such that the plant life is sufficiently maintained. The amount of water applied shall be the minimum amount necessary to result in plant life of acceptable health and vigor. The irrigation application shall be in accordance with the local historical evapotranspiration (ET) rate curve and modified in response to recent ET rates. Although during periods of extreme ET the amount of water applied will need to be greater than the historical ET value, at no time shall it exceed the historical ET by more than 30%. ET data will be available from an on-site weather station, which will download weather data to the irrigation central control system.

5.3 Soil moisture conditions shall be routinely monitored by a qualified individual with a suitable soil sampling tube and auger. This shall be performed in order to determine if acceptable moisture conditions, as defined above, are being maintained. The irrigation schedule shall be adjusted accordingly, depending upon the results of this monitoring.

5.4 Short, multiple irrigation cycles shall be utilized as necessary to minimize ponding and runoff.

5.5 At no time shall water be applied to cause soil saturation. Over-watering can result in death of plants and soil expansion, causing possible damage to pavement and foundations. A qualified structural engineer shall be retained on at least an annual basis to inspect roadway pavement and building structures for damage due to excessive soil moisture.

5.6 Inspections of the irrigation system shall be made on a daily basis to observe and provide repairs or remedies to the following unacceptable problems:

5.6.1 Over-spray on sidewalks, streets, paved areas, fences, walls, buildings, or other structures.

5.6.2 Drainage or run-off across sidewalks, streets, or paved areas.

5.6.3 Irrigation ponding on any landscape surface, sidewalk, street, or paved area.

5.6.4 Damaged, leaking, or improperly operating sprinklers, pipe, valves, controllers, or other irrigation equipment.

5.7 Only qualified Landscape Contractors and Landscape Maintenance individual shall provide or make repairs to the irrigation system.

5.8 At all times, the Landscape Contractor or Maintenance Contractor shall assign a qualified individual or individuals to inspect and monitor the irrigation system. Owner's Representatives shall be supplied with 24 hour emergency phone numbers for use in reporting broken or damaged irrigation equipment.

5.9 All irrigation equipment requires routine and methodical maintenance, cleaning, adjustment, parts inspection and replacement. It is the responsibility of the Landscape Contractor or landscape maintenance company to provide these services on a regular and continual basis.

5.10 The responsibility of ensuring that the above system management guidelines are properly observed is that of the Owner. The Irrigation Consultant has been retained to prepare construction documents only and does not provide post-construction reviews nor review of on-site maintenance. The Irrigation Consultant does not assume responsibility nor liability for ongoing maintenance of the irrigation system.

6.0 Operational Manual

6.1 Description of Equipment

6.1.1 Impact Rotor Sprinklers

Impact rotors have a pop-up height of approximately 5 inches, and are used to irrigate medium to large turf areas or to irrigate turf along sidewalks. They have plastic cases with plastic internal assemblies. These sprinklers are either part circle with an infinitely adjustable arc, or full circle. The model series of sprinkler installed on this project have a radius of throw of approximately 40 feet.

All impact sprinklers operate in the same basic fashion. Water enters the bottom of the sprinkler through the bearing nipple, proceeds up through the body and exits out the nozzle. When the water hits the arm, it is propelled out away from the sprinkler. This action causes the arm to pivot away from the water stream, creating tension on the arm spring. When the spring tension is stronger than the force against it, the arm moves quickly toward the water stream and "impacts" against the body. This "impact" causes the sprinkler to turn in a consistent manner throughout the sprinklers set arc of rotation.

6.1.2 Closed Case Rotor Sprinklers

A distinguishing mark of a closed case rotor is that it's housing (case) is closed to the elements of dirt, sand, grass and other debris. Another distinctive is it's small exposed top diameter. These design features make it the rotor of choice in turf areas used for recreational purposes, and eliminates maintenance required due to entrapped debris in the case.

6.1.3 Pop-up Spray Sprinklers

These sprinklers include a range in pop-up heights, with the 4-inch and 12-inch being utilized on this project. The 4-inch pop-ups are utilized

in turf areas with widths generally less than 25 feet. They are also useful in irrigating slightly larger turf areas that are not conducive to rotor sprinklers due to being more oddly-shaped, such as with curved boundaries. The 12-inch pop-ups are used in the same sort of geometries but in planting beds rather than turf areas, where the additional height is necessary for the spray to clear plant material. The matched precipitation spray nozzles are available in set arcs of between 60 degrees and 360 degrees and with radii of throw of 10, 12, and 15 feet (at a pressure of 30 psi). The radius of throw is adjustable down to approximately 75% of the full radius.

6.1.4 Pressure Compensating Drip Emitters

These emitters are used to irrigate shrubs and trees in planting beds, and have the advantage of delivering a fairly uniform flow rate over a large operating pressure range.

6.1.5 Remote Control Valves

Remote control valves (RCV's) are installed on the mainline as a means of controlling the distribution and timing of irrigation to individual laterals. The valves covered in this section will be electrically operated. All remote control valves can be separated into two different types. The difference between the two is how the water enters the upper chamber. This chamber is the area between the cover and the top side of the diaphragm. Once the water has entered the upper chamber there are only two paths for it to escape, the manual bleed, or the solenoid exhaust port.

In a **reverse flow** valve the water can enter the upper chamber in several ways. Through an external tube that runs from the pressure side to the upper chamber, or through holes in the outer edge of the diaphragm, or through ports machined in the valve body. In a **forward flow** valve the water enters the upper chamber through a port in the center of the diaphragm.

This port will normally be filtered. It is important that the filter is kept clean.

In normal operation, water enters the valve on the pressure side (usually the side opposite the solenoid). The water will then enter and fill the upper chamber through the path provided in the valve. When operating properly, this water is trapped in the upper chamber. The valve will only open once the force above the diaphragm has been relieved. This can happen in either of two ways, the solenoid has been energized by the controller, or the manual bleed has been activated.

6.1.6 Quick Coupling Valves

Quick coupling valves are installed on the irrigation mainline for incidental watering purposes. The quick coupling valves are activated by inserting a special lug key into the valve. The key can be equipped with a hose swivel ell for manual watering or for use with a sprinkler. Quick coupling valves equipped with a hose swivel ell are very useful in the establishment of plant materials. This particular quick coupling valve is one piece, bronze construction, with a yellow rubber cover.

6.1.7 Gate Valves

Gate valves are installed on the irrigation system mainline, and are used to isolate certain sections of a mainline for ease of repair and maintenance. The isolation gate valves are sized to match the mainline pipe. Gate valves are bronze, with threaded connections on 2-inch and smaller valves. The 3-inch and larger valves have a resilient seat and cast iron body with flanged or mechanical joints.

6.1.8 Pressure Reducing Valves

Pressure reducing valves (PRV's) are used to reduce irrigation system pressure downstream of the installed location in order to minimize equipment wear and malfunction, and pipe fitting failure. The use of pressure reducing valves on this project will be limited to area which would have City water pressures exceeding 80 PSI at the meter. Regularly scheduled maintenance and freeze protection is required for these valves to insure reliable operation and system protection.

6.1.9 Irrigation Control System

The irrigation controller is the time clock for the irrigation system. The controller actuates the solenoid valves for the specific time and duration a sprinkler or drip lateral operates. All scheduling of valves and setting of the time clock may be accomplished at the field controller. The water budgeting feature on these controllers may be used to reduce or increase by a percentage factor the irrigation times for all stations for seasonal controller adjustment. The overall effect of using the water budgeting feature is to reduce water waste, and still provide adequate irrigation water to properly maintain the landscape.

6.1.10 Central Control System

The irrigation controller is the time clock for the irrigation system. The controller actuates the solenoid valves for the specific time and duration a sprinkler or drip lateral operates. With the addition of a centralized control system the irrigation supervisor has the ability to reduce irrigation times on cool days, increase the time on warm days, and delete irrigations on rain or high wind days, all from a central location. The overall effect of using the central irrigation controller is to reduce water waste, and still provide adequate irrigation water to properly maintain the landscape. **Refer to the manufacturer's maintenance manual for further information on this equipment.**

6.1.11 Mainline and Lateral Pipe

All of the mainline pipe is solvent weld or gasketed Class 200 PVC. The lateral pipe is solvent weld Class 200 PVC. Concrete thrust blocks have been poured at all fittings, sizes 3-inch and larger and at all gasketed fittings.

7.0 General Operation

7.1 System Start-up and Shut-down

Considering the fact that the climate in Loveland is cold enough to necessitate winterization of the irrigation system, there will be an annual spring start-up and autumn shut-down requirement. This will consist of expelling water from the entire system, including the inlet and outlet riser to the backflow prevention assembly, as well as insuring that the mainline piping and any other components between the City water meter and the backflow preventer are protected.

Additionally, in the event of mainline pipe or component repair, the following general information is provided.

For the repair of any one section of mainline or a mainline component, the irrigation system should be shut down at the first available upstream valve. This would be either at an isolation gate valve or at the point-of-connection for that mainline. After the repair is completed, the valve should be opened gradually, in order to minimize the possibility of water hammer. Furthermore, in order to bleed air from the system, a nearby downstream quick coupling valve or a sprinkler lateral should be opened/activated while the valve is gradually opened. After a sufficient amount of water has passed through the system to purge entrapped air, the quick coupling valve or sprinkler lateral may be closed.

7.2 Scheduling

Irrigation scheduling is defined as the management process of determining and implementing the timing and duration of irrigation applications. The key information required for scheduling irrigations is evapotranspiration

rates through the growing season. Evapotranspiration (ET) is the amount of water transpired from plant material and evaporated from the plant and soil surfaces.

An ET rate curve is a graphical representation of the ET as it varies throughout the "average" growing season. An on-site weather station will download ET data on a daily basis to the central software.

In addition to monitoring the health of plant material and relating the depth of irrigations to the evapotranspiration, a valuable irrigation scheduling tool is a soil probe. A soil probe is a metal tube of approximately one inch in diameter and varying length that is pushed or driven into the soil in order to extract a soil core sample. It is a simple, quick, and inexpensive means of determining the soil moisture content at various depths within the soil. Used in this way it is a helpful, supplemental method of monitoring irrigation applications and effectiveness.

Soil moisture sensors can be an effective adjunct for a centrally-controlled irrigation system. These sensors are installed in representative locations in the landscape and are useful in terminating an irrigation cycle when a pre-set moisture level is reached. In this way, if previous irrigation or rainfall has been sufficient to meet the landscape's water requirements, the moisture sensor will shut down irrigation until such a time that the soil has dried out sufficiently to drop below the pre-set level.

8.0 Routine General Monitoring

8.1 Need for General Monitoring

The visual appearance and the very life of the landscape plant material is dependent upon the proper functioning of the irrigation system. For that reason it is imperative that the irrigation system be routinely monitored. The visual appearance of the landscape plant material can provide valuable feedback about the functioning of the irrigation system. There are three general factors that contribute to the need for this monitoring:

8.1.1 The ever-changing water needs of the plant material, dependent upon seasonal variations and life cycle variations.

8.1.2 Variable weather conditions, and its effect upon the water needs of the landscape.

8.1.3 The condition of the irrigation system itself.

8.2 What to Look for in General Monitoring

There are several key areas to look for when engaging in general monitoring of the landscape and irrigation system. Some of these necessitate watching the irrigation system operate, while others can be observed without the system operating. The key areas are:

8.2.1 Adequate and uniform coverage for all areas. This involves watching for dry spots, stressed plant material, and over- or under-adjusted radii and arcs of throw for sprinklers.

8.2.2 Excessively wet areas, possibly indicating pipe breakage.

8.2.3 Broken or stuck sprinkler heads.

8.2.4 Overspray onto walkways, roads, buildings, parked cars, or other hardscapes.

8.3 Scheduled Routine Inspections

On a pre-established and routine basis, the irrigation system should be inspected in a more thorough manner than that possible with the general monitoring described above. This inspection process involves sequencing through all of the controller stations to verify proper operation of the controller, valves, sprinklers and drip emitters. With the size of this system, it would probably be desirable, to break this inspection process up into more numerous inspections of portions of the system spread out during the year. As a suggestion, these portions of the system could be defined by the point-of-connection.

When a problem is observed it should be corrected as soon as possible. The Adjustment, Maintenance and Troubleshooting of Equipment section that follows is intended to aid in the correction of problems observed through general monitoring.

9.0 Adjustment, Maintenance And Troubleshooting Of Equipment

9.1 Impact Rotor Sprinklers

9.1.1 Adjustment

When an impact sprinkler has a radius of throw adjustment, it is typically accomplished with an adjusting pin that is held in place by means of a compression spring. Turning the pin in a clockwise direction will increase the breakup of the stream and shorten the distance of throw.

Arc adjustment for part circle impact sprinklers is typically made with the collar wires. For this adjustment a screwdriver should be inserted between the ears of the collar, and the screwdriver turned in the direction desired for moving the collar. The collars are held in place by the spring tension of the wire collars and care must be taken to not twist or crimp the collars. Use a screwdriver to adjust. Do not use pliers.

9.1.2 Maintenance

Impact sprinklers are generally manufactured to operate under a wide range of pressures. However, if exceptionally high pressure is encountered, the arm spring may have to be tightened at the top, about 1/16 to 1/8 inch. This will raise the maximum operation pressure to above 100 psi. (At extremely high pressures, the normal arm spring setting may result in the arm hitting on the backstroke, causing the sprinkler to stop rotating or rotate in reverse. Tightening the arm spring will correct the problem.)

Application of a foreign lubricant to a water lubricated impact style sprinkler is **not recommended**. This includes oil, WD-40, silicone, Teflon, pipe dope, etc. These foreign lubricants might make the sprinkler work right away, but it will actually cause the sprinkler to wear out faster. Foreign lubricants attract dust and debris. When lubricants are applied to the bearing washers initially, an oil base forms on the washers. This allows the sprinkler to spin freely for a short time only! Over time, dust is attracted to the washers on the bearing stack. This causes additional friction on the washers and causes them to wear out much faster. If foreign lubricants have been applied, all of the washers and seals need to be replaced. It is also a good idea to clean the brass at this time by a process called bead blasting.

9.1.3 Troubleshooting

First check for the obvious problems such as turf obstruction; dirt or debris in nozzle or case; excessive water pressure; broken arms, trips, etc.; foreign lubricants; inadequate water pressure. Other typical problems include:

- The sprinkler is stuck or won't return: The most common reason for this is water pressure that is too high or too low. Impact sprinklers can fail under either scenario. To determine the operating pressure, a pitot tube and a pressure gauge may be used to get a pressure reading at the head. This is done by placing the end of the pitot tube in the water stream, as close to the nozzle as possible. It is important not to place the end of the pitot tube inside of the nozzle opening. This can scratch the inner wall of the nozzle, as well as giving an inaccurate pressure reading.
- The sprinkler is leaking: This is normally caused by worn washers and seals. They should be replaced.
- The sprinkler is not throwing as far as it should: If the operating pressure has been

verified to be within specified range, then the cause is probably some type of blockage, either in the nozzle or the inlet screen. Cleaning the nozzle should be done with air, water or a soft bristled object (such as a pipe cleaner). Do not use wire or a screwdriver! This can scratch the nozzle.

9.1.4 Servicing

If the **Rain Bird Maxi-Paw** is being serviced, note that it has a feature that allows adjustment of the arm spring based on available pressure and nozzle size. This spring should stay in the "A" position if using the 8, 10 or 12 regular nozzles, or the 10 low angle nozzle. The spring should be moved to the "B" position when using the smaller nozzles. This is especially important when used in low pressure situations. If the spring is in the wrong position the Maxi Paw will not trip properly.

9.2 Pop-up Spray Sprinklers

9.2.1 Adjustment

The necessary adjustments for pop-up spray sprinklers are minimal. Occasionally an adjustment of the radius of throw is required. That is accomplished by turning the screw in the top of the nozzle in a clockwise or counter-clockwise direction as necessary to increase or decrease the throw. Care should be taken not to adjust the throw downward by more than 25% (For example, the lower limit of a 15-foot radius nozzle is approximately 11 feet). If further reduction of the radius is necessary, another size in the nozzle series should be considered.

The arc of throw may also occasionally need adjustment. The arcs for each of the nozzles is fixed, but the positioning of that arc can be adjusted. That is accomplished by either rotating the sprinkler body or by rotating the pop-up stem (when it has a ratchet mechanism). If the range of arc needs to be adjusted (as opposed

to the positioning of that arc), a different nozzle should be considered.

If variable arc nozzles (VAN) are used, first set the left stop. Then turn the knurled band on the nozzle to increase or decrease the angle of coverage.

9.2.2 Maintenance

The pop-up spray sprinklers have a screen that may occasionally require cleaning. This screen is accessed by simply unscrewing the nozzle from the top of the stem.

9.2.3 Troubleshooting

- Misting: This is a result of excessive water pressure. Reducing the pressure may be done in one of two ways. Either by using the flow control on the remote control valve, or by installing a pressure regulator before or on the valve.
- Inaccurate pattern: This is usually caused by some type of blockage, either in the nozzle itself or in the screen. Only water, air or a soft bristled object should be used to clean the nozzle. Use water to clean the screen.
- Leaking around the stem: This is usually caused by debris between the wiper seal and stem. A quick way to solve this problem is to step down lightly on the stem while the sprinkler is in operation. This causes water to flush quickly between the stem and cap, taking the debris with it. If this does not work, the cap is probably damaged and needs to be replaced.

9.3 Remote Control Valves

9.3.1 Adjustment

Typically the only adjustment required on a remote control valve is related to pressure regulation. On valves that have external pressure regulators, connect a pressure gauge to the schrader valve connection on the regulator. Adjust the regulator knob until the desired downstream pressure required for proper system operation is attained. This device will maintain the desired downstream pressure regardless of variations in supply pressure. Valves without pressure regulators can be adjusted to reduce the flow and downstream system pressure by turning down the flow control stem. However, it is not recommended to exceed a 25% reduction in pressure using this method.

9.3.2 Maintenance

Valves can be cleaned by removing the bonnet and accessing the diaphragm assembly. Remove debris that has collected in the upper chamber or below the diaphragm. Clean the solenoid screen of grit and organic material. Some solenoids can be disassembled and cleaned internally. Clean diaphragm screen or ports, external flow tube or other filters in the valve.

9.3.3 Troubleshooting

Before assuming that there is a valve problem, check the obvious. Is the water turned on, is the controller plugged in and programmed correctly, are there isolation valves that might be turned off? Verify valve operation by using the manual bleed, this might indicate a controller or wiring problem if the valve works properly when using the manual bleed. Typical problems include:

- a). Valve will not close: There are two things that will cause this. The first cause is a physical obstruction (rocks or other debris) preventing the diaphragm from seating. When removing a physical obstruction, be sure to

thoroughly inspect the diaphragm assembly and valve seat area for damage. The second reason is insufficient force being applied above the diaphragm. Probable causes:

- ⦿ The solenoid plunger is missing, or stuck in the up position. Remove and inspect the solenoid.
- ⦿ Diaphragm filter plugged. This will prevent water from entering the upper chamber.
- ⦿ Flow control turned up too high. The diaphragm can stick in the up position under low flow/low pressure conditions.
- ⦿ Constant voltage from the controller. The solenoid will usually be warm to the touch and a slight vibration can be felt if this is happening.
- ⦿ Leak between the bonnet and body. Water will be visibly leaking where the body and bonnet are connected. This will again prevent sufficient force from developing in the upper chamber.
- ⦿ An open manual bleed. An open external manual bleed will be very obvious. An internal manual bleed system can be unknowingly activated if the valve is unfamiliar to the customer.
- ⦿ A large hole in the diaphragm. (Forward flow valve only). Sufficient force will not build in the upper chamber. Remove the diaphragm assembly and inspect it very carefully, replace it if there are any bubbles or other signs of wear.
- ⦿ The valve is installed backwards. The arrows on the valve body indicate the direction of water flow through the valve.

- b). Valve seeping: This is usually indicated by a puddle at the lowest sprinkler head. Using an automotive stethoscope may aid in determining which valve is leaking in a manifold. There are two main causes for this to happen.

- ⦿ Solenoid, or solenoid seat is damaged. Water will constantly leak past the plunger. Replace the solenoid plunger or the seat if possible.

- ⦿ Valve seat is damaged. Check the valve seat and the diaphragm seating area for pitting and small debris. Replace the diaphragm if damaged, it may be necessary to replace the valve body if the seat area is damaged.

- c). Valve will not open: There are again two main causes of this problem. The first cause is an adjustment problem, the flow control stem is tightened all the way down. The second, is that the force is not being released from the upper chamber. Probable causes:

- ⦿ Solenoid burned out. A resistance test will verify if the coil is bad (Refer to the volt ohm-meter section to learn how to perform this test). Replace if necessary.

- ⦿ A torn diaphragm (Reverse flow valve only). The hole in the diaphragm will allow more water into the upper chamber than can be bled off through the solenoid port. Inspect the diaphragm, and replace it if necessary.

- ⦿ Plugged ports. The port below the solenoid, and/or the port leading to the solenoid chamber is plugged. This would again prevent the water in the upper chamber from being relieved. Clean the ports with a paper clip, never drill out the ports.

- ⦿ Solenoid not receiving voltage. The controller is not sending the necessary voltage, or there are wiring problems, or the wire connections are faulty (Refer to the volt ohm-meter section to learn how to inspect the field wiring).

9.3.4 Pressure Reducing Valves

For information on the operation, maintenance, and troubleshooting of the pressure reducing valves, refer to the manufacturer's manual.

9.3.5 Irrigation Control System

This section will describe some troubleshooting procedures that will determine if the controller is indeed the bad component in the irriga-

tion system. The controller is usually the first component blamed from an irrigation system failure. Typically, once the controller has been removed and taken to a repair facility, more than 25% are returned without a defect being found in the controller.

Controller Check: Before removing the controller it is recommended that the following are checked:

- a). Programming - A program consists of three steps:

Start time - The time of day that the irrigation should begin.

Run time - The irrigation duration for each station.

Days on - The day that the irrigation will operate.

If any of these steps are missing, the controller will not activate the valves.

- b). Auto/Off switch - This switch must be in the AUTOMATIC or ON position in order for the controller to operate.

- c). Sensors - If the controller is equipped with a rain sensor or moisture sensor, the program will not run if they have been activated.

9.3.6 Hybrid/Solid State Troubleshooting

Hybrid and solid state controllers are designed to provide the programming versatility that is needed to better protect our water resources. The technology that is necessary to accomplish this makes repairs by untrained persons nearly impossible. The following items should be checked before assuming that the controller is the problem:

- a). Visible damage - Inspect the controller for any visible signs of damage. Check the keyboard for collapsed buttons, run your finger lightly over each of the buttons, a slight "hill" should be felt at each location. If a "valley" is felt then the keyboard must be replaced. Inspect the printed circuit board for burned components, this is normally caused by lightning or, other power surges.

- b). Primary power - Verify that the primary power is within acceptable limits. Contact an electrician if incorrect.
- c). Transformer - Verify that the transformer output voltage is between 24 and 28 VAC, if the output voltage is zero, and the primary power is correct, then replace the transformer.
- d). Circuit breaker/Fuse - Check the condition of the circuit breaker or fuse. If it has blown, the most likely reason is a field wiring short. When this happens, it only interrupts the 24 volt section of the transformer. The 12 volt section will remain active, therefore the display will show that the station is on. Press the appropriate button(s) on the keypad to turn the active station(s) off. Reset the circuit breaker, or replace the fuse with the value specified by the manufacturer. Manually advance the controller to station #1 and allow it to run for one minute. If station #1 operates correctly then advance to station #2 and repeat this procedure until the fuse blows. This will determine the problem station. Once the defective station has been located, disconnect the wire that operates that valve. Continue the above procedure to test the rest of the stations, as there could be more than one problem. Once this has been completed the controller will operate all of the stations that are still connected. The faulty field wiring will have to be repaired before it can be reconnected to the controller.
- e). Microprocessor lockup problems - The microprocessor is the “brains” of the controller. Occasionally due to electrical problems the microprocessor will freeze all of its functions. The symptoms of this are:
 - Display blank; the display does not show any information, or
 - Frozen display with the display showing erratic information that cannot be cleared or changed from the keypad and the controller will not perform any of its programmed functions.

If the following steps are taken, the microprocessor will usually resume its normal functions. It will be necessary to completely power down the controller.

Note: This process will delete your existing program!

- Primary power - It is necessary to disconnect the controller from its primary electrical source either by unplugging it from the outlet or by turning off the appropriate circuit breaker in the electrical panel.
- Battery backup - Remove the battery from the controller. The purpose of the battery is to maintain the information inside of the microprocessor in the event of a primary power failure. By removing the battery the microprocessor is allowed to reset itself to its normal condition.
- Wait - Maintain this power down condition for 5 minutes to be certain the microprocessor will reset itself.
- Primary power - Reconnect the primary power to the controller.
- Function check - The display should now show 12:00 A.M. Set the time and day to the current setting. Using the manual controller function, turn on several stations and observe that they operate properly.

If the controller now operates properly re-enter your original program and continue to step f.

If controller still will not perform correctly it will need to be repaired by a qualified repair facility.

- Battery replacement - If the controller uses an alkaline battery, it is recommended that it be replaced with a new one at this time. Reinstall the correct battery in the controller and perform a final resistance test to ensure proper operation. This procedure will normally resolve approximately 30% of the solid state “failures”.

9.3.7 Central Control System

For information on the operation, maintenance, and troubleshooting of the central control system, refer to the manufacturer’s manual.

Spray Zone Example Base Schedule Worksheet

SPRAY ZONE EXAMPLE BASE SCHEDULE WORKSHEET

PROJECT NAME: JOHN DOE PARKS DATE: 03/22/99
 PROJECT LOCATION: JOHN DOE PARKS NO.1
 CONTROLLER NO: 1 STATION NO: 1 REF. PERIOD MONTH OF: MAY

ITEM	SOURCE		VALUE	UNIT or FUNCTION
I. PLANT WATER REQUIREMENT				
A. PLANT MATERIAL	Audit or Planting Plan		<i>Ws</i>	classification
B. REFERENCE PERIOD	Judgment		31	days
C. REFERENCE ET (ET _o)	Various sources		6.5	inches of water
D. LANDSCAPE COEFFICIENT (K _L)	K _s <u>0.60</u> x K _d <u>1.0</u> x K _{mc} <u>1.0</u>		0.60	plant specific multiplier
(Optional) ALLOWABLE STRESS	K _L _____ x K _{as} _____		<i>N/A</i>	site specific multiplier
E. PLANT WATER REQUIREMENT (ET)	ET _o x K _L	C x D	3.9	inches
II. IRRIGATION WATER REQUIREMENT				
F. PRECIPITATION RATE (PR)	Audit or Calculation			inches per hour
G. DISTRIBUTION UNIFORMITY (DU)	Audit or Estimate			efficiency adjustment
H. IRRIGATION WATER REQUIREMENT	ET requirement	E/G		inches
I. TOTAL RUN TIME per PERIOD	Irrig. water requirement/PR	(H/F)x 60		minutes
III. SCHEDULING REQUIREMENTS				
J. ROOT ZONE SOIL TYPE	Audit or Estimate			classification
K. AVAILABLE WATER (AW)	Table			inches per inch of soil
L. ACTIVE ROOT ZONE DEPTH	Audit or Estimate			inches
M. PLANT AVAILABLE WATER (PAW)	AW x active root zone	K x L		inches
N. ALLOWABLE DEPLETION (AD)	PAW x MAD (see Table)			budget multiplier
O. IRRIGATION DAYS PER PERIOD	Plant ET/AD	E/N		days in a period
P. TOTAL RUN TIME per DAY	Total run-period/irrigation days per period	I/O		minutes
Q. RUN TIME per CYCLE	Audit or Calculation			minutes
R. CYCLES per DAY	Total run-day/run time-cycle	P/Q		repeats to avoid runoff

fig. 23

Natural Area and Detention/Water Quality Pond and Drainage Corridor Design Guidelines

Natural Area and Detention/Water Quality Pond and Drainage Corridor Design Guidelines

- NAT-2 · Introduction: Conservation Vision
- NAT-2 · Habitat Goals and Objectives
- NAT-3 · Habitat Guidelines Planning and Adaptive Management Process Overview
- NAT-3 · Inventory
- NAT-4 · Identification
- NAT-4 · Zoning
- NAT-4 · Design

Introduction: Conservation Vision

To create, restore, enhance, and protect diverse, healthy, and visually appealing historic native ecosystems that serve a variety of site appropriate Zdscape functions (ecosystem goods and services). These ecosystems will shape visitor movement and use patterns, wildlife use and movement, resource interpretation, and provide a backdrop for which conservation can occur.

High Plains Environmental Center and Centerra Habitat Guidelines



Habitat restoration in urban and suburban environments involves mimicking the proper composition and structure of food, water, shelter, and space as found in natural habitats. Additionally, it involves the functional processes necessary to perpetuate the habitat composition and structure. Restoration involves educating visitors about ethical wildlife viewing

and habitat appreciation. It also involves ecological designs that direct visitor activities and shape visitor use patterns. In some areas guidelines may require excluding visitors whereas other areas may be open and enhance visitor experiences with good views and interpretive areas.

Within Centerra, many areas of open space have been dedicated to serve as sustainable landscape for recreational enjoyment and as habitat for plants and wildlife. To make this open space the best habitat it can be, habitat goals have been established that will provide a larger opportunity for wildlife and plant habitat. The following guidelines have been developed to aid design teams and installation contractors in creating sustainable ecosystems to provide all of the desired landscape values - sense of place; landscape functions; as well as habitat for the conservation of plants and animals.

Index of Pages:

Habitat Guidelines Planning and Management	NAT 3 to 6
NAT APDX A Planting & Seeding Specifications	NAT APDX A-1 to A-8
NAT APDX B Plant Materials For Use in Natural Areas and Detention Ponds	NAT APDX B-1 to B-6
NAT APDX C Zoning & Design Charts for Centerra	NAT APDX C-1 to C-7
NAT APDX D Landscape Functions	NAT APDX D-1
NAT APDX E Restoration Decision Charts for the HPEC	NAT APDX E-1

Habitat Goals and Objectives:

1. Plant and Animal Diversity

Create and protect habitat for a diverse array of plants and animals, particularly birds, butterflies, amphibians, and rare wetland plants.

- Increase plant species diversity including the number and variety of butterfly host grasses, forbs, and shrubs as well as the number of nectar plants and shelter plants.
- Increase the number and variety of native shrubs and trees that provide valuable cover, berries, insects, nest sites and other resources for migratory, nesting, and wintering birds.
- Increase the number and variety of wetland-dependent reptiles and amphibians, especially creating better places for amphibian breeding to occur.

2. Aesthetic Appeal

Create a beautiful landscape that visitors will enjoy and appreciate without sacrificing its value for wildlife and plant habitat.

- Increase the amount of shade and resting areas along trails and open spaces while providing habitat for wildlife and viewing opportunities for visitors.
- Use plant species that maintain their beauty in a variety of seasons, such as a species with colorful and showy flowers, fall leaf color, winter texture, and grasses that persist through the winter while they provide good wildlife habitat.
- Use vegetation to frame viewsheds and enhance the natural aesthetic qualities of the site.

3. Stormwater Function

- Maintain the primary functions of detention ponds and stream drainages to attenuate floods and improve water quality while creating and improving wildlife habitat.
- Manage vegetation to insure proper drainage functions are maintained while allowing habitat values to be expressed to the extent possible.

4. Shape Visitor Use Patterns

Use available high water tables and stormwater runoff to create opportunities to improve and restore habitat while shaping visitor use patterns to improve the conservation value of the land.

- Create ecosystems where habitat can be established for American Black Currant, Giant Burreed, Sweet Flag, Tulip

Gentian, and other rare and interesting wetland plants. Use these resources to restore tallgrass prairie plant communities and other rare plant communities.

- b) Create ecosystems that will buffer high quality resources such as Western Grebe nesting areas from visitor disturbance and future community development.
- c) Improve duck nesting habitat by increasing the total tall wetland and subirrigated prairie as nesting cover, reducing susceptibility to predators and disturbance by visitors.
- d) Use water to wet areas and create denser plant communities that are attractive to wildlife while limiting human presence in these areas.
- e) Use water to enhance the overall site's species, habitat, and landscape diversity.

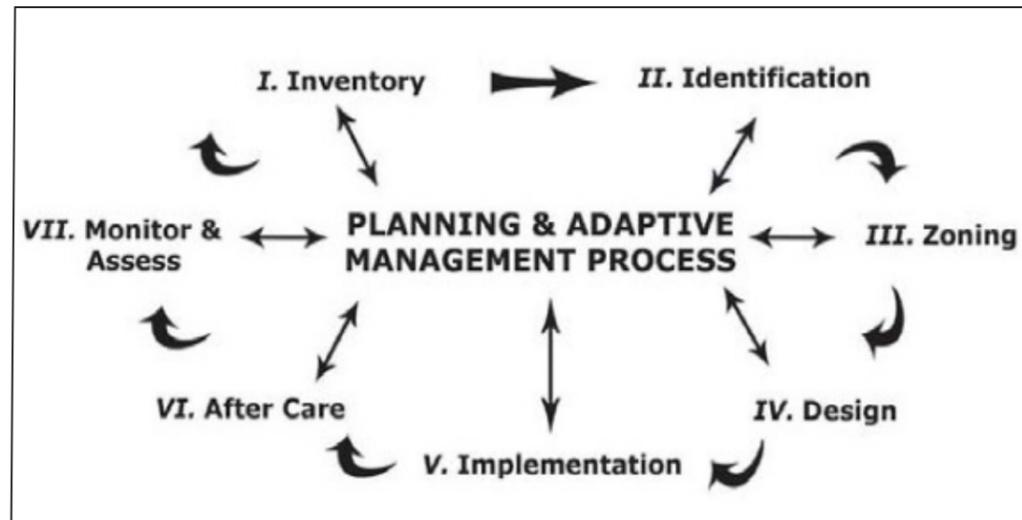
5. Sense of Place

Fit the character and context of the site and create a sense of place with the planned habitat modifications.

Habitat Guidelines Planning and Adaptive Management Process Overview

The following guidelines provide step by step instruction for applicants use during development of site design of natural areas, detention ponds and stream channels within Centerra. The steps are summarized below and then illustrated in more detail in the following paragraphs.

I. Inventory



- a) Assess the ecological and cultural site conditions of the proposed natural area, detention pond, stream channel ("project area"), and the adjacent lands.

II. Identification

- a) Determine the primary landscape functions (aesthetics, water and sediment, wildlife and plant conservation) that are important to the project area, any unique opportunities, and primary project constraints.

III. Zoning

- a) Delineate the project area into functional groups - those that have similar aesthetic needs and desires, similar water and sediment functions, and similar wildlife and animal conservation opportunities and constraints.

IV. Design

Develop a plan which mimics the specific ecological attributes and conditions found in high quality natu-

ral areas to achieve the landscape function and specific conservation goals desired in the project area. Use the design guidelines on NAT 4-6 and Appendix Charts 4-7. **The description of Design Principles, coupled with specific Design Guidelines and Standards is intended to assist in the identification and implementation of a strong, consistent design direction and level of quality. Standards [S] are to be treated as techniques that are mandatory. Guidelines reinforce the intent of the Principles, but may be subject to interpretation by the designer as approved by the Design Review Committee.**

V. Implementation

- a) Create the design in the project area making appropriate on-site adjustments to fit the specific site conditions.

VI. After Care

- a) Manage the project area making mid-course corrections and adapting the design to site conditions to achieve the landscape function and conservation goals.
- b) Provide a two year (minimum) management period. The period begins at the time of substantial completion for restoration areas.

VII. Monitoring and Assessment

- a) Create photo points, plots, transects, and collect appropriate information on the composition, structure, and functions on the project including the desired landscape functions and conservation goals.
- b) Feed this information back into the next project.

Habitat Guidelines Planning and Adaptive Management Process

I. Inventory

Obtain information on the following topics prior to developing a detention pond or natural area landscape plan.

- a) Topography, slope, and aspect (Civil).
- b) Determine hydrology including depth to groundwater (Geotechnical), and flood frequency intervals (Hydrology).
- c) Obtain agronomic soil tests from topsoil and subgrade. Submit soil samples to soil testing laboratory for an agronomic evaluation of texture, pH, salinity, and nutrients.
- d) Inventory existing undisturbed and disturbed plant communities, including noxious weeds. Evaluate wildlife potential as part of an environmental analysis.
- e) Evaluate the biological conservation potential of the project site and adjoining parcels including habitat patch size, corridors and connectivity, edge effects, and buffer potential. Evaluate cultural conditions and regional influences on the site such as proposed adjacent developments and other potentially connecting open lands. In addition, evaluate the relationship of the site to current and anticipated trails, developed recreation sites, level of human presence, and other recreational facilities.

II. Identification

- a) Based on the inventory, identify landscape functions that might be needed or best expressed on the site and determine the site's overall potential as a natural ecosystem including the opportunities and constraints of the site
- b) Typical landscape functions might include the following (See NAT Appendix D for a detailed description of the various functions):
 - 1.) Aesthetic Considerations:
 - c) Tall Visual Screen
 - d) Low Visual Screen

- e) Trail Screen
- f) Viewshed
- g) Viewshed Framing
- h) Auditory Screen
- i) Wind Moderator
- j) Temperature Moderator
- 2.) Water and Sediment
 - a) Water Quality Filter
 - b) Flood Attenuation
 - c) Erosion Control
 - d) Sediment Storage
- 3.) Wildlife and Plant Conservation
 - a) Movement Corridor
 - b) Stepping Stone
 - c) Buffers
 - d) Wildlife Breeding
 - e) Wildlife Feeding
 - f) Wildlife Resting
 - g) Migratory Stopover
 - h) Targeted Restoration Area
 - i) Protection of Local Existing Historic
 - j) Herbaceous Wetlands
 - k) Riparian Shrubland
 - l) Upland Shrubland
 - m) Park-like and Shrubby Woodlands
 - n) Short, Medium and Tallgrass Prairie

III. Zoning

Use Charts 1-7 in the NAT Appendix C, compiled with collected data to identify appropriate ecosystems and plant communities (additional plantlists can be found in the NAT Appendix B).

- a) Delineate land areas into functional groups which have similar desired landscape function.

IV. Design

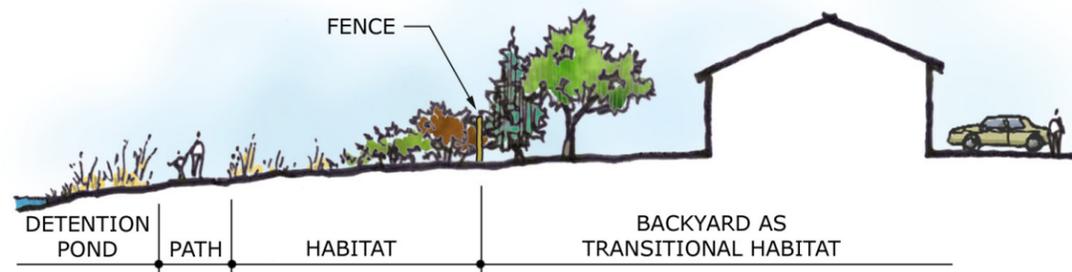
- a) General Design Considerations
 - S** 1. Create an ecosystem that is as diverse and practical as possible to accomplish the habitat goals as set forth in the goals section of these guidelines, keeping in mind the context of the site, including aesthetics and landscape functions.
 - S** 2. Mimic existing native ecosystems that are found in Colorado, from the base of the Rocky Mountains to the eastern edge of the state.
 - 3. Restore the site's composition (components), structure (horizontal and vertical arrangement), and to the extent possible the functions (processes and stressors).
 - 4. Detention ponds should be designed so that natural processes such as fire, flooding, grazing, and soil disturbances can be prescriptively applied on the site. These functional process help to reduce the dominance of aggressive plants, allowing opportunities for other conservative native plants to become established and aid in biological diversity.

- S** 5. Create unique opportunities for diversity by making flat areas more topographically diverse by creating a variety of slopes, aspects, and depths to ground water. Plant forbs, shrubs, or trees that compete better in these environments less suitable for grasses and grass-like plants, which generally dominate and out compete other plants in flat areas. Combine these techniques to create an array of diverse soils and exposures for plants and animals to thrive.
- S** 6. Use appropriate native plant materials from the closest ecotypes available in the seed and plant market (e.g.: Western Native Seed, Pawnee Buttes Seed Company, Arkansas Valley Seed).
- b) Other Design Considerations
 - 1. General Wildlife Considerations
 - a. If possible, open channel drainage into the detention ponds shall be used to facilitate habitat connectivity and reduce culvert maintenance issues. Oversize culverts to facilitate flood flow conveyance, wildlife movement through the structures, and easier access for maintenance.
 - b. Design detention ponds to the extent possible with positive grades to the outlet to limit mosquito production.
 - c. Fallen logs, old tree trunks, or large limbs can be added to the pond to provide perching sites for birds, basking areas for reptiles and amphibians, loafing sites for waterfowl, and add structural habitat elements to the detention basin. These need to be anchored to the bottom so that when water is in the basin they do not float up and clog outlet structures.
 - 2. Sedimentation, Erosion, and Water Flow
 - S** a. Critical flow areas, especially at inlets and outlets where erosion is possible, should be planted with wetland plugs and/or should be armored with permanent turf reinforcement mats as a substitute for at-grade riprap. Riprap may be used below-grade in certain situations, but should be limited on the surface to achieve a more natural appearance at the ponds and to improve water quality.
 - S** b. Proper grading should be used to facilitate the flow of water from outlet structures and to dissipate its energy.
 - S** c. Outlets need to be designed in such a way that the lakeshore, downstream wetlands or riparian areas are not degraded. Elevations need to be precise and field fit to make sure they work and do not degrade the area near the outlet. Run down channels may need to be created to a lower water line elevation depending on the slope of the lakeshore or the stream at the outlet. It will be important to design these outfalls correctly so as not to adversely impact high quality areas or, high quality receiving areas need to be created to be able to receive the additional flows. Knowledge of outlet release flows and velocities will be important, as well as current vegetation composition and structure at these outfall points.
 - S** d. Design drop structures to be aesthetically pleasing while still achieving energy dissipation characteristics. Drop Structure Examples:
 - e. Sediment catchments of unnatural sources such as parking lots and roads should be created as close



to the sediment source as possible to improve the water quality of receiving waters and downstream detention ponds. Design sediment traps for easy cleaning.

- f. In addition to 2e, or as a substitute, pre-forebays can be designed adjacent to detention ponds to act as a first filter before the main water quality or detention ponds. Design forebays for ease of maintenance and cleaning.
 - S** g. Design sides of ponds with a 4:1 or flatter slope to reduce the possibility of rill and gully erosion on slopes, improve the ability to manage these slopes, and to create wider planting zones for wetland and subirrigated plant species. Employ erosion control fabric or similar erosion control measures on slopes steeper than 6:1.
 - S** h. Depending on the water surface elevations and the size of the ponds, most ponds should be created with some topographic diversity on the bottom including high spots, low areas, and peninsulas of higher ground while maintaining positive drainage to the outlet. Retention of water is not permitted as per guidelines from the Loveland Airport. Some flat bottom ponds are permissible to add a diversity of ponds to the overall palette, but generally topographic variability adds to plant species diversity, structural complexity, aesthetic interest, and generally creates better habitat.
3. Aesthetics and Visitor Management
- S** a. Detention ponds should be integrated into the existing landscape so as not to be a visual intrusion but an enhancement to the topography and an aesthetic amenity.
 - S** b. Detention ponds in identified sensitive natural areas should be used strategically to shape visitor use patterns, to allow people to view wildlife and scenery while acting as a wildlife blind to screen movement of visitors. Properly sized berms integrated with the proper elevation of trail corridors can achieve this balance between good viewing opportunities while screening visitor movement. Vegetation on pond berms can help balance viewing lanes with screening as well. Detention ponds including berms and vegetation should be used to reduce the trail's zone of influence on the surrounding habitat. A well scaled cross sectional drawing including walkers (children and adults), bicyclists and vegetated berms can aid in designing these features. A variety of recreational and visual experiences are desired.
 - S** c. Access by trails should generally not encircle the entire pond in a loop fashion, unless the trail is screened or set back far enough so as not to disturb the whole shoreline.
4. Relationship to the Built Environment
- a. Generally buildings and homes constructed next to detention ponds and other habitats should “back”



to these areas and act as a viewing blind. The activities of people and associated facilities such as parking lots, public entrances, and primary doors should generally be on the opposite side from the detention ponds and other habitat areas.

- b. Buildings and homes should be set back to the degree possible so as to buffer high quality habitats. This will help to limit the intrusion of light, noise and pets into the open space.

- S** c. Landscaping on the habitat side of the building should consist of native plantings, to the degree possible, and provide a natural transition between the built environment, detention ponds, stream corridors, and other habitat areas.
 - S** d. All native and natural planting areas should use plants depicted in the NAT Appendix B.
 - S** e. All horticultural or non-native plants should be screened for invasiveness into natural areas by using the Nature Conservancy's Nature Serve Explorer web site as well as using a general Internet search with the “species name” and the word “invasiveness”. Invasive and aggressive non-native or horticultural plants should be strictly avoided, especially adjacent to natural areas, open spaces, or detention pond habitats where additional moisture may aid in the establishment and reproduction of these non-native plants. Nature Serve Website: <http://www.natureserve.org/explorer/servlet/NatureServe?init=Species>
 - S** f. Access trails or other entrance points into detention pond habitat and open space areas, especially HPEC lands, should be limited by design to selected areas that are not adjacent to high quality habitat.
 - S** g. The intrusion of light and noise should be limited in quality habitat areas. Install only low-level or ground level lights and cutoff lights so as to reduce impacts of light on wildlife, night time educational programs, and star viewing. The use of well designed berms with vegetation and other types of vegetated landscape buffers can be used to reduce noise and the effects of lighting. All lighting within the 20' boundary of natural areas should be 0.1 tenth footcandle or lower.
 - S** h. Dogs and cats can have a tremendous impact on native wildlife, particularly small mammals and songbirds. Provide appropriate signage that requires all pets to be leashed and kept on trails.
5. Trees, Shrubs and Vines
- a. Plant trees, shrubs, and vines after drill seeding, generally in the early spring or fall. This can be done right after the initial seeding effort or after herbaceous plants are established and weeds are under control. Remember that established grasses compete well with woody plants for water and nutrients, especially in fine textured soils. Planting woody plants in bare areas, providing supplemental water for two to three years, and mulching are helpful to get plants established. One gallon vines and five gallon trees and shrubs are recommended for good establishment.
 - S** b. Concentrate or mass woody plants into beds or planting zones to create more habitat impact for wildlife more quickly. This will also reduce watering, weeding, and other management costs. Steel header shall not be used to edge planting beds in natural areas.
 - S** c. Plant each species in the optimal moisture zones as per the tree and shrub list on page NAT Appendix B-4.
 - S** d. Select woody plants that can be used strategically above and around inlets and outlets to lessen the negative aesthetic affects of such man-made structures.
 - S** e. Trees and shrubs should be caged for several years to keep voles, cottontail rabbits, and beavers from chewing on the bark. Cages consist of an 18” to 24” diameter ring of ½” hardware cloth or narrow gauge chicken wire held down by rebar and landscape staples. Cages shall be installed prior to substantial completion.
 - S** f. Construct tree wells around each woody plant with 3-4” of wood chip mulch to help hold moisture, increase mycorrhizal activity, reduce weed and grass encroachment and competition, and direct supplemental water to the roots.
 - g. Masses of plants can be treated like a bed with each tree or shrub having an individual tree well. However, the entire bed may be caged as a group and the whole planting mass mulched. This reduces installation costs and may save wire.
6. Wetland and Sub-irrigated Plugs
- a. Generally, plugs are planted after drill seeding from mid-May through July. Planting small plugs in the fall is not generally recommended because of plant loss due to Canada geese herbivory. Planting plugs

can be done right after the initial seeding effort or after seeded herbaceous plants are established and weeds are under control. This could be 2 to 5 seasons after initial seeding. For these later plantings, wetland plugs should be concentrated in bare areas and areas needing erosion protection.

- b. Plant wetland and subirrigated plugs in super cells, 2.5" pots, deep pots, or one gallon plants for good establishment.
- c. Concentrate or mass wetland plugs in critical areas where erosion is anticipated or where moisture regimes favor establishment and growth of the particular species. Because water regimes are not always clearly known and weather patterns are not predictable,
- S** d. Plant each species in the optimal moisture zones as per the tree and shrub list on page NAT Appendix B-4.
- S** e. In addition to the above planting technique, if the hydrology is very unpredictable, use species with wider tolerances to moisture conditions and species with a taller stature so that they do not become completely inundated.
- f. Critical areas may be planted on one foot centers or two foot centers and can be protected with turf reinforcement mats, jute or other erosion control blankets, depending on the situation. With landowner permission and on non-jurisdictional sites, larger plugs may be selectively hand dug from open space areas to supplement purchased plant material, especially for stabilization of critical sites. See the Sedimentation, Erosion, and Water Flow Section, Page NAT-4 for use of plugs on inlets and outlets.
- g. Plugs can be used to improve habitat, add color and aesthetic interest, improve species diversity, or increase populations of unique and rare wetland plants.
- h. Selected wetland and subirrigated plugs can be used strategically around inlets and outlets to lessen the negative aesthetic affects of such man-made structures.
- i. If herbivory by geese, muskrats or other animals is anticipated or becomes a major problem, plugs can be caged or covered with chicken wire, jute, or other products to protect them. Grids of string slightly above the water elevation can also be laid out across the site to reduce waterfowl access to newly planted wetlands.
- S** j. Wetland plugs may be necessary in areas that cannot be seeded due to constant inundation or extreme saturation of the pond bottom or periodic inundation during the seasonal seeding windows. Pumping water out of the pond to seed or waiting for a dry period to seed may be another option to putting in plugs.
- S** k. Follow the specifications in the NAT Appendix A for seeding.

SEE APPENDIX FOR:

- V. Implementation
- VI. After Care
- VII. Monitoring & Assessment

NAT Appendices

NAT Appendices

- NAT-APDX A · Planting & Seeding Specifications
- NAT-APDX B · Plant Materials For Use in Natural Areas and Detention Ponds
- NAT-APDX C · Zoning & Design Charts for Centerra
- NAT-APDX D · Landscape Functions
- NAT-APDX E · Restoration Decision Charts for the HPEC

- NAT APDX A-1 to A-8
- NAT APDX B-1 to B-6
- NAT APDX C-1 to C-7
- NAT APDX D-1
- NAT APDX E-1

NAT Appendix A - Planting and Seeding Specifications

INDEX:

- A. General Seeding for Detention Ponds
- B. Detention Pond Easements, Construction and Restoration
- C. Wildflower Restoration
- D. After Care, Monitoring & Assessment

Pages NAT APDX A-1 to A-2
Pages NAT APDX A-2 to A-5
Pages NAT APDX A-5 to A-7
Page NAT APDX A-8

V. Implementation

A. General Seeding Guidelines for Ecological Zones in Detention Ponds Depending on Their Hydrological Regime

I. PLANTING PRIOR TO SITE DEVELOPMENT

If the detention pond is being created several years before the development occurs and before the pond will experience any consistent water regime, use the following seeding guidelines:

- a) Apply herbicides to weeds prior to beginning detention pond development to reduce noxious weeds and other aggressive non-desirable plants. Several seasons of weed control could greatly improve the establishment of desirable native vegetation. When controlling weeds just before the detention ponds are constructed, proper herbicide selection is important, preventing weeds from persisting in the soil, affecting seedling establishment or water quality.
- b) Seed with a Pre-development Mix which is a diverse mix with a wide ecological amplitude. In this mix there are species that can tolerate a wide array of moisture conditions. There are a few species that grow well in wet conditions, several species that can handle mesic conditions, and few species that grow in dry conditions (Seed Mix A).
- c) OR, if the water from the development will be arriving to the pond within one year, one could substitute a cover crop like Regreen, Quick Guard, or sterile oats for the Pre-development Mix. Do NOT use Cereal Rye (*Secale cereale*) or Wheat (*Triticum aestivum*), or other crop or non-native species that will persist or reseed after one year's growth. Cover crops should be sterile hybrids which are unable to reseed.
- d) Detention ponds need to be assessed the year before development is completed to determine if there is a need to reseed.
- e) Assessment should be ongoing as local or regional conditions in the watershed change which may affect the water regime, including periods of drought, frequent flooding, accelerated or delayed development schedules, or other factors which may affect establishment or survival of species seeded into detention ponds.

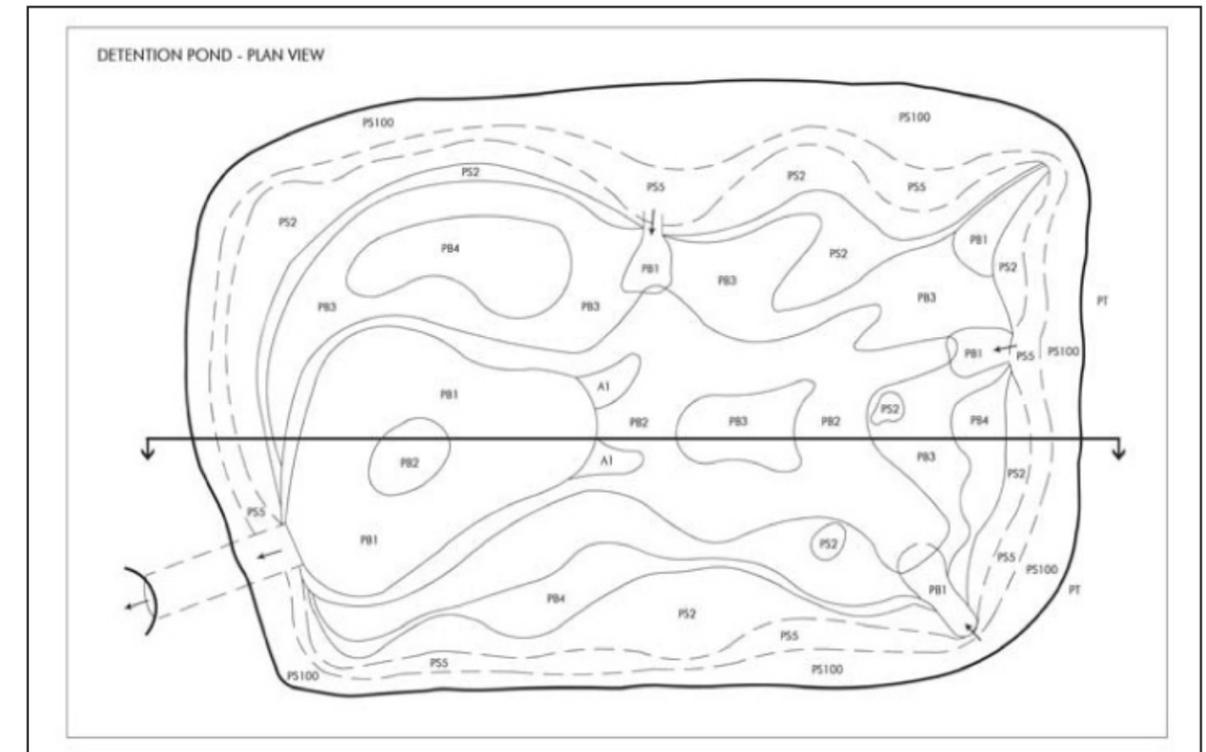
2. HIGH GROUND WATER DETENTION PONDS

Defined as ponds where the bottom soil surface elevation is within 18" of the ground water and soils are loamy to clayey, or the bottom is within 12" to 6" of the ground water and soils are sandy to gravelly (See Detention Pond Plan and page NAT APDX C-4 for Zone Descriptions).

- a) If the bottom of the pond is not too wet to support equipment, drill seed wetland subirrigated grass seed (part of the wetland subirrigated grass and shrub mix) into the bottom of the pond and lower side slopes in zones PB1, PB2, PB3, PB4, and PS2 and PS5. Make two passes in opposite directions (15 to 45 degree angles), each pass applying half the total rate, except in the PS5 Zone where one pass is needed.
- b) OR, if the pond bottom is too wet, broadcast or hydro seed wetland subirrigated grass seed (part of the wetland subirrigated grass and shrub mix) into the bottom of the pond and lower side slopes in zones PB1, PB2, PB3, PB4, and PS2 and PS5). Raking or harrowing this grass seed into the soil will be necessary,

especially on pond slopes.

- c) Drill one pass of the upland grass and shrub mix in the PS5 zone which has received one pass with the wetland subirrigated grass and shrub mix, and 2 passes on the rest of the slope and the top of the pond above slope (PS100 and PT). This completes the drill seeding.
- d) Broadcast the rest of the wetland mix (packaged separately) including wetland wildflowers (if applicable) onto the bottom of the pond (PB1, PB2, PB3, PB4). Make two passes in opposite directions, each pass applying half the total rate.
- e) Broadcast the upland slope wildflowers on the slopes of the pond in zones PS5, PS100 and PT. Make two passes in opposite directions, each pass applying half the total rate.
- f) Apply appropriate erosion control blankets or mulch per specification on page NAT APDX A-2.



3. NORMAL DETENTION PONDS

Defined as ponds where the bottom soil surface elevation is greater than 18" above the ground water and soils are loamy to clayey, or the bottom is greater than 12" to 6" above ground water and soils are sandy to gravelly (See Detention Pond Plan above and page NAT APDX C-4 for Zone Descriptions).

- a) Drill seed the bottom of the pond with the subirrigated grass and shrub seed mix up to the 5 year water surface elevation (PS5), using only one pass on low spots and near inlets and outlets (PB1), one pass on slopes (PS2 and PS5), and two passes in all other areas (PB2, PB3, and PB4). Each drill seeding pass should be seeding only half of the desired total rate of grass seed (about 4-5 lbs per acre).
- b) Drill one pass of the upland grass and shrub mix in the PS2 and PS5 zone which has received one pass with the subirrigated grass mix, and 2 passes on the rest of the slope and the top of the pond

- above slope (PS100 and PT). This completes the drill seeding.
- c) Broadcast the wetland seed mix including wetland wildflowers on the bottom of the pond near any inlet or outlet structure and in all low spots within the pond (PBI). Make two passes in opposite directions, each pass applying half the total rate.
- d) Broadcast the subirrigated wildflowers on the bottom of the pond in zones PB2, PB3, PB4, and PS2. Make two passes in opposite directions, each pass applying half the total rate.
- e) Broadcast the upland slope wildflowers on the slopes of the pond in zones PS5, PS100 and PT. Make two passes in opposite directions, each pass applying half the total rate.
- f) Apply appropriate erosion control blankets or mulch per specification on page NAT APDX A-2.

4. APPLICATION OF EROSION CONTROL BLANKETS AND MULCH

- a) The side slope of the detention ponds should not be graded steeper than 3:1. 4:1 or flatter is preferred.
- b) Because vegetation on hotter south-facing and west-facing slopes is more difficult to establish, especially if the pond slopes are not irrigated, these slopes should be blanketed to improve surface soil moisture and thus improve germination.
- c) All slopes steeper than 6:1 should be covered with erosion control blankets.
- d) Erosion control blankets should last for a minimum of two full growing seasons, and thus, if installed in the fall, should be a 24 month blanket and if installed in spring should be an 18 month blanket. Natural fiber blankets such as North American Green Straw Coconut 150 BioNet or North American Green Coconut 125 BioNet are preferred to synthetic blankets because the synthetic tend to trap and kill reptiles and amphibians.
- e) All blankets should be installed per manufacturer's recommendations.
- f) Especially in close proximity to developed sites, hydromulch should be used at 1500 to 2000 pounds per acre to mulch the site. Blankets or hydromulch are preferred over crimped hay or straw due to the reduced chance of introducing weeds, and because they do not blow off site. In addition, they have a cleaner look if next to a developed site.
- g) OR, on more remote sites, certified weed-free hay or certified weed-free straw with no seed heads can be crimped into the seedbed after seeding.
- h) Very wet to moist pond bottoms may not be able to be mulched.
- i) Periodic inspections should occur to insure that no erosion is occurring on-site, especially around inlet and outlet structures, on steep slopes, and around irrigation heads.

B. Construction and Restoration for Native Areas Adjacent to Development Areas

I. GUIDELINES, ACTIVITIES, AND RESTRICTIONS

- a) Construction shall be limited to as small as possible size to complete the work in a timely and efficient manner without unnecessary disruption to native open space. The location of staging areas and development access should be designated by the contractor and agreed upon by the Centerra DRC. (Example: For a one acre or smaller detention pond, it is recommended to have a 15 to 20 foot permanent easement from the top of the pond and a 30 to 50 foot construction easement with one 50 by 50 foot staging area. A larger easement to act as a conservation buffer could be included in Centerra.)
- b) All installation of woody plants shall be done by a Landscape Architect or qualified party.
- c) Construction, including any staging area, shall be fenced with standard orange construction fencing to clearly define the limits of work. Sensitive natural areas shall be protected with orange construction fencing.
- d) Vegetation of significance that is agreed upon as a disturbance free zone that will not be cleared, grubbed, or disturbed shall be fenced. No work or disturbance shall occur in these zones.
- e) Limit construction and disturbance envelope to minimize disturbance to the site. Keep construction

- activities within 20' of the property line.
- f) Equipment and materials must stay within the designated construction area and out of disturbance free zones.
- g) Fines shall be issued to the contractor on a per square foot basis for uplands and wetlands disturbed outside the easement or in disturbance free zones agreed upon and fenced within the easement. Fines range from \$100 to \$500 per square yard of damage outside of the easement, depending on the type and location of damage.
- h) Fines shall be issued on a per tree and per shrub basis for damage done outside the easement or in disturbance free zones agreed upon and fenced within the easement. Fines are issued on a per individual basis. Tree and shrub species, diameter, and size are used to determine replacement and establishment costs.
- i) Cash shall be required up front or a "bond" from the CONTRACTOR or OWNER on a "per square foot disturbed" basis. These funds will be used to restore or fix areas outside of the easement or in disturbance free zones as designated within the easement. They also ensure that proper restoration has occurred within the construction easement.
- j) A pre-construction meeting shall be held on the work site with all personnel who will be working onsite so that all "workers and especially equipment operators" clearly understand the limitations and locations of approved activities and the consequences if they don't follow the easement restrictions. This should include a walk through of the entire easement.
- k) Any new workers starting after the beginning of the work shall be informed of the easement restrictions.
- l) A three to five year weed control plan and restoration guarantee shall be included in the easement documents. Restoration guarantees shall include establishment of 75% of target species, percent cover requirements of target species equal to 75% of pre-construction cover, and percent cover of weeds equal to or less than that of pre-construction conditions.

2. SELECTION OF QUALIFIED CONTRACTORS

- a) The contractor and subcontractors shall be selected by an evaluation process in addition to the bid process to ensure that they can do quality work in a native open space setting.
- b) Contractors and their subcontractors must submit a list of their previous work in sensitive open space sites or environmentally sensitive areas, references for this work, and they must be approved by LANDOWNER or LANDOWNER'S REPRESENTATIVE before the final award of bid is given to the contractor.
- c) All contractor documents and specification should be approved by the LANDOWNER or LANDOWNER'S REPRESENTATIVE prior to their issuance.

3. ABOVE GROUND DESIGN GUIDELINES

- a) All manholes or other above ground utility structures, except those indicated below, should be within 3" of existing grade so as not to be a visual intrusion or to impair future open space mowing and management operations.
- b) Taller structures such as air vents, transformers, etc. must be painted "Sandalwood Tan" or an appropriate color to blend in with the existing vegetation during the majority of the year .
- c) Outlet structures and inlet pipes must blend in with the side slope grade and not protrude into the pond unless necessary to perform the desired function, and approved by the DRC.
- d) Outlet structures and inlet pipes shall not be placed in drainage ways, flood plains, or flood prone areas.

4. GENERAL CONSTRUCTION PRACTICES

- a) The CONTRACTOR or OWNER must notify the LANDOWNER or LANDOWNER'S REPRESENTA-

- TIVE one week prior to any access or commencement of construction activities.
- b) Absolutely no vehicles, equipment, or materials are allowed outside the construction easement at any time before, during, or after the construction operations.
 - c) Work should be halted during moderate to heavy rains or snows to reduce the erosion of soils offsite and for the protection of downstream waterways.
 - d) All dewatering techniques and activities, if necessary, shall follow Colorado Department of Health guidelines, or guidelines approved by the LANDOWNER or LANDOWNER'S REPRESENTATIVE.
 - e) Where needed, the open space shall be protected from sedimentation with a silt fence, straw bales, and other standard sediment control practices.
 - f) If required, all plant salvage operations required of the CONTRACTOR shall be protected from damage with fencing and must be reinstalled as soon as topsoil has been replaced.
- 5. RESTORATION: FINISH GRADING, CLEAN-UP & DAMAGE REPAIR, TOPSOIL, SCOPE OF WORK, SEED QUALITY, MATERIALS, EXECUTION - RESTORATION & SEEDING**
- a) Finish Grading of Natural Areas and Detention Ponds
 - 1. Upon completion of other construction work and prior to final payment, the CONTRACTOR shall remove all construction debris, material and equipment. They shall restore the existing area to as clean of a condition as existed before their operations began. All stockpiles of topsoil shall be used on disturbed areas and all excess bedding, subsoils, or other backfill materials shall be removed as directed by the OWNER, LANDOWNER, or LANDOWNER'S REPRESENTATIVE. All remaining areas shall be worked as herein specified.
 - 2. The CONTRACTOR shall then grade the entire site designated as a natural area or detention pond to a finished grade, leaving small irregularities and rough spots to provide microhabitat and topographic diversity to aid in plant establishment. Rough grading may be sufficient to meet this specification if approved by the OWNER, LANDOWNER, or LANDOWNER'S REPRESENTATIVE and the SEEDING CONTRACTOR. The CONTRACTOR shall meet existing grades at the boundaries of the limit of work. Allowance shall be made for topsoil and any other surface material, which is called for in the Contract Drawings and Specifications.
 - b) Clean-up and Damage Repair
 - 1. All debris and excess excavated material shall be disposed of offsite by the CONTRACTOR and at their own expense. All fences, gates, signs, and any other structures damaged shall be repaired or replaced as necessary. All damage shall be repaired as soon as possible by the CONTRACTOR and at their own expense after all initial restoration and seeding operations are completed.
 - c) Amendment of Existing Onsite Topsoil
 - 1. This work consists of providing and replacing suitable topsoil at locations and thicknesses shown as existing prior to construction and called for elsewhere in these Specifications, but in no case shall it be less than 4" unless approved by the OWNER, LANDOWNER, or LANDOWNER'S REPRESENTATIVE. No imported topsoil is required.
 - 2. Topsoil shall consist of loose, friable native soils that existed prior to construction. These soils shall be reasonably free of admixtures of subsoil, refuse, stumps, roots, rocks, brush, weeds or other material which would be detrimental to the proper development of vegetative growth.
 - 3. Topsoil has living components and thus should be placed in small piles adjacent to detention pond installation operations where it will not be mixed with bedding materials, subsoils, and other contaminants. Large piles of topsoil placed for more than a few days, especially during warm conditions, is not an acceptable practice. Topsoil shall not be replaced until the areas to be covered have been properly prepared and the detention pond, compaction, and subsoil grading operations have been completed for a particular area of the pond.

- 4. Topsoil shall be keyed to the underlying material by the use of harrows, roto tillers, rollers, or other equipment suitable for the purpose.
- d) Scope of Work
 - 1. Seeding shall consist of furnishing and sowing seed at locations shown on plans, or as designated, in conformity with the requirements of these specifications. This item includes any necessary ground preparation prior to seeding, including but not limited to chiseling, disking, and hand raking as necessary to prepare the soil for seeding. It shall also include the furnishing and application of Colorado certified weed-free native grass hay mulch or approved equivalent.
- e) Seed Quality
 - 1. All brands furnished shall be free from such noxious seeds as Canadian Thistle, Russian Thistle, Bindweed, Leafy Spurge, Diffuse Knapweed, and all noxious weeds listed by the State of Colorado. Additionally, all brands furnished for use in native areas shall be free of undesirable non-native grasses such as Smooth Brome, Intermediate Wheatgrass, Tall Fescue, Kentucky Bluegrass or Crested Wheatgrass.
 - 2. The landscape contractor shall furnish to the LANDOWNER or LANDOWNER'S REPRESENTATIVE a signed statement certifying that the seed furnished is from a lot that has been tested by a recognized laboratory. Seed which has become wet, moldy, or otherwise damaged in transit or in storage will not be acceptable.
- f) Materials
 - 1. Seed
 - a. Owner shall designate the type of seed mix. No changes or substitutions shall be made without permission from the LANDOWNER or LANDOWNER'S REPRESENTATIVE two weeks prior to restoration and seeding.
 - b. Seed types and amount of pure live seed (PLS) required per acre are based on soil type and irrigation regime.
 - c. Seed mixes at the rate indicated on the mix in PLS when drill seeding. For slopes 3:1 or greater, double the PLS per acre when broadcast seeding.
 - d. If seed available on the market does not meet the minimum purity and germination percentages specified, the landscape contractor must compensate for a lesser percentage of purity or germination by furnishing sufficient additional seed to equal the specified product. The tags from the seed mixes must be supplied to owner.
 - e. Pack seeds of the latest season's crop for delivery in suitable rodent proof bags in accordance with standard commercial practices. If seed is stored after delivery to the work site, store in cool, dry, and weatherproof place in a manner that protects the seed from deterioration and permits easy access for inspection. All labeling required by law shall be intact and legible.
 - f. The formula used for determining the quality of PLS shall be: (Pounds of seed) x (purity) x (germination) = pounds of PLS.
 - 2. Hay Mulch
 - a. The material will be certified weed-free native grass hay. Each delivery of certified weed-free native grass hay shall have the proper weed-free certifications, transit certificate, and weight slip. Hay shall not be musty, moldy, decayed, caked or of otherwise low quality. Hay shall be free of weeds and viable seeds.
 - b. At least 75% of the hay by weight shall be 10" or more in length.
 - c. Do not conduct the mulching application when wind conditions may cause the mulch to blow from the intended target area.
- g) Execution - Restoration and Seeding

1. Submittals
 - a. CONTRACTOR shall notify LANDOWNER or LANDOWNER'S REPRESENTATIVE 48 hours prior to seeding.
 - b. CONTRACTOR shall supply LANDOWNER or LANDOWNER'S REPRESENTATIVE with tags from every bag of seed and all load tickets for native hay mulch at the time of execution.
2. Site Preparation
 - a. Area should be shaped and graded according to pre-construction topographic features or appropriate restoration plan. Existing drainage patterns upstream and downstream of the detention pond should be maintained unless specifically stated otherwise.
 - b. Topsoil and strippings removed by the CONTRACTOR prior to construction shall be placed to a minimum depth of 6" prior to tilling, unless approved otherwise by the LANDOWNER or LANDOWNER'S REPRESENTATIVE. Remove tree limbs, trash, large rocks, and other debris.
 - c. The top 4" of the surface shall be chiseled, disked, and/or tilled, and roughed parallel to slope contours to prepare soil for seeding.
 - d. Finished graded areas shall be protected from damage by vehicular and pedestrian traffic and erosion.
3. Fertilizer Application and Organic Amendment – None shall be applied.
4. Seeding
 - a. Native grass and wildflowers seeding shall be accomplished in one or another of two seeding seasons within a calendar year; namely the "spring seeding season" from February 21 through May 15 and the "fall seeding season" from October 15 through December 15. Either of these seasons shall be understood to comprise that period of time in the spring or fall, respectively, favoring the healthy growth of native grasses and wildflowers in the locality in which the seeding is done.
 - b. Seeding of portions of the areas designated may be permitted before the construction is completed in order to take advantage of growing conditions, but should be protected from vehicles, compaction, erosion, and other disturbances that may disrupt future germination and establishment of seeded species.
 - c. Seed shall not be sown during windy weather, or when ground is frozen or otherwise un-tillable.
 - d. Method of Seeding
 1. Drills: A grass drill shall be used unless the LANDOWNER or LANDOWNER'S REPRESENTATIVE approves another method. Grass drills are to be used to seed native grasses only, not native wildflowers unless specifically directed by the LANDOWNER or LANDOWNER'S REPRESENTATIVE. The drill should be equipped with a satisfactory feeding mechanism, agitator, double disk furrow openers, depth adjustment mechanism, and packer wheels. Depending upon the seeding recommendation, it may be necessary to have separate boxes for fluffy grasses, small seeded grasses and for legumes. Drill seeding shall be at approximately 6" to 7" spacing, to a depth of 1/4" to 1/2". All seeding on slopes shall be parallel to the contours unless otherwise approved by the Owner. In areas where the smallest dimension (width or length) exceeds 300 feet, the site shall be cross-seeded at an angle of approximately 45 degrees.
 2. Hydraulic Equipment: This shall be restricted to areas inaccessible to drills as determined by the LANDOWNER or LANDOWNER'S REPRESENTATIVE. If hydromulch is to be applied, the seed should be applied in a separate operation prior to mulching. Hydraulic mulching equipment shall include a pump capable of being operated at 100 gallons per minute and 100 pounds per square inch pressure, unless otherwise directed. The equipment shall have an acceptable pressure gauge and a

nozzle adaptable to hydraulic seeding requirements. Storage tanks shall have a means of agitation and a means of estimating the volume used or remaining in the tank.

3. Hand Application: Broadcast seeding by hand or a manually operated broadcast type seeder is to be used to seed native wildflowers. For grasses, it is only acceptable on small areas and areas not accessible to drills as determined by the LANDOWNER or LANDOWNER'S REPRESENTATIVE. Native grass seed only will be covered 1/4" to 1/2" deep by raking or harrowing. Application rate shall be increased by 50% for all native grasses to be hand seeded at the sole expense of the Contractor.
4. Native wildflower seed will be mixed with 6 parts perlite to one part native wildflower seed. This native wildflower seed mix will be broadcast after grasses have been seeded and before native grass, hay mulching, or hydromulching.
5. Mulch
 - a. All areas to be seeded shall be mulched. Hay mulch shall be used in all locations except when conditions require the use of hydromulch with the permission of the OWNER and the LANDOWNER or LANDOWNER'S REPRESENTATIVE.
 - b. Hay Mulch: Use only in remote areas with low human presence and without immediate adjacent development. After seeding has been completed, a rate of 4,000 lbs. of hay per acre, or as directed, shall be applied uniformly, crimped in with a crimper. Anchor hay mulch to the soil by crimping hay into the soil with a crimping disc on appropriate contours 2" to 3" deep at no wider than 8" spacing. Use V-type wheel land packers, scalloped disc packers, or other suitable equipment. No less than 75% of the hay shall remain on the surface after anchoring. The LANDOWNER or LANDOWNER'S REPRESENTATIVE may order the employment of hand-crimping operations on such areas where excessively steep slopes or confined areas would cause unsatisfactory crimping to result by mechanical methods. Start mulching on the windward side of relatively flat areas or on the upper part of steep slopes, uniformly covering the area. Mulch that remains clumped or bunched after application shall be separated and re-spread. The seeded area shall be mulched and crimped within 24 hours after seeding. Areas not mulched and crimped within 24 hours after seeding must be reseeded with the specified seed mix at the landscape contractor's expense prior to mulching and crimping. On steep slopes, drainage ways or other specific areas, which are difficult to mulch and crimp by conventional methods, jute mesh or other blanketing materials may be used when approved by the LANDOWNER or LANDOWNER'S REPRESENTATIVE. These materials properly installed, anchored, and secured as per manufacturer's recommendations. These areas will have seed mixes specifically designed for site conditions.
 - c. Hydromulch: As required, cellulose fiber mulch shall be added with the proportionate quantities of water and other approved materials in the slurry tank. All ingredients shall be mixed to form a homogenous slurry. Using the color of the mulch as a metering agent, the operator shall spray apply the slurry mixture uniformly over the designated seeded area. Unless otherwise ordered for specific areas, wood cellulose fiber mulch shall be applied at the minimum rate of 1,720 lbs. per acre. Hydraulic mulching shall not be done in the presence of free surface water resulting from rains, melting snow or other causes. Wood fiber mulch shall be "Conwed, Hydromulch 2000" which is manufactured by the Conwed Corporation or approved equal.
6. Protection
 - a. Immediately after seeding, protect seeded areas against traffic or other use by erecting temporary fencing or barricades and providing signage as directed by the LANDOWNER or LANDOWNER'S REPRESENTATIVE. Retill, seed and mulch any areas impacted by traffic as directed by the ENGINEER, OWNER, LANDOWNER or LANDOWNER'S REPRESENTATIVE.

7. Clean Up

- a. THE CONTRACTOR shall be responsible for clean up of the site, including removal of all wires, ties, bags, etc. Failure to clean the site shall result in withholding of payment.

C. Wildflower (Forbs) Restoration Specifications and Prescriptions for High Plains Environmental Center

I. WHY WILDFLOWERS (FORBS)

- a) Wildflowers are an essential part of most native plant communities, including natural detention ponds like playas and streamside plant communities. Wildflowers are essential to create a more diverse habitat that attracts many more species of wildlife to a site. The following process will help contractors to more successfully establish wildflowers.

2. SITE SELECTION

- a) Before seeding wildflowers it is essential to assess the condition of the site. The ecological opportunities and constraints of the site must be considered, including soil type, soil moisture, soil nutrients, slope, aspect, light regime, hydrology, topographic features, as well as the existing vegetation. Most wildflowers in the plains of Colorado thrive in full sun or light partial shade. They generally survive best where ecological conditions are not favorable to grasses, including coarse texture soils with a higher content of sand, gravel, and rocks. Also, wildflowers are more abundant on rocky sites and steep areas with adequate moisture for establishment, which may otherwise be environmentally harsh. Areas that are densely dominated by rhizomatous grasses, or are dominated by diverse and extensive infestations of perennial weeds and/or annual weeds, are poor candidates for wildflower seeding without intensive manipulation of the site with considerable expenditures of time and money. These conditions can be created on a detention pond site by adding a sand, gravel or rock component to the soil from excess pipe or culvert bedding materials.

3. DESIGN A SEED MIX WITH PROPER SEEDING RATES

- a) Plant palettes should be selected carefully to match the existing site conditions. A restoration ecologist should design an appropriate site specific mix based on the conditions of the site and the goals for the project. Wildflower seeding rates vary from 4-10 lbs per acre for wildflower plantings, to 10-12 lbs per acre for wildflower/grass plantings. Rates should achieve a minimum of 15-20 and a maximum of 60 - 80 live seeds per square foot of forbs. On drier sites, or during dry years, the seeding rate should be 35 -45 live seeds per square foot maximum.

4. SEEDING WILDFLOWERS WITH GRASSES

- a) Wildflowers can be sown alone or with grasses depending on the goals for the restoration site. Wildflowers generally perform best when sown alone because of the competitive nature of grasses. If grasses are desired on the site with forbs, then the following special design modifications should be considered to allow forbs the competitive advantage they need to get established. These are: 1) Grasses and forbs can be separated spatially, with patches of grass only and patches of forbs only. Forbs will perform best in shallow, coarse, irregular soils, or steep slopes; grasses will perform best in fine textured and deeper soils on flat to moderate slopes. 2) Grasses can be seeded at lower rates (1/3 or less) to make them less competitive. 3) Seed only with bunch grasses because they are less competitive and leave more space for forbs to get established. Good cool season bunch grasses include Green Needlegrass, Indian Ricegrass, Prairie Junegrass, and Slender Wheatgrass. Some of the best warm season bunch grasses include Little Bluestem, Sideoats Grama, and Blue Grama (can form a sod if mowed or grazed extensively). 4) Forbs can be purchased in pots or grown and planted to establish populations.

5. PREPARING THE SEED

- a) Cold-moist stratification: (Only necessary if seed is planted in the spring). This is the process where seed is stored in a moist medium, such as Perlite or Vermiculite, generally for 30 to 90 days to break

seed dormancy. Mix one part seed with two parts Perlite or Vermiculite, and soak until very moist in a zip lock bag. Pour off additional free water and store in a refrigerator at 34°F to 40°F for 30 to 90 days as specified for the particular species.

- b) Soaking: Many seeds will germinate best if they have been allowed to imbibe water prior to sowing. Thus soaking seeds, especially those with a hard seed coat may be necessary to improve germination. Some seeds also do best with a hot soak.
- c) Scarification: This is the process whereby the seed coat is weakened by either mechanical or chemical means. This process helps to break down the seed coat so that the seed can more easily imbibe the water that is essential to the germination process. Mechanical scarification can be done by placing the seed in an open box and scratching it with medium to coarse grit sandpaper, or for larger seeds by scratching the hard seed coat with a file or knife. Chemical scarification (or acidification) is done with a dilute solution of sulfuric acid. This method helps to reduce chemical inhibitors to germination and it helps to break down resistant seed coats. Generally, the seeds that need chemical scarification are found in fleshy fruits like Solomon's Seal, plums, cherries, or hawthorns. Check with your seed supplier for their recommendations on the treatment of seeds prior to sowing. The key to germination is for moisture to reach the embryo which is in the interior of the seed. Additional germination requirements are good seed/soil contact, warm temperatures (over 55°F for cool season plants and 75°F for warm season plants), and overcoming external or internal dormancy.

6. WHEN TO SEED WILDFLOWERS

- a) Seeding in the fall: Because many wildflowers need a cold-moist stratification for 30 to 90 days to break dormancy, the natural time to seed them is in the fall, also called dormant seeding. Dormant wildflower seeding should occur after the soil temperature has cooled to below 55°F, or generally in late October, November, or early December, before the ground freezes. Dormant seeding of perennial wildflowers is the preferred approach, although there may be some situations where spring seeding is conducted.
- b) Seeding in the spring: Annuals and species that germinate readily can be seeded in the early spring with great success. The main advantage to seeding in the spring is the opportunity to kill Colorado's many cool season weeds that have germinated in early spring, thus reducing competition for moisture and nutrients.

7. SITE PREPARATION

- a) The primary objective at a restoration site where a diversity of forbs is desired is to clear the area of existing vegetation, especially non-native species, aggressive perennial sod forming grasses, and noxious weeds.

Fall seeding scenario:

1. Chisel or disk the ground in the spring.
2. Allow weeds to germinate and spray with glyphosate (e.g. Roundup) or till weeds to prevent establishment.
3. In the fall before seeding, spray, shallow till, or scarify with a harrow once more to get the ground as clean and weed-free as possible. Glyphosate can be used to kill these early germinating weeds and seeding can occur right after spraying. Or, a pre-emergence application of imazapic (e.g. Plateau) can be used (4 oz active ingredient/acre) to control weeds. **Please carefully read and follow label directions on all herbicides prior to their purchase and use.**
4. If necessary, add sand, gravel, or rock to the soil in the areas where wildflowers are going to be seeded to increase their competitive advantage.

8. SEEDING DEPTH

- a) The depth that wildflower seed is planted is critical to its success. Most wildflower seed should be surface sowed, or very lightly raked in not more than 1/8". Generally, a seed should not be planted

deeper than the diameter of the seed. For example, a 1/16" diameter seed should be sown to a 1/16" depth. Seeds sown in sand can be planted at two times that depth, unless otherwise specified by the seed supplier or restoration ecologist. If sown in the fall or early spring, most wildflower seed can be sown on the surface and allow precipitation and freeze/thaw action to incorporate the seed into the soil and to achieve good seed to soil contact.

9. SEED APPLICATION

- a) Wildflower seed is generally small and should be broadcasted either by hand, with an adjustable hand-held broadcast seeder, a drop seeder/spreader, or a rotary seeder/spreader. Seed can also be very lightly drilled to 1/8" or less in sandier or courser soils. Steep areas can also be broadcast seeded and hydro-mulched at a rate of 1500 to 2300 pounds per acre. If seeding with grasses, wildflowers should always be seeded last, as grasses are seeded deeper than forbs.
- b) Mix seed with Perilite in a ratio of one part seed to five parts Perilite. Perilite gives the small wildflower seeds more bulk, which acts to spread the seed across the site and, because it is white and stands out against the darker soils, it helps the person seeding to cover all areas with the desired species and at the desired rates. If more even coverage is required, the quantity of seed can be split in half. One half can be seeded in a north-south direction and the remaining half will be seeded perpendicular to the first in an east-west direction. On a smooth seedbed, larger seeded species can be incorporated into the soil by lightly raking it or with a chain harrow. Seed can also be seeded into a roughed seedbed just prior to a fall or spring snowstorm which aids in incorporating the seed into the seedbed. Sowing too deeply can prevent germination or hinder the growth of young seedlings, especially in heavy clayey soils.
- c) Apply a light weed-free hay or straw mulch at a rate of 2000 to 3000 pounds per acre, covering from 30% to 50% of the ground surface. This helps hold moisture, prevent soil crusting, reduce wind erosion, and absorb excess free nitrogen, which aids in reducing weed competition. This step may be skipped especially if supplemental irrigation is going to be provided.
- d) Good soil to seed contact is essential for germination to occur. A firm seedbed is also important for good soil to seed contact, and to ensure small seeds don't get buried too deeply. As a general rule of thumb, a foot should not sink more than 1/4" into the soil when walking across the prepared seedbed.

10. WATERING

- a) To increase the success of germination and establishment of wildflower stands, if possible, water the area to keep the seedbed moist for a period of three to six weeks. Once seedlings reach the three-leaf stage, irrigation frequency can be gradually reduced, but should be longer in duration.

11. MANAGEMENT OF WILDFLOWER STANDS

- a) Management of wildflowers includes selectively spraying weeds, mowing, and possibly burning or grazing the stand. Spot spraying broadleaf weeds and spraying early season weeds with a non-residual broadleaf herbicide prior to green up of flowers has proven successful. Undesirable annual and perennial grasses can be controlled with grass specific herbicides such as Poast (Vantage), Fusilade, Ornamec, or Select. These post-emergent herbicides can be applied over wildflowers because they do not affect broadleaf plants. They are best applied on new growth and young plants. Do not use if desirable grasses are present or have been seeded. Also, mowing 2-4 times per year in problem areas can help to reduce the canopy of weeds that shade the slower growing wildflower seedlings below. The number of mowing cycles depends on the weed cover, yearly precipitation, and to a lesser extent, soil type. Once weeds are under control, mowing or burning can be done on a 3-7 year cycle, depending on the extent of cover, growing conditions, plant community health, and seasonal weather conditions. Generally, burning should take place on non-drought years, after plants have reached maturity and may be declining, and where cover is high. Moist plant communities can be burned more frequently (3-5 years), whereas drier communities should be burned less frequently (5-7 + years). Grazing can be used as well but requires

Wildflower Restoration Calendar - Begin in the fall to access site to seed in the fall of the following year. ©Ark Ecological Services, 303-985-4849

Goal (Project)	Objective	Process	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Restore native wildflowers to HPEC	Identify areas that need to have wildflowers restored	Walk the site looking for slopes, rocky areas, or poorly developed soils, areas that don't have deep fine textured soils, or areas that don't have good grass cover												
	Analyze site characteristics and select species to match site.	Use wildflower list to select restoration spp.												
	Mechanically prepare seedbed	Chisel, disc, harrow, or hand prepare seedbed												
	Chemically control annual, biennial, & perennial broadleaf and grass weeds	Spray noxious weeds with herbicide*					One Applic.					One Applic.		
	Gather and purchase enough seed to restore chosen areas	Hand collect native wildflower seed from local sources & dry							Every Month					
	Gather and purchase enough seed to restore chosen areas	Purchase seed from Western Native Seed												
	Prepare seed to be planted	Scarify and soak seed just prior to planting												
	Sow wildflower seed before the ground freezes	Broadcast or lightly drill seed												
Goal (Project)	Objective	Process	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Restore native wildflowers to HPEC	Ensure germination, establishment, and plant vigor if resources are available	Water ¼ inch three times each day for 4 weeks, then ½ inch once a week through mid September				¼"	¼"	¼"	½"	½"	½"			
	Reduce compaction and damage to new seedlings	Restrict access to the area												
	Reduce compaction and damage to new seedlings	Restrict access to the area at the beginning of the next year												
	Reduce weed competition	Spot spray, mow, or hand pull weeds				One Applic.	If Needed				One Applic.	If Needed		

*If both grass weeds and broadleaf weeds are present in the spring, use either glyphosate (e.g. Roundup), or a combination of glyphosate and imazapic (e.g. Plateau), or a new product called Journey. Use a broadleaf herbicide (e.g. 2,4-D, Curtail) in the spring if only broadleaf weeds are present. In the fall use only glyphosate because you can plant soon after spraying, there is no residual activity like with imazapic. Follow label closely. See *Wildflower Restoration Specifications and Prescriptions for HPEC* for more details.

- more time and may not be appropriate for certain areas or at certain times in the open space.
- b) Mowing can also be used as an end of the growing season treatment to disperse wildflower seeds. At least two weeks after all of the flowers have faded, and when most of the seeds appear to be mature, the wildflower stand can be mowed if desired. Seeds are mature when they are hard and usually dark in color, often brown, reddish, or black. If the seeds are inspected at various times in the post flower process, one can determine the stages of seed development and recognize which color and hardness indicates a mature seed for a particular species. Once this is determined, the stand can be mowed at a height of 4" to 6" off the ground, high enough not to damage the wildflowers. The process of mowing aids in seed dispersal and reduces the competition of some weeds and some grasses. Additionally, it allows more sunlight to reach the ground, which is often necessary for additional wildflower germination and seedling growth. Mowing also aids in the survival of low-growing wildflowers.

SUMMARY AND CONCLUSION

Well-planned ecological restoration must consider the composition, structure, and function of native ecosystems to create healthy and sustainable landscapes. Wildflowers are essential components of these landscapes and must be considered as a part of each restoration project. Wildflowers enhance diversity, structural complexity, food and shelter for wildlife, beauty, color, fragrance, texture, form, seasonal interest, and educational opportunities. To fulfill the goals of natural resource conservation and education at High Plains Environmental Center, the restoration of wetland, riparian, and prairie communities should include the use of a diverse array of site appropriate, native wildflowers.

VI. After Care

A. Weed Management After Seeding and Initial Restoration Activities

- 1) For the first two to three years after seeding, the main practice for weed control should be mowing or weed whacking to prevent weed seeds from being produced. Careful spot spraying is also acceptable if over spray reaching the soil surface can generally be limited or avoided. Many herbicides affect seedling grasses and non-target plants and may reduce or inhibit germination of plants. Other herbicides, like Plateau, are selective in their affect on seedlings, young grasses and wildflowers and can be used to help establish many warm season grasses and wildflowers while killing weeds and inhibiting their germination. Always read and follow label directions.
- 2) The selectivity of herbicides on target and non-target plants, and seed in the soil seed bank is affected by the type of herbicide and its mode of action, the application rate, the timing of the application, the life stage of the plants, soil moisture conditions, temperature, the surfactant used and rate, and other factors. Pesticide applicators should be well versed in the affects of the herbicide being used and in the environmental conditions in which the herbicide is being used. If in doubt in newly seeded areas, use mechanical controls or cultural practices to the fullest extent possible where practical. Biological controls may also be an option, but generally take a longer time period which may not be acceptable at this stage of the restoration process.
- 3) After the initial establishment period, if chemical weed controls are needed in the pond bottoms of wet to wet mesic detention areas, herbicides and surfactants with aquatic labels should be selected. Aquatic approved herbicides often used in wetland areas such as detention ponds include Aquatic 2, 4-D amine, Renovate 3, Rodeo, Habitat, or Garlon 3A, depending on the weeds being targeted.
- 4) Even though the herbicides are approved for aquatic use, if possible, most spraying applications should occur during periods of dry weather and dryer conditions to reduce the amount of herbicide that gets into the water itself.
- 5) Slide slopes, generally above the high water line, can be sprayed with non-aquatic approved herbicides as per the herbicide label.

- 6) Careful attention should be paid to the herbicide being used in high water table areas. Herbicides with the active ingredient of dicamba, often under the trade name of Banvel, or picloram, often under the trade name of Tordon, should not be used in high water table areas or under trees, due to their mobility in the soil.
- 7) Cattails will generally come in to all of the created detention ponds through natural dispersal and establishment. They should be eradicated or suppressed in detention ponds for the first three to five growing seasons to allow less aggressive native plants to get established. Cattails, although they are a native plant, are often so competitive that they become a monoculture if not managed.
- 8) Cattail management includes using soils that are free of cattail tubers during construction, hand pulling small plants, wick applications with gloves, spot spraying with backpacks using an aquatic approved glyphosate product like Rodeo. Mid-summer applications work well due to the large leaf surface area to which to apply the herbicide. Hand pulling works well in the spring and in early years of the pond establishment before the cattails have developed an extensive root system.
- 9) Reed Canarygrass is another aggressive non-native wetland grass that may go unnoticed, but which should be controlled to achieve a diverse, healthy, and functional detention pond.
- 10) Woody plants that spread via rhizomes should be discouraged from establishing in front of and immediately adjacent to inlet and outlet structures. These plants can be controlled using cut stump treatments with a high concentration (generally 25 to 50% active ingredient) of Garlon, Rodeo, or Roundup. Read and follow the label directions.

B. Stormwater Management

- 1) Erosion problems should be quickly fixed using appropriate bioengineering technologies.
- 2) Sediment traps should be cleaned out after large storm events, or as the need dictates.

VII. Monitoring and Assessment

- a) Set up photo points, plots, and transects at stratified random locations to determine the frequency and percent cover of desirable plants, weeds, bare ground, leaf litter, and rock. Take photos in four directions, N, E, S, W, or NE, SE, SW, NW, at least twice per year from the photo point.
- b) Assess the site at least twice a year to determine the level of success in hydrologic function, aesthetics, screening and buffering, and other site goals and objectives (See landscape functions on Page NAT APDX D-1).
- c) Assessments should be done during storm events and just after the water has dissipated to determine how the ponds have functioned. Look for erosion and sedimentation sites, determine if inlets and outlets functioned properly, assess how plant materials responded to the event. Determine if the outlet structures' water quality plates need to be cleaned.
- d) Assess the success of the establishment of the desired future plant community over a three to five year period. Determine if desired target plants are getting established or just beginning to establish. Where weeds are under control, undesirable bare soil areas could be re-seeded or planted with the rarest appropriate plants suitable to the location. If a fairly healthy native plant community is establishing, be patient to allow wildflowers an opportunity to come in.
- e) Use adaptive management to make mid-course corrections to the composition, structure, and functional aspects to the detention ponds. Record these for use in future designs.
- f) After 5-7 years, bare areas that are not freshly deposited soil from an erosion and/or sedimentation event, which are greater than 6-9 square feet and need an enhancement of conservative species, should be planted or seeded with rare wildflowers or other missing, under-represented, desirable plants to meet habitat goals. If species have equal coefficients of conservation (See Tables of Wildflower Species on Pages NAT APDX B-1 through B-3), choose showier species near human use areas or species that are known to attract more butterflies, birds, or desirable pollinators in more remote locations.

- g) Choose well-rooted, disease-free and weed-free plant materials grown in a reputable nursery.
- h) Use adaptive management to continue to tweak the detention pond ecosystems to achieve the habitat goals and objectives.

NAT Appendix B - Plant Materials for Use in Natural Areas and Detention Ponds

The following tables of plant materials represent plants appropriate for HPEC land restoration and should also be used in natural areas and detention ponds within Centerra. The list depicts appropriate species based on a variety of characteristics that should be considered in preparing planting plans for native areas and detention ponds.

Wildflower List		Life Form	Flower Color	Blooming Season*	Height (inches)	Sun/Shade Tolerance			Soil Type			Soil Moisture			Attracts Butterflies	Attracts Birds	Conservation Coefficient*			
Scientific Name	Common Name					Shade	Partial	Sun	Clay	Clay Loam	Loam	Sandy Loam	Sand	Gravel						
Upland Species																				
<i>Abronia fragrans</i>	Snowball Sand Verbena	p	white	6-7	4-24			xx					x	xx	xx				5	
<i>Achillea lanulosa</i>	Native Yarrow	p	white	6-8	6-30			xx	x	xx			x	xx	xx	x			3	
<i>Agoseris glauca</i>	False Dandelion	p	yellow	6-8	6-12			xx		xx			xx	xx	xx				6	
<i>Allium textile</i>	Sand Onion	p	white & red	4-6	8-12		x	xx	xx	xx	x		x	xx	xx				6	
<i>Argemone polyanthemos</i>	Prickly Poppy	p	white	6-7	18-30			xx	x	xx			x	xx	xx				3	
<i>Artemisia frigida</i>	Fringed Sage	p	green	7-9	6-18		xx	xx	xx	xx	xx		x	xx	xx				3	
<i>Artemisia ludoviciana</i>	Prairie Sage	p	green	7-9	12-30			xx		xx	xx		x	xx	xx				3	
<i>Asclepias speciosa</i>	Showy Milkweed	p	pink	6-7	24-54		x	xx	xx	xx	xx	x	x	xx	x		x		2	
<i>Asclepias pumila</i>	Low Milkweed	p	white	7-10	6-8		x	xx		x			x	x	x		x		6	
<i>Aster ericoides</i>	Many-flowered Aster	p	white	8-10	18-24		x	xx	x	x	xx	xx	xx	x	xx	xx			4	
<i>Aster falcatus</i>	Rough White Aster	p	white	8-10	24-48		x	xx	x	x	x	?	?	x	xx	x			6	
<i>Aster hesperius</i>	Western Aster; Violet Aster	p	pink	7-10	36-60		x	xx	xx	xx	xx	xx	xx						6	
<i>Aster porteri</i>	Porter's Aster	p	white	7-10	18-24		x	xx	x	x	x	xx	xx	x					7	
<i>Astragalus adsurgens</i>	Prairie Milkvetch	p	pink	5-7	6-12			xx		x	xx	xx	x	xx	xx				6	
<i>Astragalus agrestis</i>	Field Milkvetch	p	purple	5-8	8-12		xx	xx		x	x		xx	xx	x				6	
<i>Astragalus ceramicus</i>	Painted Milkvetch	p	white & purple	5-6	6-12		x	xx		x	x	xx							7	
<i>Astragalus crassicaulis</i>	Ground Plum	p	pink & white	5-6	1-3			xx		x	x		x	xx	xx				7	
<i>Astragalus drummondii</i>	Drummond's Milkvetch	p	white	5-7	12-24		x	xx	x	x	x		x	xx	xx				6	
<i>Astragalus gracilis</i>	Slender Milkvetch	p	pink	5-7	6-28		x	xx	x	x	x	x	x	xx	xx				5	
<i>Astragalus missouriensis</i>	Missouri Milkvetch	p	purple	5-6	1-6			xx		x	xx	xx	x	xx	xx				7	
<i>Astragalus mollissimus</i>	Woolly Milkvetch	p	purple	5-6	4-16			xx		x	xx	xx	x	xx	xx				6	
<i>Astragalus pectinatus</i>	Narrowleaf Milkvetch	p	white	5-6	4-24			xx		x	xx	xx	x	xx	xx				6	
<i>Astragalus shortianus</i>	Early Purple Milkvetch	p	purple	4-6	3-6			xx		x	xx	xx	x	xx	xx				6	
<i>Bahia dissecta</i>	Ragleaf Bahia	a	yellow	7-9	12-24			xx	xx	xx	xx	xx	x	xx	xx	x			5	
<i>Brickellia eupatorioides</i>	False Boneset	p	white	8-10	12-36			xx		x	xx	xx	x	xx	x				4	
<i>Callirhoe involucrata</i>	Poppy Mallow; Winecups	p	purple	5-10	2-6			xx	x	x	xx	xx	x	x	xx	xx			9	
<i>Calylophus serrulata</i>	Calylophus	p	yellow	5-9	8-12			xx	x	xx	xx	xx	x	xx	xx	xx			8	
<i>Calystegia sepium angulata</i>	Hedge Morning Glory	p	white	6-9	10 ft		x	x	x	x	x	x	x	xx	x				8	
<i>Casilleja integra</i>	Orange Paintbrush	p	orange	6-9	6-12		x	xx	xx	xx	xx	x	x	xx	x				7	
<i>Cleome serrulata</i>	Rocky Mtn. Beepplant	a	pink	6-8	24-36		x	xx	x	xx	xx	x	xx	xx	xx	x			3	
<i>Coreopsis tinctoria</i>	Plains Coreopsis	a	yellow w/red	6-8	18-36		x	xx	xx	xx	x		x	xx	xx				5	
<i>Dalea candida</i>	White Prairie Clover	p	white	6-7	10-24		x	x	x	x	xx	xx	x						7	
<i>Dalea jamesii</i>	James Prairie Clover	p	yellow & pur	5-6	1-3			x		x	x	x							8	
<i>Dalea purpurea</i>	Purple Prairie Clover	p	purple	6-8	18-30		x	xx	xx	xx	xx	xx	x	xx	x				7	
<i>Delphinium virescens</i>	Plains Larkspur	p	white	4-7	24-48			xx	xx	xx	xx	xx	x	x	xx	xx			6	
<i>Echinacea angustifolia</i>	Narrow-leaved Coneflower	p	purple	7-8	14-36			xx	x	xx	xx	xx	xx	xx	xx	xx	x		9	
<i>Eriogonum effusum</i>	Prairie Baby's Breath	p	green	7-9	1014			xx		x	x		x	xx	xx				5	
<i>Eriogonum umbellatum</i>	Sulfur Flower	p	yellow	7-8	6-18			xx		x	x	xx	x	xx	xx				5	
<i>Erysimum asperum</i>	Western Wallflower	b	yellow	4-6	12-30		x	xx	x	xx	xx	xx	x	xx	xx				6	
<i>Eustoma grandiflora</i>	Tulip Gentian	a/b	blue	6-8	10-18			xx	x	xx	x		xx	xx					10	
<i>Gaillardia aristata</i>	Blanket Flower	p	yellow w/red	7-8	12-24		xx	xx	xx	xx	xx	xx	x	xx	xx	x			4	
<i>Gaura coccinea</i>	Scarlet Gaura	p	red & white	5-8	8-18			xx	x	xx	xx	xx	x	xx	xx				5	
<i>Gilia pinnatifida</i>	Pinnateleaf Gilia	b	bluish white	6-9	4-20			xx		x	xx	xx	x	xx	xx				4	
<i>Haplopappus spinulosus</i>	Cutleaf Ironweed	p	yellow	5-9	6-20		x	xx	x	x	x	xx	xx	x	xx	xx			6	
<i>Helianthus petiolaris</i>	Plains Sunflower	a	yellow	6-10	18-36			xx		x	xx	xx	x	x	xx	xx			3	
<i>Helianthus pumilus</i>	Little Sunflower; Low Sunfl.	p	yellow	6-7	18-32			xx	x	xx	xx	xx	x	x	xx	xx			4	
<i>Heterotheca villosa</i>	Golden Aster	p	yellow	6-9	6-12			xx	x	x	x	xx	xx	x					2	
<i>Hymenopappus filifolius</i>	Threadleaf Plainsman	p	yellow	6	12-18			xx		x	x		x	xx	xx				6	
<i>Hymenoxys acaulis</i>	Perky Sue; Goldflower	p	yellow	5-7	8-20			xx	x	x	xx	xx	x	xx	xx				7	
<i>Ipomoea leptophylla</i>	Bush Morning Glory	p	purple	5-7	18-36			xx		x	xx	xx	x	xx	xx				7	
<i>Lathyrus eucosomus</i>	Purple Peavine	p	purple	5-7	12-20		x	xx	x	x	x	?	?	x	x	?			6	
<i>Lesquerella ludoviciana</i>	Bladderpod	p	yellow	5-7	6-12			xx		x	xx	xx							6	
<i>Liatris punctata</i>	Dotted Gayfeather	p	purple	8-10	12-24			xx	x	xx	xx	x	x	xx	x				6	
<i>Linnium lewesi</i>	Native Blue Flax	p	blue	5-7	12-30			xx	x	xx	xx	xx	x	xx	xx				5	
<i>Lithospermum incisum</i>	Narrowleaf Puccoon	p	yellow	4-6	8-20		x	x	xx	xx	xx	xx	x	xx	xx				6	
<i>Lomatium orientale</i>	Salt-and-Pepper	p	white	3-6	2-12			xx	x	x	x		x	xx	xx				5	

Wildflower List		Life Form	Flower Color	Blooming Season	Height (inches)	Sun/Shade Tolerance			Soil Type						Soil Moisture			Attracts Butterflies	Attracts Birds	Conservation Coefficient*					
Scientific Name	Common Name					Shade	Partial	Sun	Clay	Loam	Loam	Sandy Loam	Sand	Gravel	Hydric	Mesic	Xeric								
Upland Species																									
<i>Lupeolobos montanum</i>	Sand Lily	p	white	4-6	6-8			x	xx	x	x	x										5			
<i>Lupinus argenteus</i>	Silvery Lupine	p	Blue	6-8	12-30			x	xx				xx	xx	xx							5			
<i>Lupinus pusillus</i>	Annual Lupine	a	Blue & white	7-8	4-8																	7			
<i>Machaeranthera bigelovii</i>	Bigelow's Aster	b/p	purple	8-9	12-24																	3			
<i>Machaeranthera tancetifolia</i>	Tansy Aster	a/b	purple	5-8	8-15																	3			
<i>Maianthemum amplexicaule</i>	False Solomon's Seal	p	white	4-7	12-24	xx	x						xx	xx								5			
<i>Mertensia lanceolata</i>	Lanceleaf Chimningbells	p	blue	5-6	8-15			x	xx				xx	xx	x							7			
<i>Mentzelia nuda</i>	Plains Evening Star	b/p	white	6-9	24-36																	5			
<i>Monarda fistulosa</i>	Horsemint	p	purple	6-8	18-36			x	xx				xx	xx	x							6			
<i>Musineon divaricatum</i>	Musineon	p	yellow	4-5	3-8								xx	xx	x							6			
<i>Nuttallia sinuata</i>	Yellow Evening Star	b	yellow	7-10	12-24								xx	xx	x							7	Colorado	S2	Imperilled
<i>Oenothera albicaulis</i>	White Prairie E. Primrose	a	white	5-6	12-18																	6			
<i>Oenothera brachycarpa</i>	Y. Stemless E. Primrose	p	yellow	5-7	8-16																	7	Present in CO ?		
<i>Oenothera caspitosa</i>	W. Stemless E. Primrose	p	white	5-8	4-6																	6			
<i>Oenothera coronopifolia</i>	Cutleaf Evening Primrose	p/b	white	5-7	4-10																	5			
<i>Oenothera latifolia</i>	Plains Evening Primrose	p	white	4-8	4-18																				
<i>Oligoneuron rigidum</i>	Rigid Goldenrod	p	yellow	8-10	24-36			x	xx				xx	xx	x							7			
<i>Oxytropis lambertii</i>	Lambert's Loco	p	purple	4-6	6-18			x	x													7			
<i>Oxytropis sericea</i>	Silky Loco, Rocky Mtn. L.	p	white	4-6	6-18																	6			
<i>Penstemon albidus</i>	White Penstemon	p	white	5-7	12-16																	8			
<i>Penstemon angustifolius</i>	Narrow-leaved Penstemon	p	blue	5-6	12-24																	6			
<i>Penstemon secundiflorus</i>	Side Bells Penstemon	p	pink	5-7	8-24			?	x													7			
<i>Penstemon virgatus</i>	Tall One-sided Penstemon	p	blue	6-7	18-36			x	x													6			
<i>Phacelia heterophylla</i>	Scorpion Weed	b?	white	5-7	12-24																	5			
<i>Polansia dodecandra</i>	Clammy Weed	a	white	8-9	8-24																	4			
<i>Psoralea esculenta</i>	Prairie Turnip	p	purple & yell.	5-7	6-12																	7			
<i>Psoralea lanceolata</i>	Lanceleaf Scurf Pea	p	purple & wh.	5-7	12-24																	7			
<i>Psoralea teniflora</i>	Scurf Pea	p	blue	5-7	12-24																	6			
<i>Ratibida columnifera</i>	Prairie Coneflower	p	yellow	7-10	18-36																	4			
<i>Scutellaria brittonii</i>	Skullcap	p	blue	5-6	4-8																				
<i>Silphium laciniatum</i>	Native Compass Plant	p	yellow	7-9	60-100			xx	xx				x	xx	x							9			
<i>Solidago altissima</i>	Tall/Canada Goldenrod	p	yellow	7-9	24-48			x	xx				xx	xx	x							4			
<i>Solidago missouriensis</i>	Smooth Goldenrod	p	yellow	7-9	12-24			x	xx				x	xx	xx	x						6			
<i>Solidago mollis</i>	Soft Goldenrod	p	yellow	7-9	12-18																	6			
<i>Sophora sericea</i>	Silky sophora	p	white	4-6	4-16																	6			
<i>Sphaeralcea coccinea</i>	Scarlet Globemallow	p	orange	4-8	4-18																	4			
<i>Stanleya pinnata</i>	Golden Prince's Plume	p	yellow	5-6	24-36																	7			
<i>Thelesperma filifolium</i>	Green Threadleaf	a/b	yellow	6-9	10-18																	6			
<i>Thelesperma megapotamicum</i>	Colorado Greenthread	p	yellow	5-7, 8-10	12-36																	6			
<i>Thermopsis divaricarpa</i>	Golden Banner	p	yellow	5-7	12-24	x	xx	x					xx	xx	x							4			
<i>Thermopsis rhombifolia</i>	Arroyo Golden Banner	p	yellow	5-6	6-16			x	xx																
<i>Townsendia grandiflora</i>	Easter Daisy	p	white	3-7	2-8																	6			
<i>Tradescantia occidentalis</i>	Spiderwort	b	blue	5-8	10-24																	5			
<i>Valeriana edulis</i>	Edible Valerian	b	white	6-7	36-60																	6			
<i>Vicia americana</i>	American Vetch	p	blue	6-7	6-16			x	xx				x	xx	xx	x						5			

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Wildflower List		Life Form	Flower Color	Blooming Season	Height (inches)	Sun/Shade Tolerance			Soil Type						Soil Moisture			Attracts Butterflies	Attracts Birds	Conservation Coefficient*					
Scientific Name	Common Name					Shade	Partial	Sun	Clay	Loam	Loam	Sandy Loam	Sand	Gravel	Hydric	Mesic	Xeric								
Wetland Species																									
<i>Agalinis tenuifolia var. pariflora</i>	Slenderleaf False Foxglove	p	purple	7-9	8-18			x	xx													8	Wyoming	S1	Critically Imperilled
<i>Anemone canadensis</i>	Canada Anemone	p	white	5-7	8-24			xx	xx				xx	xx								7	Wyoming	S2	Imperilled
<i>Asclepias incarnata spp. incarnata</i>	Swamp Milkweed	p	white/pink	7-8	36-72								xx	xx								6	Arizona	S1	Critically Imperilled
<i>Bidens cernua</i>	Nodding Bur Marigold	a	yellow	7-9	24-38			x	xx				xx	xx	x							3			
<i>Bidens frondosa</i>	Common Begger's Ticks	a	yellow	7-9	36-48			x	xx				x	xx	x							3			
<i>Eupatorium maculatum var. bruneri</i>	Spotted Joe Pye Weed	p	light purple	7-9	36-72			xx	xx				xx	xx								7	Wyoming	S2	Imperilled
<i>Helianthus nuttallii var. nuttallii</i>	Marsh Sunflower	p	yellow	7-8	36-84								x	xx	x							6			
<i>Iris missouriensis</i>	Rocky Mountain Iris	p	blue	5-6	10-118			x	xx				x	xx	x							5			
<i>Lobelia siphilitica</i>	Great Blue Lobelia	p	blue	8-10	12-36			xx	xx				x	xx								8	Wyoming	S1	Critically Imperilled
<i>Lythrum alatum var alatum</i>	Winged Lythrum	p	purple	6-9	12-42			xx	xx				x	xx	x							8	Wyoming	S1	Critically Imperilled
<i>Mentha arvensis</i>	Field Mint	p	blue	5-6	10-24			xx	xx				xx	x								4			
<i>Sagittaria latifolia var. latifolia</i>	Broadleaf Arrowhead	p	white	7-9	12-24			x	xx				xx	x								7	Wyoming	S1	Critically Imperilled
<i>Verbena hastata var. scabra</i>	Blue Vervain	p	blue	7-8	18-30			x	x				x	xx								5			

Key
p - perennial
b - biennial
a - annual
x - somewhat adapted
xx - highly adapted
* numbers represent blooming season months

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HPEC Wildflower Restoration List.xls/Wildflower Characteristics8/1/2008

Shrub and Tree Species List for Detention Ponds, Drainages, and Other Natural Areas

The following tables of plant materials represent plants appropriate for HPEC land restoration and should also be used in natural areas and detention ponds within Centerra. The list depicts appropriate species based on a variety of characteristics that should be considered in preparing planting plans for native areas and detention ponds.

Common Name	Scientific Name	Growth Form	Height (feet)	Spread (feet)	Color	Bloom Seas	Water Sched.*	Light	Soil Type					Hardiness Zone
									Clay		Sandy		Sand	
									Fine	Moderately	Moderately	Course		
Species for Uplands - north and east facing (Zones PS100, PT, R4, and U1)														
Fourwing Saltbush	<i>Atriplex canescens</i>	Medium Shrub	2-6	3-8	Gray foliage, conspicuous fruits	summer	1	sun to partial sh.	x	xx	xx	xx	xx	3
Rubber Rabbitbrush	<i>Chrysothamnus nauseosus</i>	Medium Shrub	4-6	4-6	silver green with yellow fl.	late su	1	full sun	xx	xx	xx	xx	xx	3-6
Three-leaved Sumac	<i>Rhus triobata</i>	Medium Shrub	3-6	4-8	Orange berries	summer	1	full sun		x	xx	xx	xx	3-6
Native Smooth Sumac	<i>Rhus glabra</i>	Medium Shrub	4-7	6-15	white flowers, red berries & fall foliage	spring	1-2	full sun to partial sh.	xx	xx	xx	x		3-9
Wood's Rose	<i>Rosa woodsii</i>	Medium Shrub	2-6	3-6	pink fl. & red hips	spring	2	sun to partial sh.	xx	xx	xx			2-6
White Snowberry^	<i>Symphoricarpos alba</i>	Small Shrub	2-4	4-6	white flowers & berries	spring	2	sun to shade	xx	xx	xx			3-6
Western Snowberry	<i>Symphoricarpos occidentalis</i>	Small Shrub	2-3	4-8	white flowers & berries	spring	2	sun to shade	xx	xx	xx			3-6
Netleaf Hackberry^	<i>Celtis reticulata</i>	Small Tree	10-15	8-12	inconspicuous flowers	spring	1	full sun to partial sh.	x	xx	xx	xx		4-6
Species for Uplands - south and west facing (Zones PS100, PT, R4, and U1)														
Fourwing Saltbush	<i>Atriplex canescens</i>	Medium Shrub	2-6	3-8	Gray foliage, conspicuous fruits	summer	1	sun to partial sh.	x	xx	xx	xx	xx	3
Rubber Rabbitbrush	<i>Chrysothamnus nauseosus</i>	Medium Shrub	4-6	4-6	silver green with yellow fl.	late su	1	full sun	xx	xx	xx	xx	xx	3-6
Three-leaved Sumac	<i>Rhus triobata</i>	Medium Shrub	3-6	4-8	Orange berries	summer	1	full sun		x	xx	xx	xx	3-6
Desert False Indigo	<i>Amorpha canescens</i>	Small Shrub	1-2	1-2	gray foliage, pink flowers	summer	1	full sun	?	x	xx	xx	?	5
Dwarf Rabbitbrush	<i>Chrysothamnus nauseosus</i>	Small Shrub	1-2	1-2	silver green with yellow fl.	late su	1	full sun	xx	xx	xx	xx	xx	3-6
Winterfat	<i>Krascheninnikovia lanata</i>	Small Shrub	1-3	1-2	Silvery gray foliage, inconspicuous fl.	spring	1	full sun	xx	xx	xx	x		3-5
Yucca, Spanish Bayonet	<i>Yucca glauca</i>	Small Shrub	2-3	2-3	White flowers	J-J	1	full sun		x	xx	xx	xx	4-8
Species for moist, well-drained area (2.5 - 6 feet above high water line or 1 year storm) (Zones PS5, PS100, R4 & U1)														
Saskatoon Serviceberry^	<i>Amelanchier alnifolia</i>	Large Shrub	8-15	8-10	white fl & red berries	spring	2	sun or shade		x	xx	xx		3-5
Shiny-leaved Hawthorn^	<i>Crataegus erythropoda</i>	Large Shrub	10-20	8-15	white fl & red berries	spring	2-3	sun to partial sh.	x	xx	xx	xx	x	3-5
Wild Plum	<i>Prunus americana</i>	Large Shrub	12-15	15-20	white fl. & purple plums	spring	2	sun to partial sh.		x	xx	xx	xx	3-8
Western Chokecherry	<i>Padus virginiana var. melanocarpa</i>	Large Shrub	15-25	15-20	white fl. & purple berries	spring	2	sun or shade		xx	xx	xx	x	3-5
Western Sand Cherry	<i>Prunus besseyi</i>	Small Shrub	2-3	2-3	white flowers, purple black berries	spring	2-3	full sun to partial sh.		xx	xx	xx	xx	2-6
Cottonwood Trees	<i>Populus spp.</i>	Large Tree	50-60	50	reddish flowers, gold leaves in fall	spring	2-3	full sun	x	xx	xx	xx	xx	3-9
Netleaf Hackberry^	<i>Celtis reticulata</i>	Small Tree	10-15	8-12	inconspicuous flowers	spring	1	full sun to partial sh.		x	xx	xx	xx	4-6
Species for subirrigated area (1 - 3 feet above high water line) (Zones upper PB4, PS2, Lower PS 5 on north side, upper R1, R2, & possible on R3)														
Leadplant; False Indigo	<i>Amorpha fruticosa</i>	Medium Shrub	6-12	4-6 ft	purple flowers	summer	2-3	sun to partial sh.	xx	xx	xx	xx	xx	4-9
Redosier Dogwood	<i>Cornus sericea</i>	Medium Shrub	6-8	6-8	white flowers & berries	sp to su	3	sun or shade	xx	xx	xx	xx		2-7
Golden Currant	<i>Ribes aureum</i>	Medium Shrub	4-8	4-6	yellow fl., red fruits., red fall foliage	spring	2	full sun to partial sh.		xx	xx	xx		4-6
American Black Currant	<i>Ribes americanum</i>	Small Shrub	2-4	2-4	yellow fl., red fruits., red fall foliage	spring	3	full sun to partial sh.	?	xx	xx	xx	?	3-6
Peachleaf Willow	<i>Salix amygdoloides</i>	Medium Tree	20-40	40	reddish flowers, gold leaves in fall	spring	2-3	full sun to partial sh.	x	x	xx	xx	xx	4-6
Species for Wetland area (0 - 2 feet above high water line) (Zones W1, W2, W3, R1, and lower R2)														
Stapleleaf Willow^	<i>Salix eryocephala var. ligulifolia</i>	Large Shrub	8-15	8-15	yellow catkins, red & yellow twigs	spring	3	full sun to partial sh.	xx	xx	xx	xx	xx	3-5
Whiplash Willow	<i>Salix lasiandra</i>	Large Shrub	15-25	10-15	yellow catkins	spring	3	full sun	xx	xx	xx	xx	xx	3-7
Sandbar Willow	<i>Salix exigua</i>	Medium Shrub	5-10	5-20	yellow catkins	spring	3	full sun to partial sh.	x	xx	xx	xx	xx	3-9
Bluestem Willow^	<i>Salix irrorata</i>	Medium Shrub	5-8	4-6	yellow catkins, bluish twigs	spring	3	full sun to partial sh.	x	xx	xx	xx	xx	3-5

***Shrub and Tree**

Watering Schedule 1

1st year
2nd year
3rd year
4th year

Soak every 2 wks

Soak every three weeks

Soak once a month

Water during extended dry periods

Watering Schedule 2

1st year

2nd year

3rd year

Soak every week

Soak every two weeks

Soak every three to four weeks

Watering Schedule 3

1st year

2nd year

3rd year

Soak twice a week

Soak once a week

Soak every two weeks

^ Species on the margins of their range

*ZONES COORDINATE WITH CHARTS ON PAGES NAT APDX C-2 THROUGH C-7

Wetland and Subirrigated Tallgrass Prairie Species List

For Detention Ponds, Drainages, and Other Areas (See Graphic for Zone Layout)

Common Name	Scientific Name	Wetl. Desiq.	Water Regime	Water Depth Preference	Growth Pattern
Community Type	Dimensions	Area	# of Plants	Density	
	(feet)	(Sq feet)		1/ 5 sq ft	
Species for Open Water (Standing or Slow Moving) (Zone PB1, also possible in parts of Zone PB2 and PB3)					
American Threesquare	<i>Schoenoplectus pungens</i>	obligate	H	0 to 6"	sod
Smallfruit Bulrush	<i>Scirpus microcarpus</i>	obligate	H to H+	0 to 3"	sod
Pale Bulrush	<i>Scirpus pallidus</i>	obligate	H to H+	0 to 3"	sod
Softstem Bulrush	<i>Schoenoplectus tabernaemontani</i>	obligate	H to H+	0 to 24"	sod
Hardstem Bulrush	<i>Schoenoplectus acutus</i>	obligate	H to H+	0 to 36"	sod
Giant Burreed*	<i>Sparganium eurycarpum</i>	obligate	H to H+	0 to 12"	sod
Broadleaf Arrowhead	<i>Sagittaria latifolia</i>	obligate	H	6 to 12"	sprout
Flooded Slopes (Zone PS2 and PB4)					
Clustered Field Sedge	<i>Carex praegracilis</i>	facw	H-	periodically flooded	sod
American Threesquare	<i>Schoenoplectus pungens</i>	obligate	H	0 to 6"	sod
Alkali Bulrush	<i>Bolboschoenus maritimus</i>	obligate	H to H+	0 to 6"	sod
Water Sedge	<i>Carex aquatilis</i>	obligate	H to H+	0 to 3"	bunch
Emory Sedge	<i>Carex emoryi</i>	obligate	H	seasonally flooded	sod
Nebraska Sedge	<i>Carex nebrascensis</i>	obligate	H	seasonally flooded	sod
Marsh Milkweed	<i>Asclepias incarnata</i>	obligate	H-	periodically flooded	sprout
Prairie Cordgrass	<i>Spartina pectinata</i>	facw	M+ to H-	seasonally flooded	sod
Flooded Flats (Zones PB2, PB3, W1, W2, and W3)					
Clustered Field Sedge	<i>Carex praegracilis</i>	facw	H-	periodically flooded	sod
Creeping Spikerush	<i>Eleocharis palustris</i>	obligate	H	0 to 3"	sod
American Mannagrass	<i>Glyceria grandis</i>	obligate	H	seasonally flooded	rhizomatous
Prairie Cordgrass	<i>Spartina pectinata</i>	facw	M+ to H-	seasonally flooded	sod
Emory Sedge	<i>Carex emoryi</i>	obligate	H	seasonally flooded	sod
Nebraska Sedge	<i>Carex nebrascensis</i>	obligate	H	seasonally flooded	sod
Nuttall Alkaligrass	<i>Puccinellia nuttalliana</i>	obligate	M+ to H-	seasonally flooded	sprout
Marsh Milkweed	<i>Asclepias incarnata</i>	obligate	H-	periodically flooded	sprout
Marsh Sunflower	<i>Helianthus nuttallii</i>	facw	M+	periodically flooded	sprout
Saturated Slopes (Zones PS2, possible lower PS5, W1, W2, W3, and R1)					
Bottlebrush Sedge	<i>Carex hystricina</i>	obligate	H-	seasonally saturated	sod
Wolly Sedge	<i>Carex lanuginosa</i>	obligate	H-	seasonally flooded	sod
Slender Rush	<i>Juncus tenuis</i>	fac-facw	H	moist to saturated	bunch
Broom Sedge	<i>Carex scoparia</i>	facw	H	seasonally flooded	rhizomatous
Bebb's Sedge	<i>Carex bebbii</i>	obligate	H-	saturated soil	bunch
Colorado Rush	<i>Juncus confusus</i>	facw	H	moist - saturated	sod
Torrey's Rush	<i>Juncus torreyi</i>	facw-facw+	H	saturated soil	sod
Baltic Rush	<i>Juncus arcticus</i>	fac-obl	H- to H	moist - saturated	sod
American Mannagrass	<i>Glyceria grandis</i>	obligate	H	seasonally flooded	rhizomatous
Blue Vervain	<i>Verbena hastata</i>	facw	H-	moist - saturated	bunch
Marsh Sunflower	<i>Helianthus nuttallii</i>	facw	M+	periodically flooded	sprout
Saturated Flats (Zones PB2, PB3, and possibly PB4)					
Slender Rush	<i>Juncus tenuis</i>	fac-facw	H	moist to saturated	bunch
Fox Sedge	<i>Carex vulpinoidea</i>	obligate	H-	seasonally saturated	sod
Colorado Rush	<i>Juncus confusus</i>	facw	H	moist - saturated	sod
Torrey's Rush	<i>Juncus torreyi</i>	facw-facw+	H	saturated soil	sod
Bebb's Sedge	<i>Carex bebbii</i>	obligate	H-	saturated soil	bunch
Blue Vervain	<i>Verbena hastata</i>	facw	H-	moist - saturated	bunch
Rocky Mountain Iris	<i>Iris missouriensis</i>	obl-facw	M+ to H-	saturated	sprout
Marsh Skullcap	<i>Scutellaria galericulata</i>	facw	M+ to H-	moist - saturated	sprout
Agalinus	<i>Agalinus tenuifolia</i>	facw	M+ to H-	moist - saturated	sprout
Field Mint	<i>Mentha arvensis</i>	facw	M+	moist	sprout
Nuttall Alkaligrass	<i>Puccinellia nuttalliana</i>	obligate	M+ to H-	seasonally flooded	sprout
Inland Saltgrass	<i>Distichlis spicata</i>	facw	M+ to X	moist to xeric	rhizomatous
Prairie Cordgrass	<i>Spartina pectinata</i>	facw	M+ to H-	seasonally flooded	sod

Common Name	Scientific Name	Wetl. Desiq.	Water Regime	Water Depth Preference	Growth Pattern
Community Type	Dimensions	Area	# of Plants	Density	
	(feet)	(Sq feet)		1/sq ft to 1/two sq ft	
Subirrigated Slopes (Zones upper PS2, PS5, Upper R1, R2, and lower R3)					
Switchgrass	<i>Panicum virgatum</i>	fac-facw	M- to M+	subirrigated	bunch
Yellow Indiangrass	<i>Sorghastrum nutans</i>	fac	M- to M+	subirrigated	bunchy sod
Big Bluestem	<i>Andropogon gerardii</i>	fac	M to M+	subirrigated	sod
Marsh Sunflower	<i>Helianthus nuttallii</i>	facw	M+	periodically flooded	sprout
Golden Banner	<i>Thermopsis divaricarpa</i>	upland	M	moist	rhizomatous
Prairie Coneflower	<i>Ratibida columnifera</i>	upland	X to X+	dry	sprout
Indian Blanket	<i>Gaillardia aristata</i>	upland	X+ to M	dry to moist	sprout
Subirrigated Flat (Upper R1, R2, and lower R3)					
Prairie Cordgrass	<i>Spartina pectinata</i>	facw	M+ to H-	seasonally flooded	sod
Switchgrass	<i>Panicum virgatum</i>	fac-facw	M- to M+	subirrigated	bunch
Yellow Indiangrass	<i>Sorghastrum nutans</i>	fac	M- to M+	subirrigated	bunchy sod
Big Bluestem	<i>Andropogon gerardii</i>	fac	M to M+	subirrigated	sod
Great Blue Lobelia	<i>Lobelia siphilitica</i>	obl-facw	M to M+	subirrigated	sprout
Rocky Mountain Iris	<i>Iris missouriensis</i>	obl-facw	M+ to H-	saturated	sprout
Joe Pye Weed	<i>Eupatorium maculatum</i>	fac	M to M+	subirrigated	sprout
Tulip Gentian*	<i>Eustoma grandiflorum</i>	fac	M to M+	subirrigated	sprout

obligate - obligate wetland: Estimated 99% probability of occurrence in wetlands.
 facw - facultative wetland: Estimated 67%-99% probability of occurrence in wetlands.
 fac - facultative: Equally occurring in wetlands and non-wetlands (34 - 66% probability).
 upland - not found in wetland soils, but may be found above wetlands in upper subirrigated areas

X- = always xeric M- = periodically dry H- = periodically saturated
 X = xeric M = mesic H = saturated
 X+ = occasionally xeric M+ = moist H+ = standing water

*Colorado Natural Heritage Program State Conservation Ranks

S1 - Critically Imperiled Tulip Gentian*
 S2 - Imperiled Giant Burreed
 S3 - Vulnerable Likely Prairie Cordgrass

*ZONES COORDINATE WITH CHARTS ON PAGES NAT APDX C-2 THROUGH C-7

General List of Grasses and Grasslike Plants and Their Ecological Characteristics

Common Name	Scientific Name	Soil Type						Soil Moisture			Sun/Shade Tolerance			Growing Season	Height (feet)	Growth Form		
		Clay		Sandy		Sand	Gravel	Hydric	Mesic	Xeric	Shade	Partial	Sun					
Fine	Moderately Fine	Loam Medium	Loam Course	Loam Course	Very Course													
Species for Upland Slopes (Zones PS100, PT, R4, and U1)																		
Little Bluestem	<i>Schizachyrium scoparium</i>	X	X	XX	XX	XX	XX		XX	XX	X			XX	XX	warm	1 to 4	bunchgrass
Side Oats Grama	<i>Bouteloua curtipendula</i>	X	XX	XX	XX	X	X			XX	XX	X		X	XX	warm	1 to 3	bunchy, sod former
Blue Grama	<i>Bouteloua gracilis</i>	X	XX	XX	XX	X	X		X	XX	XX	XX			XX	warm	0.5 to 2	bunchgr., sod w/ mow
Western Wheatgrass	<i>Pascopyrum smithii</i>	XX	XX	XX	X			X	XX	XX	X			X	XX	cool	1 to 3	sod forming
Green Needlegrass	<i>Nassella viridula</i>	XX	XX	XX	X	X			X	XX	XX	X		X	XX	cool	1.5 to 3.5	bunchgrass
Slender Wheatgrass	<i>Elymus trachycaulus</i>	X	XX	XX	XX				XX	XX	X			X	XX	cool	1.5 to 4	short-lived,bunchgrass
Buffalograss	<i>Buchloe dactyloides</i>	XX	XX	XX	XX	X	X		X	XX	XX	XX		X	XX	warm	0.2 to 0.5	sod forming
Bottlebrush Squirreltail	<i>Elymus elymoides</i>	X	XX	XX	XX	XX	XX		X	X	XX	XX			XX	cool	1 to 2	short-lived,bunchgrass
Sand Dropseed	<i>Sporobolus cryptandrus</i>		X	XX	XX	XX	XX			X	XX	XX		X	XX	warm	2 to 3	bunchgrass
Alkali Bluegrass	<i>Poa juncifolia</i>	X	XX	XX	XX	X	X		X	XX	XX	X	X	XX	XX	cool	0.5 to 1.5	bunchgrass
Sun Sedge	<i>Carex inops ssp. heliophila</i>																	
Species for Subirrigated Areas (Zones upper PB4, PS2, Lower PS 5 on north side, upper R1, R2, & possible on R3)																		
Big Bluestem	<i>Andropogon gerardii</i>	X	XX	XX	XX	XX	X		XX	XX	X			X	XX	warm	3 to 6	bunchy, sod former
Switchgrass	<i>Panicum virgatum</i>	XX	XX	XX	XX	X	X		XX	XX	X				XX	warm	2 to 5	bunchgr., sod w/ mow
Yellow Indiangrass	<i>Sorghastrum nutans</i>	XX	XX	XX	XX	XX	X	X	XX	XX	X	X		XX	XX	warm	3 to 6	bunchy, sod former
Alkali Sacaton	<i>Sporobolus airoides</i>	X	XX	XX	XX	X			XX	XX	X			X	XX	warm	1 to 3	bunchgrass
Green Needlegrass	<i>Nassella viridula</i>	XX	XX	XX	X	X			X	XX	XX	X		X	XX	cool	1.5 to 3.5	bunchgrass
Western Wheatgrass	<i>Pascopyrum smithii</i>	XX	XX	XX	X			X	XX	XX	X			X	XX	cool	1 to 3	sod forming
Nuttall Alkaligrass	<i>Puccinellia airoides</i>	XX	XX	XX	X	X		X	XX	XX				X	XX	cool	1 to 1.5	bunchgrass
Canada Wildrye	<i>Elymus canadensis</i>	XX	XX	XX	X			X	XX	XX	X		X	XX	XX	cool	2 to 4	short-lived,bunchgrass
Species for Wetland Areas (Zones PB1, PB2, BP3, PB4, PS2, and on W1, W2, W3, R1 and R2) (seeded)																		
Prairie Cordgrass	<i>Spartina pectinata</i>		XX	XX	XX	X		X	XX	X				XX	XX	warm	3.5 to 7	sod forming
Canada Wildrye	<i>Elymus canadensis</i>	X	XX	XX	XX	X		X	XX	XX	X		X	XX	XX	cool	2 to 4	short-lived,bunchgrass
Switchgrass	<i>Panicum virgatum</i>	XX	XX	XX	XX	X	X		XX	XX	X				XX	warm	2 to 5	bunchgr., sod w/ mow
Inland Saltgrass	<i>Distichlis spicata</i>	XX	XX	XX	X			XX	XX	X				X	XX	warm	0.5 to 1.5	sod forming
Fowl Bluegrass	<i>Poa palustris</i>		XX	XX	X			X	XX	X			X	XX	XX	cool	1 to 1.5	bunchgrass
Nebraska Sedge	<i>Carex nebrascensis</i>	XX	XX	X				XX	X						XX	cool	1 to 2.5	sod forming
Woolly Sedge	<i>Carex lanuginosa</i>	X	XX	XX	XX			X	XX	X					XX	cool	1 to 3	sod forming
Creeping Spikerush	<i>Eleocharis palustris</i>	XX	XX	X				XX	X						XX	cool	0.5 to 2	sod forming
Torrey's Rush	<i>Juncus torreyi</i>	XX	XX	X				XX	XX	X					XX	cool	1 to 2.5	sod forming
Baltic Rush	<i>Juncus balticus</i>	XX	XX	X				XX	XX	X					XX	cool	0.5 to 2.5	sod forming

*ZONES COORDINATE WITH CHARTS ON PAGES NAT APDX C-2 THROUGH C-7

NAT Appendix C - Zoning and Decision Charts for Centerra

ZONING CHART I - Centerra Guideline Matrix

This guideline matrix provides a broad context for the appropriateness of various types of ecosystems and their attributes that can be created in Centerra. Centerra lands are divided up based on habitat patch size and the relationship of one patch to another, narrow and broad peninsulas of habitat, and narrow and broad habitat corridors (Column Headers). As development decisions are made, specific areas can be identified within these eight broader categories. An example of a **Small Patch Ecosystem** might be a neighborhood detention pond surrounded by the homes and other dwelling units in the neighborhood, whereas a **Large Patch Ecosystem** might be a regional detention facility covering several acres serving several neighborhoods or a larger part of the community. An example of a **Narrow Corridor Ecosystem** could be a small ephemeral stream drainage created to convey stormwater through a neighborhood, whereas a **Broad Corridor** may be needed to serve the larger community. **Peninsulas** of habitat could be **narrow or broad** but do not connect to open space lands on one end. Ecosystem attributes on the left side of the spreadsheet represent a continuum of aesthetics from open to dense vegetation, from shortgrass prairies to densely vegetated shrubby woodlands, a continuum of water regimes, and of options to buffer these ecosystems from the influences of the surrounding developed communities. Generally speaking, all of these lands are small when it comes to conserving wildlife habitat, thus limiting conservation to mostly songbirds, butterflies, some amphibians and reptiles, and plants (See NAT Appendix D for Landscape Functions).

To use the restoration decision matrix:

1. Determine the appropriate Centerra Areas Landscape Context and header for the project in consultation with the team environmental consultant or in discussions with HPEC personnel.
2. In the Centerra Guideline Matrix to the right, move down the column to find the appropriate planting types, depicted with XX.
3. Go to Charts 2A, 2B and 3 in the NAT Appendix C and NAT Appendix D to evaluate attributes of the ecosystem type to determine if the type meets project goals.
4. Select a desired habitat type.
5. Refer to Charts 4 and 5 in the NAT Appendix C for detention pond zones and specific ecosystems. Refer to Charts 6 and 7 in the NAT Appendix C for stream and channel conveyance zones and specific ecosystems and plant community types.
6. Select the specific plant communities, wildlife and habitat that you want to restore at your project site (i.e. Nebraska sedge, Herbaceous wetland, Tallgrass prairie, Shrubby woodland)
7. Refer to the Field Guide page depicted. Determine the seed mix from the Field Guide.
8. Use the descriptions and plant list from the Field Guide to determine the seed mixes, herbaceous plants and woody plants you want to restore at the project site.



Centerra Guideline Matrix	Centerra Areas-Landscape Context							
	Small Patch Ecosystem	String of Small Patch Ecosystems	Large Patch Ecosystem	String of Large Patch Ecosystems	Narrow Peninsula Ecosystem	Broad Peninsula Ecosystem	Narrow Corridor Ecosystem	Broad Corridor Ecosystem
General Aesthetics								
OPEN			X					XX
MIXED	X	X	XX	X	X	X	X	XX
DENSE	XX	XX	XX	XX	XX	XX	XX	XX
Plant Communities								
Shortgrass			X	X				X
Mixed grass	X	X	XX	XX	X	X	X	X
Tall grass prairie	XX	XX	XX	XX	XX	XX	XX	XX
Playa			X	XX		X		X
Herbaceous Wetland	X	X	X	XX	X	X	X	XX
Bulrush Marsh	XX	X	XX	X	XX	XX	XX	XX
Riparian Shrubland	XX	XX	XX	X	XX	XX	XX	X
Upland Shrubland	X	X	X	X	X	X	X	XX
Park-like Woodland	X	X	X	XX	X	X	X	XX
Shrubby Woodland	XX	XX	XX	XX	XX	XX	XX	XX
Water Relations								
No Water	X	X	X	X	X			
Temporary Water	XX	XX	XX	XX	XX	XX	XX	XX
Long-term Temporary Water	XX	XX	XX	X	X	X	XX	XX
Permanent Water	XX	XX	XX				XX	XX
Ecosystem Buffer Protection								
Landscape Edge Protection	XX	XX	XX	X	XX	XX	XX	X
Type-Veg. Screening	XX	XX	XX	X	X	X	XX	XX
Type-Fencing/limit access	XX	X	X	XX	X	X	X	X
Light and Noise Protection	XX	XX	XX	XX	XX	XX	XX	XX

XX = Very appropriate and in large amounts
 X = somewhat appropriate but in smaller amounts

ZONING CHART 2A - Quality rating of various ecosystems by landscape function focusing on aesthetics, water, and sediment.

	Herbaceous Wetland Wet Meadow and Playas w/ mudflats	Herbaceous Wetland - Bulrush Marsh	Riparian and Upland Shrubland	Park-like Woodland	Shrubby Woodland	Subirrigated Tallgrass Prairie	Short and Mid Grass Prairie
Topographic Position	<i>Low</i> (-0.5' -2'+ above AHW)	<i>Low</i> (-2' -2'+ above AHW)	<i>Moderately Low to High</i> (0' -4'+ above AHW)	<i>Moderately Low to Moderate</i> (2' -6' above AHW)	<i>Moderately Low to Moderate</i> (2' -6' above AHW)	<i>Moderately Low</i> (1' -4'+ above AHW)	<i>High</i> (4' -8'+ above AHW)
Tall Visual Screen	No	No	Limited to 15 feet	Good	Excellent	No	No
Low Visual Screen	Limited to 3 feet	Limited to 5-8 feet	Good	Fair to Good	Good to Excellent	Limited to 5 feet	No
Trail Visual Screen	Fair to Good depending on wetness	Good to Excellent depending on thickness	Good	Fair to Good	Good to Excellent	Fair to Good depending on thickness	No
Viewshed	Excellent	Fair to Excellent	Fair to Good	Fair to Poor	Poor	Excellent to Good	Excellent
Viewshed Framing	Poor	Poor to Fair	Poor to Fair	Excellent to Poor	Excellent to Poor	Poor	Poor
Auditory Screen	No	No	Fair to Good	Fair to Good	Good to Excellent	No	No
Wind Moderator	No	Poor	Fair to Good	Good	Excellent	No	No
Temperature Moderator	No	No	Limited	Good	Good to Excellent	No	No
Water Quality Filter	Good to Excellent	Excellent	Good to Fair	Good to Excellent	Good to Excellent	Fair to Good	Fair
Flood Attenuation	Good to Excellent	Good to Excellent	Good to Fair	Good	Good	Good	Fair to Poor
Erosion Control	Good to Excellent	Good to Excellent	Good to Excellent	Good	Good to Excellent	Good	Fair to Good
Sediment Storage	Good to Excellent	Good to Excellent	Fair to Excellent	Good to Excellent	Good to Excellent	Fair to Good	Fair to Poor

AHW - Average High Waterline

ZONING CHART 2B - Quality rating of various ecosystems by landscape function primarily related to conservation of wildlife.

	Herbaceous Wetland Wet Meadow and Playas w/ mudflats	Herbaceous Wetland - Bulrush Marsh	Riparian and Upland Shrublands	Park-like Woodland	Shrubby Woodland	Subirrigated Tallgrass Prairie	Short and Mixed Grass Prairie
Topographic Position	<i>Low</i> (-0.5' -2'+ above AHW)	<i>Low</i> (-2' -2'+ above AHW)	<i>Moderately Low to High</i> (0' -4'+ above AHW)	<i>Moderately Low to Moderate</i> (2' -6' above AHW)	<i>Moderately Low to Moderate</i> (2' -6' above AHW)	<i>Moderately Low</i> (1' -4'+ above AHW)	<i>High</i> (4' -8'+ above AHW)
Wildlife Movement Corridor	Fair to Good	Poor to Fair	Good	Good	Good to Excellent	Good	Fair to Poor
Stepping Stone	Good	Excellent - existing	Good	Good	Good to Excellent	Good	Fair to Poor
Buffer	Good	Good to Excellent	Good to Excellent	Good to Excellent	Good to Excellent	Fair to Good	Fair to Poor
Wildlife Breeding	Good	Excellent - existing	Fair to Good	Fair to Good	Fair to Good	Good	Fair to Poor
Wildlife Feeding	Good to Excellent	Fair to Good (bulrushes)	Good to Excellent	Good	Good to Excellent	Good	Fair to Good
Wildlife Resting	Good	Fair to Good	Good to Excellent	Good	Good to Excellent	Good	Fair to Good
Migratory Stopover	Good to Excellent	Fair to Good	Good to Excellent	Good	Good to Excellent	Good	Fair

AHW - Average High Waterline

ZONING CHART 3 - Wildlife use by function for various ecosystems.

	Short and Mixed Grass Prairie	Herbaceous Wetland Wet Meadow And Playas w/ mudflats	Subirrigated Tallgrass Prairie	Herbaceous Wetland-Bulrush Marsh	Wetland and Upland Shrub Thicket	Park-like Woodland	Shrubby Woodland
<i>Representation</i>	<i>Fair</i>	<i>Poor to good</i>	<i>Poor</i>	<i>Excellent</i>	<i>Poor to fair</i>	<i>Fair to Poor</i>	<i>Poor</i>
Topographic Position	High (4' -8'+ above AHW)	Low (-0.5' -2'+ above AHW)	Moderately Low (1' -4'+ above AHW)	Low (-2' -2'+ above AHW)	Moderately Low to High (0' -4'+ above AHW)	Moderately Low to Moderate (2' -6' above AHW)	Moderately Low to Moderate (2' -6' above AHW)
Wildlife Movement Corridor	Small Mammals	Small Mammals	Up to Medium Mammals	Medium to Large Mammals	Medium to Large Mammals	Medium to Large Mammals	Medium to Large Mammals
Stepping Stone	Some grassland Songbirds on migration Butterflies	Waterfowl Many Shorebirds Some Songbirds Many Waders Some waterbirds Many Butterflies	Most Grassland Songbirds Some Raptors Many Butterflies	Some Songbirds Some Raptors Some Waders and Most Rails Few Butterflies	Many Songbirds Some Raptors	Many Raptors Many Songbirds Few Butterflies	Many Raptors Most Songbirds Some Butterflies
Buffer	Fair to Poor	Good	Fair to Good	Good to Excellent	Good to Excellent	Good to Excellent	Good to Excellent
Wildlife Breeding	Limited Waterfowl Limited Songbirds	Waterfowl Shorebirds Some Songbirds	Waterfowl Shorebirds Some Songbirds	Grebes Waterfowl Shorebirds Some Songbirds	Limited Waterfowl Many Songbirds	Limited Waterfowl Many Songbirds Raptors	Limited Waterfowl Limited Waterfowl Many Songbirds Raptors
Wildlife Feeding	Limited Waterfowl Limited Songbirds Many Raptors Some Butterflies	Waterfowl Many Shorebirds Some Songbirds Many Waders Some waterbirds Many Butterflies	Most Grassland Songbirds Some Raptors Many Butterflies	Some Songbirds Some Raptors Some Waders and Most Rails Few Butterflies	Many Songbirds Some Raptors	Many Raptors Many Songbirds Few Butterflies	Many Raptors Most Songbirds Some Butterflies
Wildlife Resting	Limited Waterfowl Limited Songbirds Many Raptors Some Butterflies	Waterfowl Many Shorebirds Some Songbirds Many Waders Some waterbirds Many Butterflies	Most Grassland Songbirds Some Raptors Many Butterflies	Some Songbirds Some Raptors Some Waders and Most Rails Few Butterflies	Many Songbirds Some Raptors	Many Raptors Many Songbirds Few Butterflies	Many Raptors Most Songbirds Some Butterflies
Migratory Stopover	Some Grassland Songbirds Some Raptors	Waterfowl Many Shorebirds Some Songbirds Many Waders	Most Grassland Songbirds Some Raptors	Some Songbirds Some Raptors Some Waders and Most Rails	Many Songbirds Some Raptors	Many Raptors Many Songbirds	Many Raptors Most Songbirds

AHW - Average High Waterline

DESIGN CHARTS 4 & 5 Centerra and HPEC Detention Pond Narrative

These charts show specific types of wetland and riparian ecosystems and their dominant plant communities that can be restored as habitat in detention ponds on Centerra and HPEC (High Plains Environmental Center) lands. These are existing ecosystems that have been described by a plant ecologist from the *Colorado Natural Heritage Field Guide to Wetland and Riparian Plant Associations of Colorado*. In Chart 4 the ecosystem zones in the left hand column correspond to the plan view and cross section drawings (on this sheet) of representative areas of a detention pond. The second column describes the relationship between topography and water relations for each zone designation, while the following columns describe the relationship between ecosystem zones, plant designations and communities. In Chart 5 (on page NAT APDX C-5) the ecosystem zones in the left hand column correspond to the plan view and cross section drawings (on this sheet) of representative areas of a detention pond. This is followed by the individual plant communities and the associated page number in the above mentioned field guide as well as restoration suitability and desirability of each of these plant communities in a particular zone. The table is broken up by major vegetative groups. Within each group the most water loving (wet) communities are on the top left and the most xeric (dry) communities are on the bottom right.

Additional plants for each community can be found in the NAT Appendix B

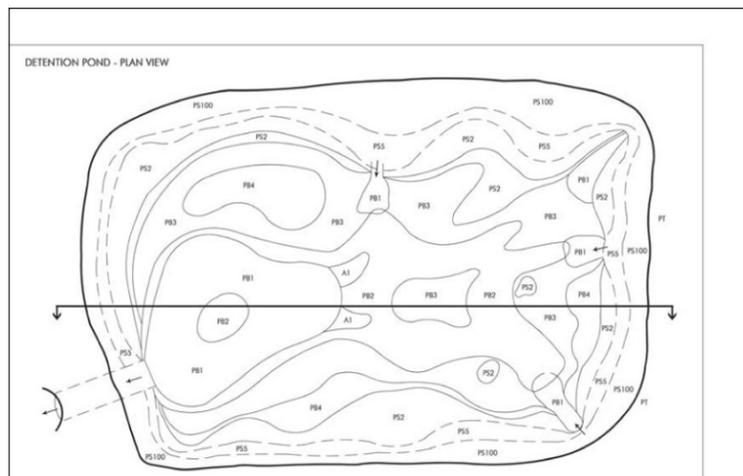


CHART 4 - Detention Pond Zones with hydrologic characteristics, soil moisture regimes, associated wetland plant designations, as well as the general plant community that might be restored to pond bottom and pond slopes.

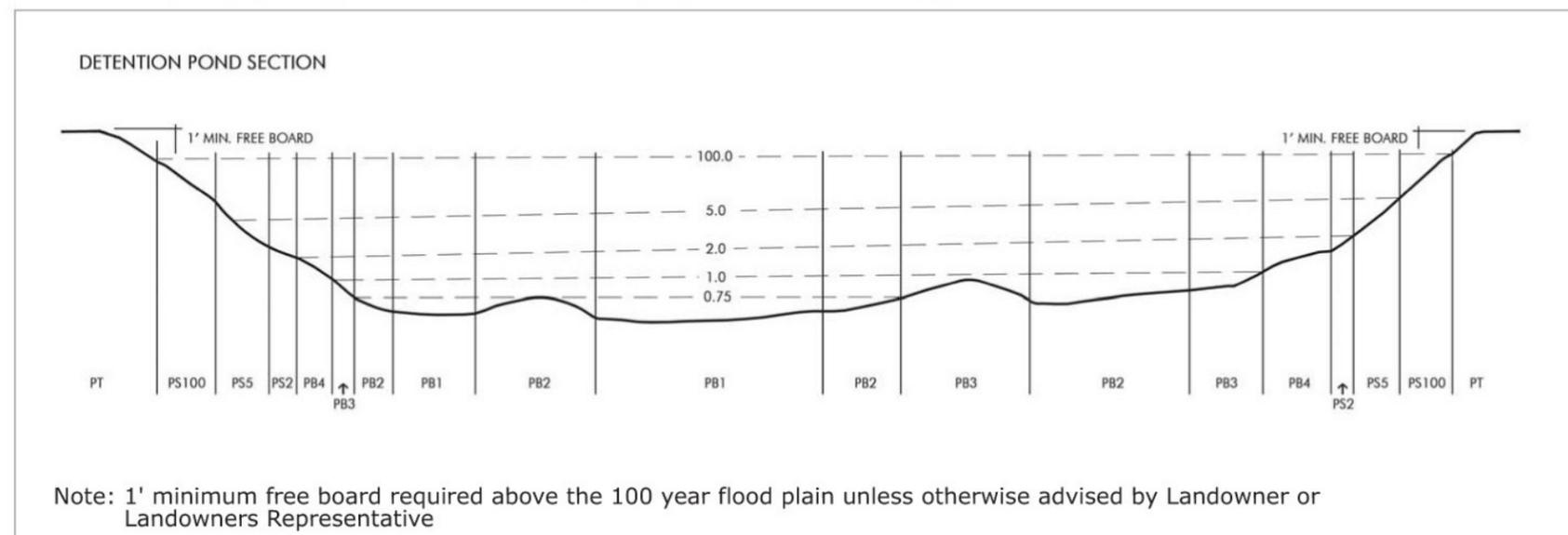
Zone Code	Hydrogeomorphology	Flood Return Interval *	Moisture Regime	Wetland Plant Designation	General Plant Community**
PB1	Pond Bottom Surface Water Frequent	0 - 0.10	H	<i>obligate</i>	Wetland Marsh
PB2	Pond Bottom Saturated	0.10- 0.75	H to H-	<i>obligate to facw</i>	Herbaceous Wetland
PB3	Pond Bottom Periodically Saturated	0.75 to 1.0	H-	<i>obligate to facw</i>	Herbaceous Wetland
PB4	Pond Bottom Moist	1.0 to 2.0	M+	<i>facw - fac</i>	Herbaceous Wetland
PS2	Pond Slope up to 2 year flow	1.0 to 2.0	M+ to M	<i>facw - fac</i>	Shrubland or Woodland
PS5	Pond Slope from 2 to 5 year flow	2.0 to 5.0	M to M-	<i>upl - facu</i>	Shrubland, Woodland, or Grassland
PS100	Pond Slope from 5 to 100 year flow	5.0 to 100	M- to X+	<i>upl - facu</i>	Shrubland, Woodland, or Grassland
PT	Pond Top above slope	100 +	X+ to X-	<i>upl - facu</i>	Grassland or Upland Shrubland

* Lower part of the range reflects when water will first flood this ecosystem while the upper end reflects when this community will be completely inundated
 ** Specific plant communities can be found on Page LAN APDX C-5.

Key:

- obligate** - *obligate wetland*: Estimated 99% probability of occurrence in wetlands.
- facw** - *facultative wetland*: Estimated 67%-99% probability of occurrence in wetlands.
- fac** - *facultative*: Estimated 34% - 66% probability of occurrence in wetlands. Equally occurring in wetlands and non-wetlands.
- facu** - *facultative upland*: Estimated 1% -33% probability of occurrence in wetlands, 67%-99% probability of occurrence.
- upl** - *upland*: Not found in wetland soils, but may be found above wetlands in upper subirrigated areas.

- X- = always xeric
- X = xeric
- X+ = occasionally xeric
- M- = periodically dry
- M = mesic
- M+ = moist
- H- = periodically saturated
- H = saturated
- H+ = standing water



Design Chart 5 Detention Pond Ecosystems and Dominant Plant Communities - Existing Colorado Plant Communities that could be restored as habitat in detention ponds and surrounding slopes.

* Additional plants for each community can be found in the NAT Appendix B*

Ecosystems	Herbaceous Wetland						Plant Community*						Upland Shrubland		
	Bulrush Marsh 416	Common Spikerush 376	Beggar Ticks 326	Nebraska Sedge 346 G4 S3	Woolly Sedge 350 G3 S3 (montane)	Prairie Chordgrass 426 G3? S3	Sandbar Willow 206	Strapleaf Willow* 222 G2G3 S2S3	River Hawthorn 288 G2Q S2	Chokecherry Plum 298 G4Q S2	Western Snowberry 310	Skunkbrush SBS G2 S2 (riparian)	Saltbush Winterfat SWS	Rabbitbrush RBS	
Field Guide Page**															
Colorado Natural Heritage Program Ranking															
Zone Code	Hydro-geomorphology														
PB1 Pond Bottom Surface Water Frequent	xx	xx	xx	x											
PB2 Pond Bottom Saturated	xx	xx	xx	xx	xx	x	x	y							
PB3 Pond Bottom Periodically Saturated	xx	x	x	xx	xx	xx	xx	x							
PB4 Pond Bottom Moist	x	y	y	x	xx	xx	xx	xx	x	y	y				
PS2 Pond Slope up to 2 year flow	y			y	x	xx	xx	xx	x	x	x	y	x	x	
PS5 Pond Slope from 2 to 5 year flow					y	x	x	x	xx	xx	xx	xx	x	x	
PS100 Pond Slope from 5 to 100 year flow						y	y	y	x	xx	xx	xx	xx	xx	
PT Pond Top above slope									x	x	x	xx	xx	xx	
	Wet----->----->----->----->----->Mesic						Wet Mesic----->----->----->----->----->Dry Mesic						Dry Mesic----->----->----->----->----->Dry		

Ecosystems	Park-like Woodland					Shrubby Woodland					Prairie		
	P. Cottonwood PL Willow P. Chordgrass Sedge 160 G1 S1	P. Cottonwood Woolly Sedge 140 G2 S1	Peachleaf Willow 182	P. Cottonwood Switchgrass Little Bluestem 150 G2 S2	P. Cottonwood Western Wheatgrass 152 G2 S2 (in part)	P. Cottonwood Bluestem Willow 126	P. Cottonwood Peachleaf & Sandbar Willow 158 G4G3 S2	P. Cottonwood Chokecherry 154	P. Cottonwood Western Snowberry 168 G2G3 S2	P. Cottonwood Skunkbrush 156	Tallgrass Prairie 322 G2 S1S2	Midgrass Prairie MGP G3G4 S2	Shortgrass Prairie SGP
Field Guide Page**													
Colorado Natural Heritage Program Ranking													
Zone Code	Hydro-geomorphology												
PB1 Pond Bottom Surface Water Frequent													
PB2 Pond Bottom Saturated	x	x	x			x	x				y		
PB3 Pond Bottom Periodically Saturated	xx	xx	xx	y	y	xx	xx				x		
PB4 Pond Bottom Moist	xx	xx	xx	xx	xx	xx	xx	y	y		xx		
PS2 Pond Slope up to 2 year flow	x	xx	xx	xx	xx	xx	x	x	xx	x	xx	y	
PS5 Pond Slope from 2 to 5 year flow	xx	y	x	xx	xx	x	xx	xx	xx	xx	xx	x	y
PS100 Pond Slope from 5 to 100 year flow	x		y	xx	xx	y	x	xx	xx	xx	x	xx	x
PT Pond Top above slope	y			y	x		y	x	y	x	y	xx	xx
	Wet----->----->----->----->----->Mesic					Wet Mesic----->----->----->----->----->Dry Mesic					Wet Mesic----->----->----->----->----->Dry		

Restoration Suitability and Desirability
 xx - highly suitable and desirable
 x - suitable and desirable
 y - marginal

* Each of these plant communities are found in Colorado and have been described by plant ecologists.
 ** Field Guide to the Wetland and Riparian Plant Associations of Colorado Colorado Natural Heritage Program, Colorado State University

ADDITIONAL PLANT COMMUNITIES - Most of these additional communities are found in the lower mountains or are found on the west slope, however all of these dominant species are found on the high plain (some are not the best adapted) although this exact plant community may not be found.

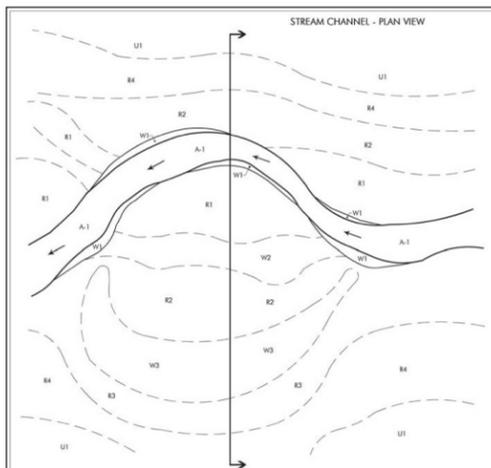
- Other Woodlands** - Plains Cottonwood/ Inland Saltgrass (142), Plains Cottonwood/Slenderwheatgrass (144) GU S2, Cottonwood Alkali Sacaton (162) (G3 S2)
- Other Shrubby Woodlands** - Cottonwood Red Osier Dogwood (114) G4 S3 (in part), Cottonwood River Birch (112), Cottonwood Alder (110),
- Forests** - Box Elder Red Osier Dogwood Forest (100), Box Elder Cottonwood Netleaf Hackberry Forest (102), Box Elder Cottonwood Red Osier Dogwood Forest (104), Box Elder Chokecherry Forest (106)
- Riparian Shrublands** - Sandbar Willow Strapleaf Willow (208)
- Herbaceous Wetlands** - Clustered Field Sedge (352)G3G4 S2, American Mannagrass (389), Mountain Rush (or Baltic Rush) (396), Rice Cutgrass (402), Alkali Muhley (404), Cosmopolitan Bulrush (418) G4 S2, Common Threesquare (420) G3G4 S3, Alkali Sacaton (430), Giant Burreed (G4 S2)

- Colorado Natural Heritage Program Ranking:**
- G1 - Globally Critically Imperiled
 - G2 - Globally Imperiled
 - G3 - Globally Vulnerable to Extinction
 - G4 - Globally Apparently Secure
 - G5 - Demonstrably Widespread, Abundant, and Secure
 - S1 - State Critically Imperiled
 - S2 - State Imperiled
 - S3 - State Vulnerable to Exterpation
 - S4 - State Apparently Secure
 - S5 - Demonstrably Widespread, Abundant, and Secure

DESIGN CHARTS 6 & 7 Centerra and Stream Drainage Narrative

These charts depict the specific types of aquatic and riparian stream ecosystems and their dominant plant communities that can be restored as habitat along drainages and floodplains upstream of detention ponds on Centerra and HPEC lands. These are existing ecosystems that have been described by plant ecologists from the Colorado Natural Heritage Program in a book entitled *Field Guide to Wetland and Riparian Plant Associations of Colorado*. In Design Chart 6 the ecosystem zones in the left hand column correspond to the plan view and cross section drawings (on this sheet) of representative areas of a drainage system. The second column describes the relationship between the topography and water relations for each zone designation, while the remaining columns describe the relationship between ecosystem zones and plant designations and communities. In Chart 7 the ecosystem zones in the left hand column correspond to the plan view and cross section drawings (on this sheet) of representative areas of a drainage system. This is followed by the individual plant communities and the associated page number in the above mentioned field guide as well as restoration suitability and desirability of each of these plant communities in a particular zone. The table is broken up by major vegetative groups. Within each group the most water loving (wet) communities are on the top left and the most xeric (dry) communities are on the bottom right.

Additional plants for each community can be found in the NAT Appendix B



DESIGN CHART 6- Aquatic and Riparian Stream Drainage Ecosystem Zones with hydrologic characteristics, soil moisture regimes, associated wetland plant designations, as well as the general plant community that might be restored to stream drainages and associated floodplains.

Zone Code	Hydrogeomorphology	Flood Return Interval *	Moisture Regime	Wetland Plant Designation	General Plant Community**
A1	Aquatic Main Channel	0 - 1.5	Aquatic to Wet	<i>obligate</i>	Aquatic
W1	Main Channel Bank Wetland	1.0-2.0	Wet to Wet Mesic	<i>obligate to facw</i>	Herbaceous, Shrub Wetland, Willow Woodla
W2	Secondary Channel Wetland	1.0 - 2.0	Wet to Mesic	<i>obligate to facw</i>	Herbaceous Wetland or Subirrigated Grassla
W3	Old Meander Scroll Wetland	1.5 to 2.5	Wet to Mesic	<i>obligate to fac</i>	Herbaceous Wetland or Subirrigated Grassla
R1	Active Riparian Point Bar	0.5 to 2.0	Wet to Mesic	<i>obligate to fac</i>	Herbaceous or Shrub Wetland
R2	Middle Riparian Point Bar	2.0 to 5.0	Wet Mesic to Mesic	<i>facw to fac</i>	Shrubland or Woodland
R3	Oldest Riparian Point Bar	4.0 to 10.0	Mesic	<i>fac to facu</i>	Shrubland or Woodland
R4	Riparian Floodplain Terrace	7.0 to 20.0	Mesic to Mesic Dry	<i>upl - facu</i>	Shrubland, Woodland, or Grassland
U1	Upland Terrace	20.0 to 100.0	Mesic Dry to Dry	<i>upl - facu</i>	Grassland or Upland Shrubland

* Lower part of the range reflects when water will first flood this ecosystem while the upper end reflects when this community will be completely inundated.

** Specific plant communities can be found on Page LAN APDX C-7.

Key:

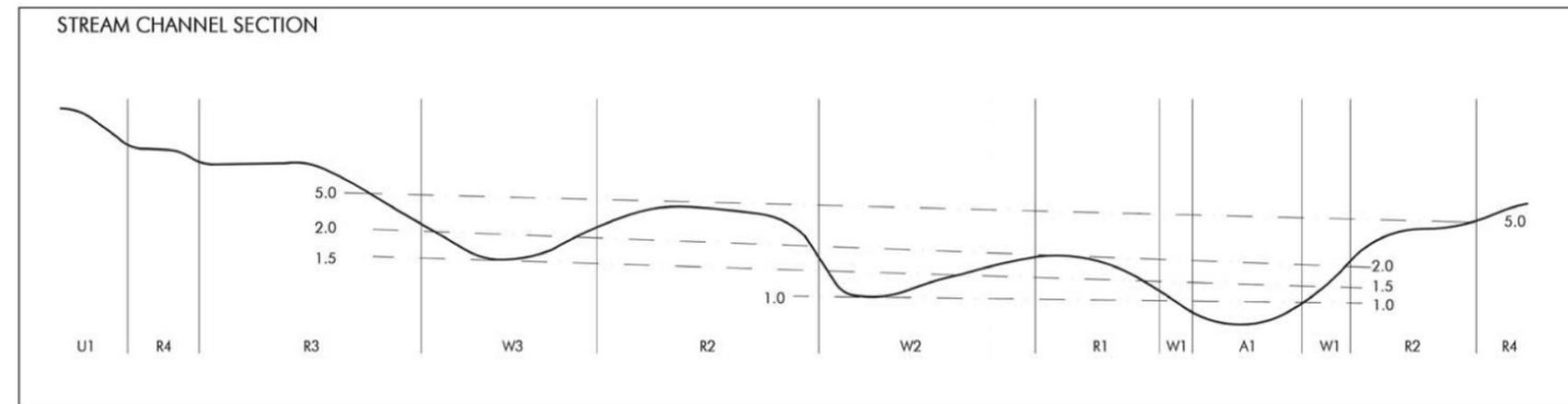
obligate - obligate wetland: Estimated 99% probability of occurrence in wetlands.

facw - facultative wetland: Estimated 67%-99% probability of occurrence in wetlands.

fac - facultative: Estimated 34% - 66% probability of occurrence in wetlands. Equally occurring in wetlands and non-wetlands.

facu - facultative upland: Estimated 1% -33% probability of occurrence in wetlands, 67%-99% probability of occurrence.

upl - upland: Not found in wetland soils, but may be found above wetlands in upper subirrigated areas.



NAT Appendix D - Landscape Functions

1. Aesthetic Qualities

- a) **Tall Visual Screen** – tall vegetation and berms that cannot be seen over or through (at least part of the year) to hide facilities or less visually appealing aspects of the landscape.
- b) **Low Visual Screen** – low but dense vegetation or berms that can be seen over, but not through, to hide facilities or less visually appealing aspects of the landscape.
- c) **Trail Screen** – a mixture of dense vegetation of various types and/or berms that help to make the trail appear as a more natural corridor, as well as to provide some or all of the other screening attributes.
- d) **Viewshed** – areas that provide unobstructed views of large, visually appealing landscape features, such as mountains, lakes, city lights, or even large cottonwood sentinel trees.
- e) **Viewshed Framing** – vegetation strategically located to frame desirable views, while possibly obstructing the views of undesirable landscape features.
- f) **Auditory Screen** – a mixture of dense vegetation and/or berms that help to dissipate noise.
- g) **Wind Moderator** – a mixture of dense vegetation and/or berms that help to dissipate wind.
- h) **Temperature Moderator** – a mixture of tall and possibly dense vegetation that help to shade the ground and provide a cooler environment for people and wildlife.

2. Water and Sediment Control

- a) **Water Quality Filter** – usually wetlands or riparian areas that remove nutrients, sediment, debris, and other pollutants from the water column through chemical, physical and biological processes.
- b) **Flood Attenuation** – areas that have the capacity to temporarily store water during small, moderate, or severe storms increasing the time it takes the water to reach the receiving body of water.
- c) **Erosion Control** – areas which have the ability to resist and adjust to wave action, shear stress caused by water, rills, gullies and other erosive forces.
- d) **Sediment Storage** – areas that have the ability to store sediment for a period of time but may release some of that sediment at a later time. These storage areas may also have plant communities that are designed to recover from being buried or that can recruit new plants on bare moist soils (e.g. pioneer plants like cottonwoods).

3. Wildlife and Plant Conservation

- a) **Movement Corridor** – an area generally linear in nature that tends to facilitate the daily or seasonal movement of wildlife from one location to another, as well as plant dispersal.
- b) **Stepping Stone** – an area generally isolated from surrounding habitat (a patch in an otherwise unsuitable matrix) that can provide some ability for species to move from one area to another via these islands of habitat. These areas can be especially valuable for birds, butterflies, wide ranging mammals, and can be a refuge for certain plant species.
- c) **Buffers** – areas that separate human landscape features from important wildlife habitat areas and/or sensitive plant species/communities. These areas reduce disturbance, excessive predation, and other negative edge effects (e.g. lights, noise, trash, pet intrusion).
- d) **Wildlife Breeding** – a mixture of food, cover, and landscape features in the right juxtaposition that tend to facilitate wildlife breeding by the conservation target species and possibly others.
- e) **Wildlife Feeding** – a mixture of food, cover and landscape features in the right juxtaposition that tend to facilitate feeding by the conservation target species.
- f) **Wildlife Resting** – a mixture of cover and landscape features in the right juxtaposition that tend to facilitate loafing areas for conservation target species.
- g) **Migratory Stopover** – a mixture of food, cover and landscape features in the right juxtaposition that tend to attract conservation target species and possibly others during migration. These areas are primarily used for resting and feeding of birds and butterflies.

- h) **Restoration** – Restore target ecosystem(s) that would represent a natural ecosystem which is supportable and sustainable in the long term. For the HPEC and Centerra this will be native plant communities that would occur from the base of the Rocky Mountains to the eastern edge of the state of Colorado and generally north of Denver. Restoring target ecosystems could include one or a combination of the following:

1. Restore the original ecosystem at the site.
2. Restore the ecosystem now best expressed by the flora and fauna of the site, particularly when a globally rare or endangered species is involved.
3. Restore the rarest or the otherwise highest priority ecosystem that is practical to restore at the site.
4. Restore a representative variety of the ecosystems at the site. Restore the largest possible example of a given ecosystem on the site.
5. Restore the highest priority and attainable mix of ecosystems in the quickest and easiest way.

4. Existing Well Represented Ecosystems that Do Not Need to be Restored

- a) **Open Water** – deeper water with limited submergent vegetation.
- b) **Shallow Water Wetland** – water less than 18” with submergent vegetation that can easily be accessed by dabbling ducks, waders, and some shorebirds.

5. Existing or Historically Under Represented Local Ecosystems that Need to be Restored

- a) **Herbaceous Wetlands - Playas with mudflats** – depressional wetlands (water collection basins) with a variety of emergent herbaceous vegetation usually surrounding areas of temporary shallow water or a temporary pond.
- b) **Herbaceous Wetlands - Wet Meadow** – often depressional wetlands or fringe wetlands. These areas are densely vegetated and dominated by wetland grasses, sedges, and rushes.
- c) **Herbaceous Wetlands - Bulrush Marsh** – fringe or depressional wetlands dominated by larger herbaceous vegetation, often very dense. They often surround, or are found on, the margins of deeper water areas.
- d) **Riparian Shrubland** – wetland areas or areas with high water tables that are dominated by willow species but may have other wetland and facultative wetland shrubs.
- e) **Upland Shrubland** – areas dominated by drought tolerant shrubs that are intermingled with grasses and wildflowers.
- f) **Park-like Woodland** – open woodlands (gallery forest) to a more closed forest dominated by one to three species of cottonwood tree with a few other tree species. These areas often have a grass dominated field layer and generally lack a diverse shrub component.
- g) **Shrubby Woodlands** – generally a more closed forest with some openings dominated by one to three species of cottonwood tree with a few other tree species. These areas have a diverse shrub component.
- h) **Tallgrass Prairie (Subirrigated)** – grassland areas with high water tables and a mixture of mostly warm season grasses. These areas are dominated by species taller than waist high and typically have a healthy component of native wildflowers.
- i) **Midgrass Prairie** – mixtures of warm and cool season grasses of medium stature with a healthy component of native wildflowers.
- j) **Shortgrass Prairie** – mixtures of warm and cool season grasses of short stature codominated by Blue Grama and Buffalograss with a healthy component of native wildflowers.

NAT Appendix E - Restoration Decision Charts for High Plains Environmental Center (HPEC)

CHART 1 - HPEC Guideline Matrix

This guideline matrix provides a broad context for the appropriateness of various types of ecosystems and their attributes that can be created on HPEC lands surrounding the reservoir. HPEC lands are divided up based on the Cedar Creek Buffer Zones of either 75 feet or 300+ feet (Column Headers). These Buffer Zones create narrow or broad corridors that encircle the two reservoirs. These corridors act as a hub that connects to incoming corridors from the surrounding matrix of developed lands. Many of the lands around the reservoirs will serve as regional detention facilities and many of the connecting corridors will convey storm water from the development into these regional detention basins. Ecosystem attributes on the left side of the spreadsheet represent a continuum of aesthetics from open to dense vegetation, from shortgrass prairies to densely vegetated shrubby woodlands, a continuum of water regimes, and of options to buffer these ecosystems from the influences of the surrounding developed communities. Generally speaking, all of these lands are small when it comes to conserving wildlife habitat, thus limiting their conservation potential to mostly songbirds, butterflies, some amphibians and reptiles, and plants. On HPEC lands, however, the reservoirs act to attract raptors, waterfowl, shorebirds, waders, and other water birds. Thus, the restoration decision matrix lands serve the important role of buffering the aquatic and adjacent wetland habitats from the influences of adjacent development.

To use the restoration decision matrix:

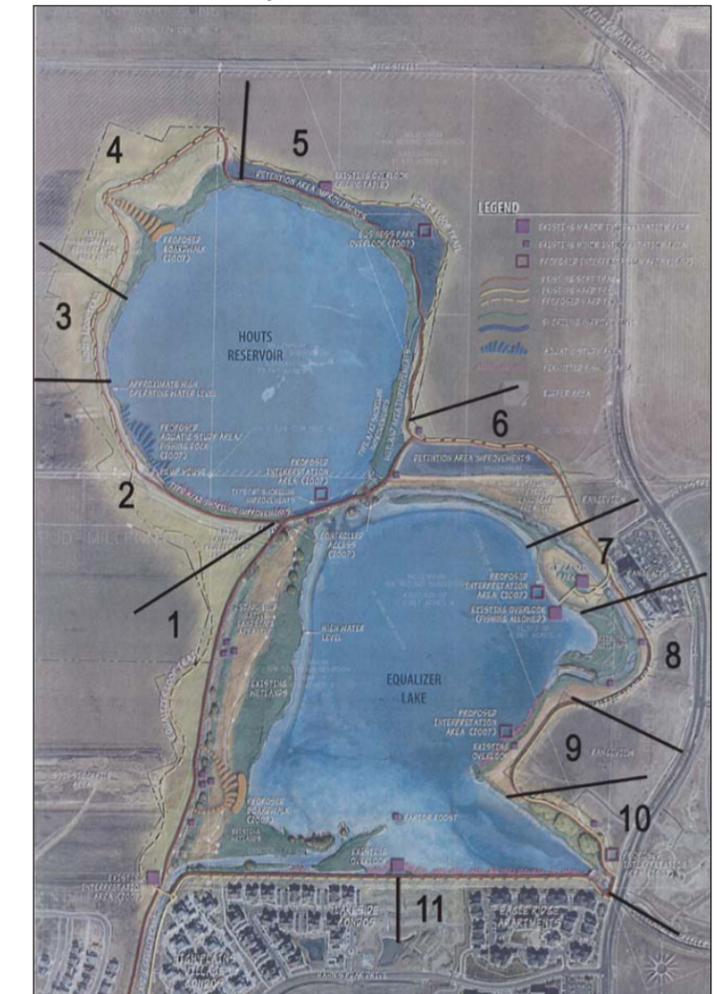
1. Determine the appropriate HPEC natural areas landscape context and header for the project in consultation with the team environmental consultant or in discussions with HPEC personnel.
2. In the High Plains Environmental Center guideline matrix below, move down the column to find appropriate planting types depicted with XX.
3. Go to Charts 2A, 2B and 3 in the NAT Appendix C and NAT Appendix D to evaluate attributes of ecosystem type to determine if the type meets project goals.
4. Select a desired habitat type.
5. Refer to Charts 4 and 5 in the NAT Appendix C for detention pond zones and specific ecosystems. Refer to Charts 6 and 7 in the NAT Appendix C for stream and channel conveyance zones and specific ecosystems and plant community types.
6. Select the specific plant communities, wildlife and habitat that you want to restore at your project site (i.e. Nebraska sedge, Herbaceous wetland, Tallgrass prairie, Shrubby woodland).
7. Refer to the Field Guide page depicted. Determine the seed mix from the Field Guide.
8. Use the descriptions and plant list from the Field Guide to determine the seed mixes, herbaceous plants and woody plants you want to restore at the project site.

High Plains Environmental Center Guideline Matrix

Ecosystem Types & Attributes	High Plains Environmental Center Natural Areas - Landscape Context										
	1 330' Equalizer SW & W	2 75' Houts SW & W	3 75' Houts W	4 300' Houts NW	5 75' Houts NE & E	6 300' Equalizer N	7 75' Equalizer NE	8 300' Equalizer W	9 75' Equalizer WSW	10 75' Equalizer SW	11 75' Equalizer S
General Aesthetics											
OPEN	X				XX	XX	XX	XX	XX	X	XX
MIXED	XX	X	X	X	X	X	X	X	X	XX	
DENSE	XX	XX	XX	XX						XX	
Plant Communities											
Shortgrass	X			X	X	X	XX	XX	XX	X	X
Mixed grass	XX	X	X	XX	X	X	X	X	X	XX	XX
Tall grass	XX	XX	XX	XX	XX	XX	XX	XX	X	XX	X
Playa	XX			XX	XX	XX					
Herbaceous Wetland	XX	X	X	XX	XX	XX	XX	XX	X	XX	X
Bulrush Marsh	X	XX	XX	X	X	X	XX	X	XX	X	
Riparian Shrubland	XX	XX	XX	X	X	X	XX	XX	XX	XX	XX
Upland Shrubland	XX	X	X	X	X	XX	XX	X	X	XX	XX
Park-like Woodland	XX	X	X	XX	X	X	XX	X	XX	XX	X
Shrubby Woodland	XX	XX	XX	XX	X	X	X		XX	XX	
Water Relations											
No Water	X	X		X			XX		XX	XX	XX
Temporary Water	XX	X	X	XX	X	X	X	X	X	X	
Long-term Temporary Water	XX	XX	XX	X	XX	XX	XX				
Permanent Water	XX		X		X	X				XX	
Ecosystem Buffer Protection											
Landscape Edge Protection	X	XX	XX	X	XX	X	XX	X	XX	XX	XX
Type-Veg. Screening	X	XX	XX	X	X	X	X	X	X	X	X
Type-Fencing/limit access	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
Light and Noise Protection	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX

XX = Very appropriate and in large amounts
 X = somewhat appropriate but in smaller amounts

HPEC Zone Map CHART



General Lighting Design Guidelines

General Lighting Design Guidelines

LIT-2 · Lighting Philosophy

LIT-2 · Exterior Lighting Design

General Lighting Design Guidelines

1.0 Lighting Philosophy

Lighting provides a welcome dusk and nighttime atmosphere where entrances, destination points, and features are high-lighted. Forecourts, plazas, and village greens are inviting, and traveled sidewalks and pedestrian promenades are lighted to provide guidance. These Guidelines and Standards help Centerra establish environmentally sensitive lighting that limits trespass and light pollution. Specifically, these Guidelines address the basic objectives of site lighting:

- ☞ Safety and Security
- ☞ Identity and Image
- ☞ Nighttime Visibility and Function
- ☞ Environmental Sensitive Lighting

1.1 Safety and Security

- 1.1.1 Provide safety lighting to illuminate potentially hazardous conditions such as vehicle/pedestrian intersections, crosswalks, stair, and ramps.

1.2 Identity and Image

- 1.2.1 Select luminaries to reinforce District identity. Luminaire selections should not only be based upon photometric performance, but also on the aesthetic character or image desired for Centerra.

1.3 Nighttime Visibility and Function (Lighting Quality not Quantity)

- 1.3.1 Use light fixtures with discretion based upon lighting quality as opposed to quantity.
- 1.3.2 Increase contrast to increase visibility. Consider wall wash lighting to illuminate facades, creating contrast so that objects are easier to see.
- 1.3.3 Control luminaire brightness. If a light source is very bright, everything else in the immediate surrounding area will appear relatively dark, making it harder to detect object details.
- 1.3.4 Provide shielded luminaries to prevent glare caused by uncontrolled light emitted from wall pack fixtures or floodlights.

- 1.3.5 Provide white light sources such as metal halide, fluorescent, and inductive lamps, designed to maximize reaction time and color recognition under low light levels. High pressure sodium and mercury vapor lighting is prohibited.

1.4 Environmentally Sensitive Lighting

- 1.4.1 Minimize light trespass and light pollution. Use The Illuminating Engineering Society of North America (IESNA) recommended practice RP-33-99 "Lighting for Exterior Environments" shall be used as criteria to limit light pollution and light trespass.
- 1.4.2 Minimize light trespass through the careful selection, location, and proper aiming, and shielding of light fixtures.
- 1.4.3 Avoid high wattage luminaries with poor visual shielding that create uncontrolled light pollution. Excessive light levels with high amounts of reflected light shall not be permitted.
- 1.4.4 Use low wattage, shielded luminaries that are properly located and aimed.
- 1.4.5 "Dark Sky" practices shall be adhered to. Lighting techniques that "uplight" buildings or landscape and shine light into the sky shall not be permitted

2.0 Exterior Lighting Design

The key to quality exterior lighting is to place light only where it is needed, without causing glare. By not wasting light, smaller lamp wattages can be used to achieve superior effects. The most important result is improved visibility. Another by-product is reduced energy usage and improved maintenance. Design Criteria includes basics such as lighting levels (illuminance), uniformity, and brightness balance (luminance), as well as recommendations for reducing glare, light trespass, and light pollution.

2.1 Open Space and Natural Areas

- 2.1.1 Avoid lighting Open Space and Natural Areas to preserve the natural environment and minimize light pollution.

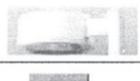
2.2 Roadway Lighting

- 2.2.1 Provide low glare lighting at conflict zones such as pedestrian crossings, parking lot entries, and roadway intersections.
- 2.2.2 Provide pedestrian lighting or roadway lights at each pedestrian crosswalk, roadway intersection, and parking lot entry, based upon the following standards:
 - ☉ **Pedestrian Crossing Lights:** Two light poles, maximum, or install pavement mounted pedestrian lights that are activated when pedestrians cross the road, warning motorists to stop.
- 2.2.3 Provide vehicular-oriented roadway lighting, based upon the following standards:
 - ☉ **Roadway Pole Height:** 25 - 35 feet, depending on the roadway width and adjacent land use type.
 - ☉ **White Light Source:** Metal Halide or Induction Lamps
 - ☉ **Maximum Initial Lumens per Luminaire:** 12,000 lumens (25 foot high poles); 22,000 lumens (35 foot high poles)
 - ☉ **Luminaries Per Pole:** Two, maximum
 - ☉ **Color:** RAL powder coat color 7039

- 2.2.4 Use only fully shielded luminaries that direct light downwards (IESNA full cut-off designated fixtures).
- 2.2.5 Do not locate canopy trees within forty feet of a streetlight on an arterial or collector roadway.

2.3 Parking Lot (Field) Lighting

- 2.3.1 Provide Parking Lot Lighting, based upon the following standards:
 - ☉ **Parking Lot Pole Height:** 25 - 35 feet (parking lots with two or more rows of cars); 15 - 25 feet (parking lots with less than two rows of cars)
 - ☉ **White Light Source:** Metal Halide or Induction Lamps
 - ☉ **Maximum Initial Lumens per Luminaire:** 22,000 lumens (25 - 35 foot high poles); 12,000 lumens (15 - 25 foot high poles)
 - ☉ **Type:** Dome-top hemispherical fixtures
 - ☉ **Luminaries Per Pole:** Two, maximum
 - ☉ **Color:** RAL powder coat color 7039

Road Classification	Curb-to-Curb Width	Luminaire Style	Light Standard Description	Lamp	Approximate Light Standard Spacing
Major Arterial	80'		Curvilinear single-head on 35' pole	250W 3K metal halide	200' between pairs (one each side of road)
Major Arterial	45'		Curvilinear single-head on 35' pole	250W 3K metal halide	170' (on one side of road only)
Major Arterial	80'		Curvilinear double-head on 35' pole	250W 3K metal halide	185' (single poles in median)
Major Collector	80'		Curvilinear single-head on 30' pole	150W 3K metal halide	85' (staggered spacing)
Major Collector	50'		Curvilinear single-head on 30' pole	150W 3K metal halide	85' (staggered spacing)
Major Collector	50'		Curvilinear double-head on 30' pole	150W 3K metal halide	125' (single poles in median)

Lighting Standards for Roadways

	Minimum Horizontal Illuminance	Maximum uniformity ratio, (maximum to minimum) ²	Maximum average illuminance	Minimum Vertical Illuminance ³
Commercial Parking Lots	0.5 footcandles	10:1	2 footcandles	0.2 footcandles
Corporate Parking Lots	0.2 footcandles	10:1	1 footcandle	0.1 footcandles
Multi-family Residential and School Parking Lots ⁴	0.1 footcandles	20:1	.5 footcandles	N/A

Parking Lot Lighting Criteria

2.3.2 Use only fully shielded luminaries that direct light downwards (IESNA full cut-off designated fixtures).

2.3.3 Locate light fixtures within medians or on concrete pedestals. Concrete pedestals shall have a smooth top, one-inch chamfer, and coated with CDOT Class V structural coating, color Thoro 432.

2.4 Pedestrian Walkway and Path Lighting

2.4.1 Provide Pedestrian Walkway and Path Lighting, based upon the following standards:

- ⦿ **Walkway and Path Pole Height:** 10 - 12 feet
- ⦿ **Location:** Along pedestrian promenades and at decision points along walkways and paths
- ⦿ **White Light Source:** Metal Halide, Compact Fluorescent, and Induction Lamps
- ⦿ **Maximum Initial Lumens per Luminaire:** 4,800 lumens

2.4.2 Avoid lighting walkways and paths that are typically not used at night.

2.4.3 Light key signage at decision points to aid in navigation.

2.5 Stairs and Ramps

2.5.1 Incorporate recessed step lights into the stair sidewalls or install pedestrian bollards at stair landings.

2.5.2 Shield stair step sidewall lights with louvers.

2.5.3 Provide Stair and Ramp Lighting, based upon the following standards:

- ⦿ **White Light Source:** Compact Fluorescent or LED Lamps
- ⦿ **Maximum Initial Lumens per Luminaire:** 1,800 lumens

	Average Illuminance	Average to Minimum
Lighted Pedestrian Walkways	0.5 footcandles	4:1

Pedestrian Walkway Lighting Criteria

2.6 Feature and Landscape Lighting

2.6.1 Use fixtures to light only selected landscape features or objects.

2.6.2 Use lighting to illuminate selected walls, features, and other key elements throughout Centerra.

2.6.3 Use adjustable shielded luminaries that are recessed into the ground to provide an even, warm wash of light across wall surfaces, accentuating the texture of rough stone.

2.6.4 Conceal lighting sources from public view by locating fixtures in planting beds, landscape areas, or behind rocks.

2.6.5 Mount and install luminaries to be completely protected from lawn mowers, weed eaters, and snow blowers.

2.6.6 Equip luminaries with internal louvers and shields to control glare and prevent excess spill lighting.

2.6.7 Use luminaries with high quality optics.

2.6.8 Provide Feature and Landscape Lighting, based upon the following standards:

- ⦿ **White Light Source:** Metal Halide
- ⦿ **Maximum Initial Lumens per Luminaire:** 2,400 lumens

2.7 Non-Residential Area Lighting

2.7.1 Light storefront facades and sign bands with lighting fixtures located on buildings, oriented downwards.

2.7.2 Provide internal controls to turn off storefront façade and sign bands one hour after closing. Only a minimum security light level shall remain after store closing.

2.7.3 Use shielded motion sensor lighting for loading docks, designed to illuminate only when trucks or pedestrians appear.

2.7.4 Orient all building mounted security lighting downwards, completely shielded (IESNA full cut-off designated fixtures). Unshielded wall pack lights shall not be permitted.

2.7.5 Design outdoor canopies associated with drive-up windows and service stations to sensitively integrate luminaries. All luminaries shall be fully recessed with flat lenses. Dropped, sagging, or protruding lenses shall not be permitted.

2.7.6 Floodlighting and up lighting will not be permitted. Lamps over 2,400 lumens shall not be permitted.

2.7.7 Avoid vertical lamps over 5,000 lumens. Vertical lamps under 5,000 lumens shall be fully shielded from all viewing angles.

2.7.8 Provide full cut-off IESNA designated light fixtures for vertical lamps over 5,000 lumens.

2.7.9 Use current IESNA recommended practices including "Lighting for Exterior Environments" RP-33-99 and Parking.

2.8 Retail Pedestrian Center Lighting

2.8.1 Use down wall wash lighting to accentuate buildings that frame and enclose formal open space without creating light pollution.

2.8.2 Illuminate paths, key signage, and interest points to draw attention to these features.

2.8.3 Light key signage at decision points to aid in navigation.

2.8.4 Integrate concealed or fully shielded lighting in benches and low seating walls.

2.8.5 Provide Retail Pedestrian Center Lighting, based upon the following standards:

Pedestrian Lighting—

- ⦿ **Pedestrian Pole Height:** 10 - 12 feet
- ⦿ **Luminaries per Pole:** Two
- ⦿ **Location:** Among pedestrian promenades and at key locations within plazas and courtyards.
- ⦿ **White Light Source:** Metal Halide, Compact Fluorescent, and Induction Lamps
- ⦿ **Maximum Initial Lumens per Luminaire:** Pedestrian Lighting - 4,800 lumens;

Signage Lighting

- ⦿ **Location:** Mounted at the top of the sign, oriented downward or integrated into the sign design. Internally illuminated individual sign letters with backlit halo shall be permitted.

Major Feature Lighting

- ⦿ **White Light Source:** Low glare Compact Fluorescent, Adjustable Shielded Floodlights, or Metal Halide lamps (35 watt PAR).
- ⦿ **Maximum Initial Lumens per Luminaire:** 2,400 lumens

Building Façade Lighting

- ⦿ **White Light Source:** Compact Fluorescent or PAR Metal Halide (35 watt)
- ⦿ **Maximum Initial Lumens per Luminaire:** 2,400 lumens

Building Entry Lighting

- ⦿ **Type:** Wall Sconces or Pendants
- ⦿ **White Light Source:** Compact Fluorescent
- ⦿ **Maximum Initial Lumens per Luminaire:** 2,400 lumens

Bench and Low Seat Wall Lighting

- ◉ **White Light Source:** Compact Fluorescent, Fiber Optics, or LED Strip Lighting
- ◉ **Maximum Initial Lumens per Luminaire:** 1,800 lumens

Wall Sconces

- ◉ **Location:** On walls that define the perimeter of pedestrian gathering areas.
- ◉ **White Light Source:** Compact Fluorescent
- ◉ **Maximum Initial Lumens per Luminaire:** 1,800 lumens

Stone Wall and Column Lighting

- ◉ **White Light Source:** Compact Fluorescent, Adjustable Shield Floodlights, or PAR Metal Halide Lamps (35 watt)
- ◉ **Maximum Initial Lumens per Luminaire:** 2,400 lumens

2.9 Office / Employment Area Lighting

2.9.1 Provide Business Park Lighting, based upon the following standards:

- ◉ **Pole Height:** 14 - 16 feet, two poles required
- ◉ **Location:** At each parcel entrance, arranged so the light fixtures appear to create a gateway, producing a strong sense of arrival.
- ◉ **White Light Source:** Metal Halide, Compact Fluorescent, and Induction Lamps
- ◉ **Maximum Initial Lumens per Luminaire:** 4,800 lumens

2.9.2 Avoid building up lighting. Building up lighting shall not be permitted.

2.10 Residential Lighting

2.10.1 Provide Residential Lighting, based upon the following standards:

Single Family Street Lighting

- ◉ **Fixture Type:** Arm-mounted full-cutoff luminaires.
- ◉ **Pole Height:** 15 - 18 feet
- ◉ **Location:** Along street frontages
- ◉ **White Light Source:** 70-watt Metal Halide

- ◉ **Maximum Initial Lumens per Luminaire:** 4,800 lumens

Single Family Street-Side Parking Space Lighting

- ◉ **Fixture Type:** Post-top full-cutoff pedestrian luminaires
- ◉ **Pole Height:** 10 feet
- ◉ **Location:** Side street parking spaces in alleys
- ◉ **White Light Source:** 70-watt Metal Halide recommended
- ◉ **Maximum Initial Lumens per Luminaire:** 4,800 lumens

Multi-Family Street-Side Parking Space Lighting

- ◉ **Fixture Type:** Post-top full-cutoff pedestrian luminaires
- ◉ **Pole Height:** 10 feet
- ◉ **Location:** Along internal streets
- ◉ **White Light Source:** 70-watt Metal Halide recommended
- ◉ **Maximum Initial Lumens per Luminaire:** 4,800 lumens

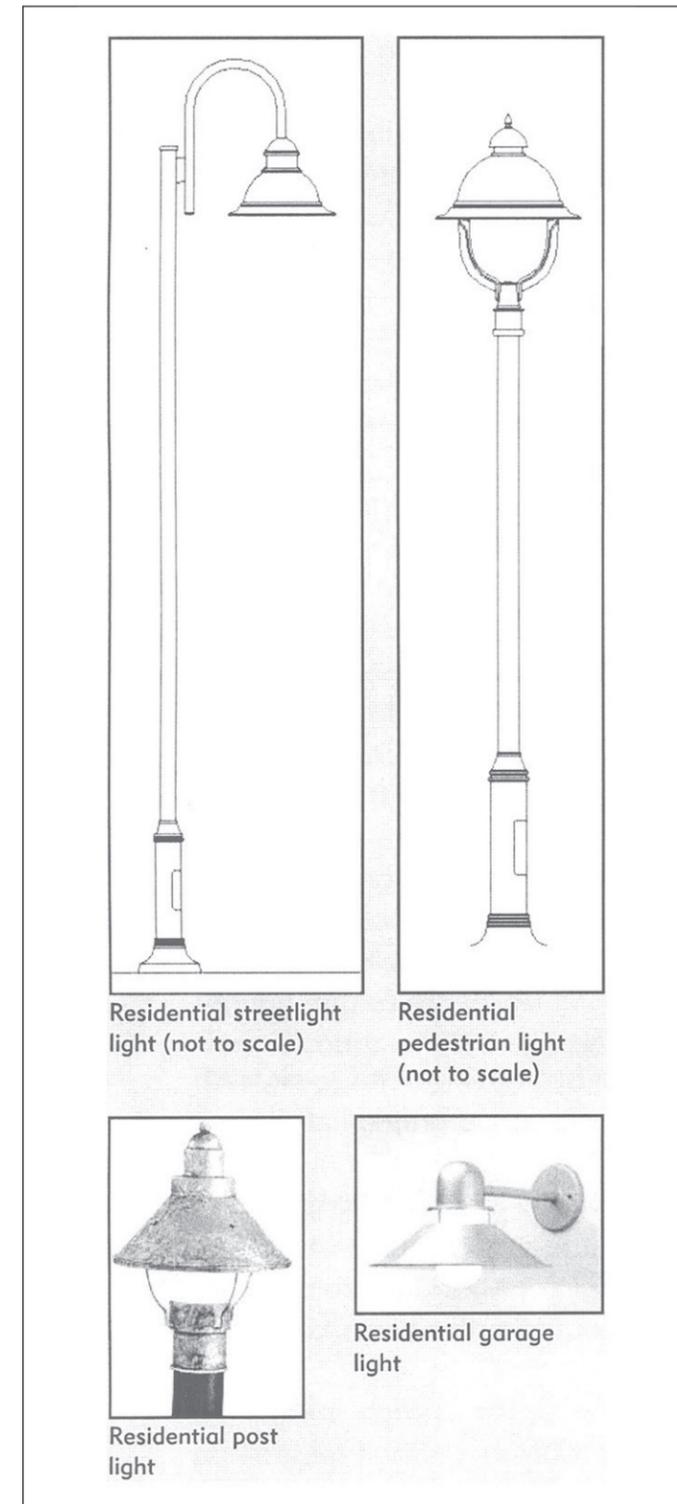
Single Family Home Lighting

- ◉ **Fixture Type:** Post-top lanterns
- ◉ **Pole Height:** 6 feet
- ◉ **Location:** Along pedestrian paths
- ◉ **White Light Source:** 13 - 15 watt Compact Fluorescent lamps
- ◉ **Maximum Initial Lumens per Luminaire:** 925 lumens

Garage-Mounted Lighting

- ◉ **Fixture Type:** Motion sensor lanterns
- ◉ **Location:** Attached to the garage facade
- ◉ **White Light Source:** Compact Fluorescent lamps
- ◉ **Maximum Initial Lumens per Luminaire:** 925 lumens

2.10.2 Locate luminaires no higher than 16 feet above grade when City street trees are planted adjacent to light poles. Coordination with the City of



Residential Lighting

Loveland is required.

2.10.3 Provide electronic ballasts rated a minimum start temperature of -5 degrees or lower for all compact florescent lamps.

2.11 Holiday and Temporary Lighting

During the winter holiday season, holiday lighting may be used. The intent for holiday lighting is a tasteful display using traditional lighting techniques such as strings of Christmas lights. Any lighting that is temporary in nature by means of cord and plug connection and/or not installed by the National Electric Code is defined as Holiday and Temporary Lighting. Refer to Community Association Covenants for residential holiday restrictions.

2.11.1 Use low wattage string lights.

2.11.2 Prohibit dynamic displays such as "chasers."

2.11.3 Prohibit searchlights or other lights designed to attract attention.

2.11.4 Install and energize holiday lighting only from November 1 through January 31.

2.11.5 The Centerra DRC on a yearly basis shall consider and approve other lighting techniques.

2.12 Sports Field Lighting

2.12.1 Prohibit sports field lighting within residential areas.

2.12.2 Equip floodlights with both internal and external shielding.

2.12.3 Prohibit aiming angles above 60 degrees from vertical.

2.12.4 Incorporate IESNA cut-off luminaires in lieu of adjustable floodlights for tennis courts and other small area playing fields.

2.12.5 Control field lighting so that when fields are not in use, the sports lighting equipment is turned off. In no case shall the sports lighting be on after 11 pm.

2.13 Lighting Controls

- 2.13.1 Determine lighting control zones and methods for pedestrian and parking lot lighting in order to determine if areas can be turned off during extremely low activity levels.
- 2.13.2 Turn off art, feature, architectural, and other non-essential lighting during low activity periods.
- 2.13.3 Activate non-metal halide parking lot lighting during low activity periods with motion sensors or time clocks.
- 2.13.4 Activate low use area, non-metal halide pedestrian lighting during low activity periods with motion sensors or time clocks.

General Signage Design Guidelines

General Signage Design Guidelines

- SIG-2 · Purpose
- SIG-2 · Applicability
- SIG-2 · Regulations Applicable to All Signs
- SIG-2 · Prohibited Signs
- SIG-2 · Construction, Installation, and Maintenance Requirements
- SIG-2 · Sign Area Management
- SIG-2 · Total Allowable Sign Area
- SIG-2 · Sign Area Penalty
- SIG-3 · Freestanding Signs — General Regulations
- SIG-3 · Freestanding Identity Signs
- SIG-5 · Freestanding Directional Signs
- SIG-6 · Building-Mounted Identity Signs
- SIG-7 · Regulatory Signs
- SIG-8 · Banners
- SIG-8 · Window Signs
- SIG-8 · Temporary Signs
- SIG-9 · Building Entry Information Signs
- SIG-9 · Flags and Pennants
- SIG-9 · Menu Boards
- SIG-9 · Other

General Signage Design Guidelines

1.0 Purpose

These sign guidelines are intended to create a strong image and reduce visual clutter, while allowing for signs that inform residents and visitors of the various amenities, services, and products within the Centerra planned community. Unity of freestanding signs is achieved by the repetition of design elements including buff sandstone columns and bases that are consistently battered, arched-top sign faces, in some cases lettering style, and illumination source, and a limited palette of sign face colors. Building mounted wall signs are also strictly regulated in terms of size and appearance.

2.0 Applicability

This Sign Guidelines Section applies to all signs within the Centerra Planned Community, unless covered by a separate Planned Sign Program that is established as a part of a specific project. All significant projects are encouraged to develop a Planned Sign Program. These Sign Guidelines in concert with The Centerra Planned Sign Program, supersede the City of Loveland Sign Code, except as noted, and shall be enforced by both the Centerra Design Review Committee (DRC) and City of Loveland. The definitions as contained within the City of Loveland Sign Code, Chapter 18.50 of the Loveland Municipal Code, are considered a part of this planned sign program and are not repeated within this document. In areas where this document is silent, the City of Loveland Sign Code shall prevail, becoming the governing document. Proof of sign permit from the City of Loveland and approval by the Centerra DRC shall be required before installation of any sign.

3.0 Regulations Applicable to All Signs

3.1 Site Distance Triangle

3.1.1 Provide only pole or ground mounted signs within sight triangles. All signs located within the sight distance triangle, as defined by the City of Loveland, shall either be of pole construction or ground mounted.

3.1.2 Limit pole diameter to twelve (12) inches, maximum.

3.1.3 Locate pole signs a minimum of seven (7) feet above finished grade (as measured to the bottom of the sign).

3.1.4 Limit ground mounted signs to a maximum height of 24 inches above finished grade.

3.2 Off-Premise Signs

3.2.1 Prohibit off-premise signs, except for Project Identity Signs (e.g., Centerra, business parks, town centers, etc.). These are the exclusive responsibility of the Master Developer.

4.0 Prohibited Signs

4.1 Prohibit the following signs, except as specifically approved by the DRC:

- ⊙ Animated, Changeable Copy, Exposed Light Bulb, and Flashing Signs
- ⊙ Roof Signs
- ⊙ Portable Signs
- ⊙ Hand-lettered Signs
- ⊙ Paper or Cardboard Signs (attached to or temporarily placed within windows of buildings and/or affixed to the exterior or interior of doors, and hand-held signs)
- ⊙ Signs in the Public Right-of-Way (R.O.W.)
- ⊙ Internally illuminated awnings
- ⊙ No "Sale" or "Special Announcement" signs without specific DRC approval
- ⊙ Inflatable features for advertising without specific DRC approval
- ⊙ Cabinet Signs (Internally illuminated plastic face) with the exception of convenience stores as described in this Section
- ⊙ Signs on benches, trash receptacles, vending machines or other site furniture
- ⊙ Neon signs, except as allowed by Section 15
- ⊙ Signs held by people or people in costume
- ⊙ Plastic Signs (formed plastic or injection molded)
- ⊙ Other Signs as identified in the Master or Community Association Covenants
- ⊙ Signs on Umbrellas

5.0 Construction, Installation, and Maintenance Requirements

5.1 Prohibit exposed conduit, raceways, ballast boxes, or transformers.

5.2 Prohibit labels on exposed surfaces, except those required by ordinances. Where necessary, labels shall be placed in inconspicuous locations.

5.3 Insure that all metal surfaces are uniform and free from dents, warps, and other defects. Painted surfaces shall be free of particles, drips, and runs.

5.4 Flush mount exposed screws, rivets, or other fastening devices and finish so as to be unnoticeable.

5.5 Limit individual letter depth. Depth of individual dimensional letters shall not exceed one-quarter of the letter height to a maximum of 12 inches deep. No letter is required to be less than four inches deep if internally illuminated. Text that has capital and lower-case letters shall use the capital letter height to determine the maximum depth of all letters.

5.6 All sign applicants shall provide assurance that the sign will be adequately maintained. All signs will be kept neatly finished and repaired, including all fasteners and supports. A Centerra Master Association or City of Loveland representative may inspect and have authority to order painting, repair, alterations or removal of a sign that constitutes a hazard to safety, health, or public welfare by reason of inadequate maintenance, dilapidation, or obsolescence.

5.7 Any sign which is associated with a business that is no longer being conducted, shall have the sign face altered so that the message is no longer visible to the public within 45 days of the cessation of such business.

6.0 Sign Area Measurement

6.1 Provide proper sign area measurement. Specific sign areas for Centerra Development Identity Signs are defined in the following Sections. All other sign areas

on freestanding and building-mounted wall signs shall be measured per the City of Loveland Sign Code.

6.2 Measure individual letter and logo signs that are mounted on a landscape wall by the outline of the letters and logo, as if it were a building-mounted wall sign.

7.0 Total Allowable Sign Area

7.1 Design sign area, based upon the following standards:

7.1.1 One (1) sign per building face, a maximum of two (2) signs per building frontage.

7.1.2 Total allowable sign area shall be equal to 2.2 square feet per linear foot of building frontage for the first 200 linear feet. An additional 1.1 square

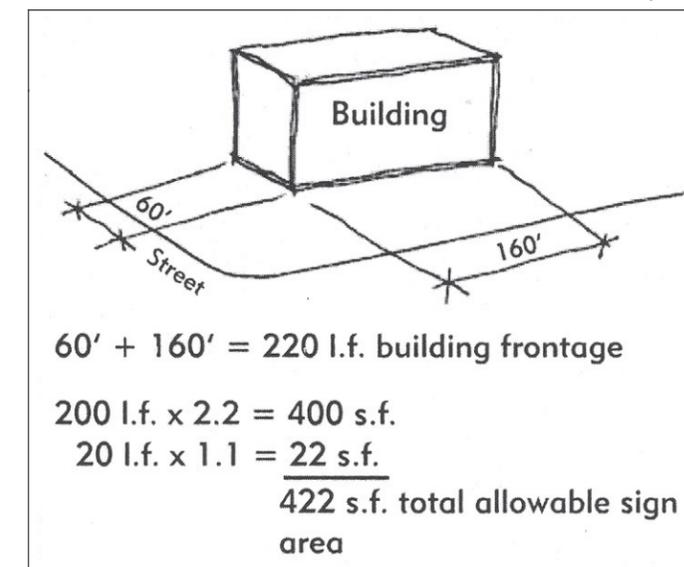


fig. 1 Total Allowable Sign Area

foot of sign area may be provided for each additional linear foot of building frontage. (Figure 1).

7.1.3 All signs, including Project Directional, Freestanding Menu Boards, Freestanding Identity Signs, and Building Mounted Signs shall be counted as part of the total allowable sign area.

7.1.4 A Project Identity Sign shall count as one of the two maximum Freestanding Identity Signs for the premise on which it is located, but shall not count towards the total allowable sign area for that premise.

8.0 Sign Area Penalty

- 8.1** Reduce total allowable sign area by 15 percent for any of the following conditions that are present on the property:
- 8.1.1 Corporate logo panel colors and fonts other than the standard text colors and fonts in relation to Freestanding Identity Signs.
 - 8.1.2 Recessed wall or convenience store canopy signs used instead of individual channel letters. Sides of the sign shall be completely recessed and not visible.
 - 8.1.3 Cabinet-style logos used in addition to individual letters. Logo cabinets shall not occupy more than 20 percent of the total message area.
 - 8.1.4 Color and font of building-mounted letters and logos is not uniform.

9.0 Freestanding Signs - General Regulations

9.1 Style

- 9.1.1 Provide a solid base for all freestanding signs. Signs shall be designed to be in character with the prototypical sign designs illustrated in this Section. Pole signs shall not be permitted.

9.2 Number of Signs

- 9.2.1 One (1) Freestanding Identity Sign per street frontage, maximum of two (2) signs per premise.
- 9.2.2 Project Identity Signs count as one (1) Freestanding Identity Sign for the premise on which it is located, but do not count towards the total allowable sign area for that premise.

9.3 Height

- 9.3.1 One (1) foot of height for every one (1) foot of setback as measured from the public roadway

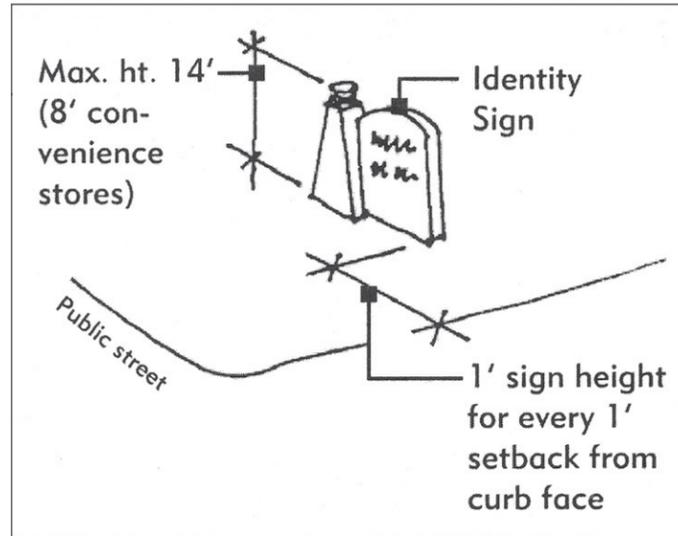


fig. 2 Maximum Sign Height curb face or edge of pavement, to a maximum height of 14 feet (Figure 2).

- 9.3.2 Maximum height for all Convenience Store associated Freestanding Signs shall be eight feet.

9.4 Setbacks

- 9.4.1 Freestanding Identity Signs shall be setback a minimum of eight feet from the public roadway curb face or edge of pavement. Signs shall not be placed within the ROW.

9.5 Maximum Sign Area

- 9.5.1 Freestanding Identity Signs shall contain a minimum 27 square feet of sign area per face, to a maximum of 54 square feet for all sign faces.
- 9.5.2 All freestanding signs setback greater than 16 feet shall be allowed an additional 3.3 square feet of sign area per face (6.6 square feet total) for every additional foot of setback up to a maximum of 100 square feet per face (200 square feet, total). (Figure 3).

9.6 Number of Items of Information

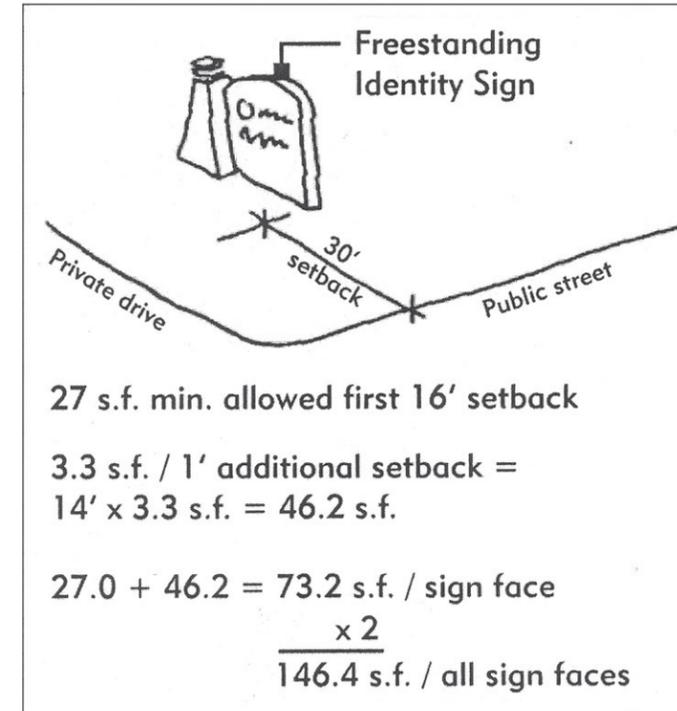


fig. 3 Example Calculation of Maximum Sign Area

- 9.6.1 Sign shall not contain more than four items of information, not including an address.

- 9.6.2 Directional arrows shall not be included on Identity Signs.

9.7 Changeable Copy and Electronic Messages

- 9.7.1 Signs with changeable copy or electronic messages shall not be permitted, except for those displaying time and temperature, or price associated with fuel. Messages shall not change more frequently than every five seconds.

9.8 Separation Between Signs

- 9.8.1 Provide a minimum separation of 75 feet between any two freestanding identity signs.

9.9 US 34 Regulations

- 9.9.1 All Freestanding Signs located contiguous to US

34 shall have a horizontal orientation.

- 9.9.2 All Freestanding Signs located contiguous to US 34 shall not exceed a maximum height of 12 feet if located within 75 feet of the ROW.
- 9.9.3 All signs proposed for US 34 shall be in compliance with regulations enforced by C.D.O.T.
- 9.9.4 All other setback and height restrictions in this Section shall apply.

9.10 I - 25 Regulations

- 9.10.1 Premises with more than 500 feet of frontage along I-25 ROW shall be permitted a maximum of one (1) Freestanding Sign oriented to I-25, unless otherwise regulated by a project planned sign program.

10.0 Freestanding Identity Signs

10.1 Residential Signage

- 10.1.1 Refer to Community Association Covenants for additional sign regulations related to residential areas.

10.2 Illumination

- 10.2.1 Freestanding Identity Signs shall be exterior or interior illuminated with only the text lighted.
- 10.2.2 Cabinets signs shall not be permitted
- 10.2.3 All light sources shall be shielded to prevent glare.

10.3 Landscaping

- 10.3.1 Freestanding Identity Signs shall be located entirely within a landscaped area.
- 10.3.2 A minimum of four square feet of landscaping shall be provided for every one (1) square foot of sign face.

10.3.3 Only one (1) face of the sign shall be counted.

10.3.4 The portion of the sign located on the ground plane (foot print) shall not be counted as landscape area.

10.3.5 The landscape area shall be designed to have 75 percent of the area covered by live plant material within three years of installation.

10.3.6 Landscaping shall be installed within six months of installation of the sign.

10.4 Centerra Development Identity Signs

10.4.1 All Centerra Development Identity Signs shall be constructed by the master developer and maintained by the Centerra Master Association.

10.4.2 All Development Identity Signs shall be located in signage and landscape easements.

10.4.3 Development Identity Signs may be composed of the following elements: faux, dark patina bronze finish sign panel; custom light fixtures; stacked or monolithic boulder columns; and light bronze halo illuminated typography and logos.

10.4.4 Centerra Development Identity Signs include, but are not limited to:

- Centerra Landmark Boundary Monuments (Figure 4)
- Landmark Development Entry Sign (Figure 5)
- Primary Development Entry Sign (Figure 6 A & B)
- Secondary Development Entry Sign (Figure 7)

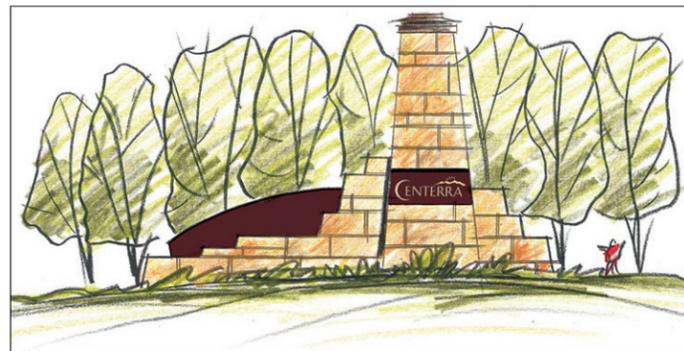


fig. 4 Centerra Landmark Boundary Monuments

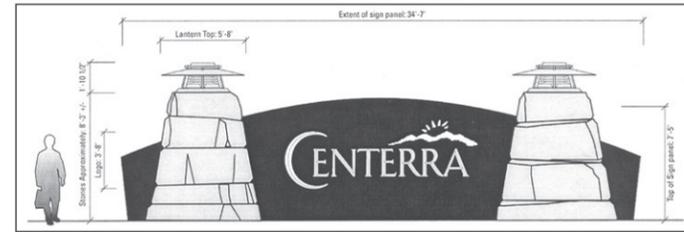


fig. 5 Landmark Development Entry Sign

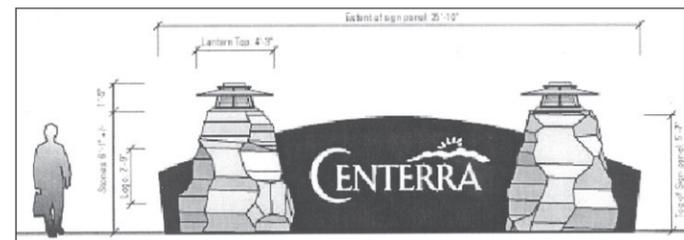


fig. 6 Primary Development Entry Sign - Option A

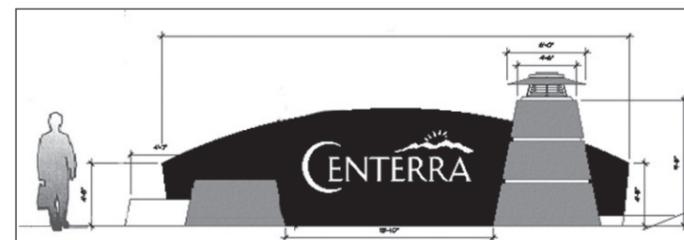


fig. 6 Primary Development Entry Sign - Option B

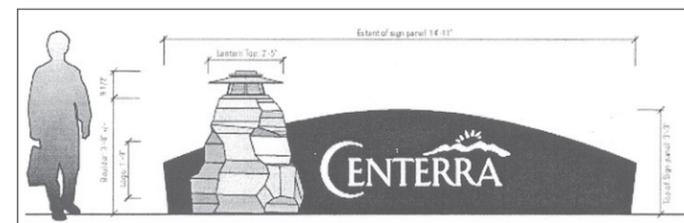


fig. 7 Secondary Development Entry Sign

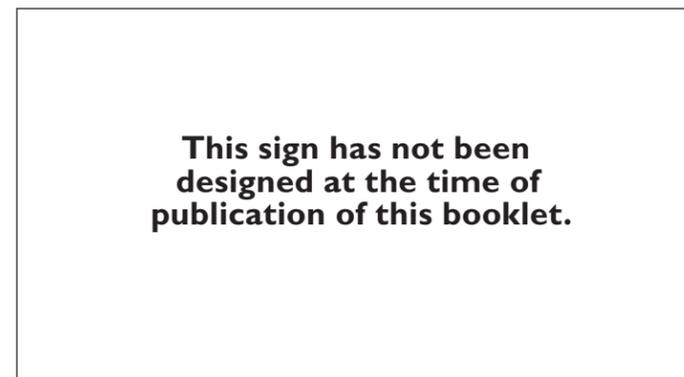


fig. 8 Entry Monuments to Districts or Major Subdivision Areas

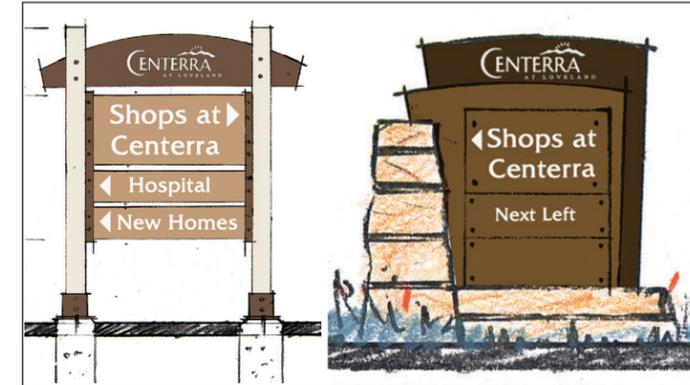


fig. 9 Marketing / Directional Sign

e). Entry Monuments to Districts or Major Project or Subdivision Areas (Figure 8)

f). Marketing / Directional Sign; (Figure 9)

note: see section 11 for added information on free standing directional signs.

10.5 Freestanding Private Development Identity Signs

All freestanding private development identity signs shall comply with the following guidelines, unless specifically approved by the Centerra DRC:

Commercial/Retail Tenant Signs

10.5.1 For cohesive commercial/retail projects of greater than ten (10) acres in land area, one (1) freestanding landmark project identity sign that identifies the name of the overall project, without specific tenants, may be placed at the primary vehicular entrance to the site or other location approved by the DRC. This sign may be in addition to the multi-tenant freestanding sign identified below. The design of these signs should be a derivation of the other freestanding signs used at Centerra, subject to DRC approval. (See Figure 10 for examples of such signs).

10.5.2 Freestanding signs for the identification of Commercial /Retail uses shall be combined into an overall sign listing multiple tenants (Figure 11).

10.5.3 All Commercial/Retail Tenant Signs shall be designed to be a derivativion of the other free-standing signs used at Centerra, subject to DRC approval. (see figure 11 for an example of such signs)

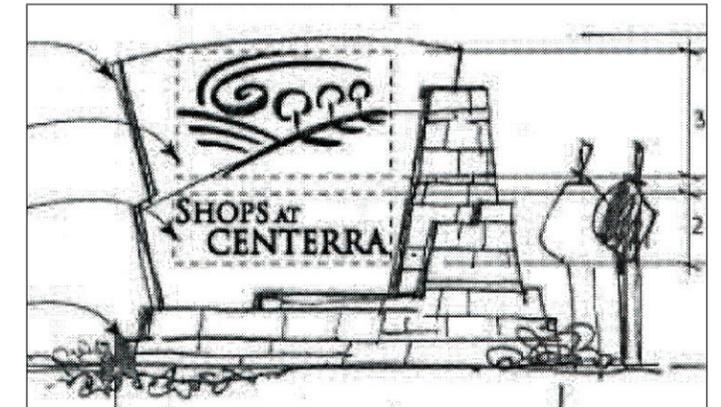


fig. 10 Freestanding Landmark Project Identity Sign



fig. 11 Freestanding Commercial / Retail Identity Sign

10.5.4 Letters on Commercial/Retail Tenant Signs shall be uniformly colored with the option of color variations in the backlighting that will be visible only at night.

10.5.5 Discourage single tenant Commercial/Retail Tenant Signs. Where necessary, provide a smaller version of a sign that is sympathetic to the intent of other signs in the project, subject to DRC approval

Business and Industrial Park Tenant Signs

10.5.7 Business Park/Industrial Park Tenant Sign are designed to identify a single tenant, as opposed to multiple listings (Figure 12).

10.5.8 All Business and Industrial Park Signs shall be uniform in size, unless otherwise approved by the DRC.

10.5.9 All Business and Industrial Park Tenant Signs shall be composed of the following elements: faux, light patina bronze finish sign panel; custom light fixture; cut sandstone columns; and halo illuminated typography and logos.

10.5.10 Letters on Business Park and Industrial Park Signs shall be uniformly colored with the option of color variations in the backlighting that will be visible only at night.

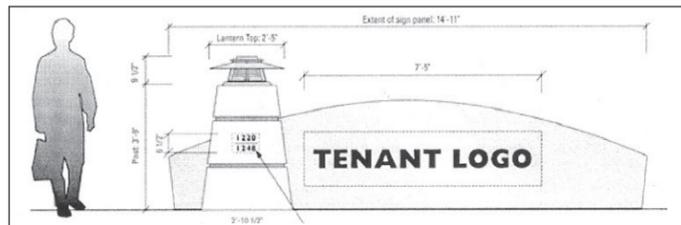


fig. 12 Business Park / Industrial Park Tenant Sign

10.5.11 Each parcel is allowed one (1) Tenant Sign, unless otherwise approved by the DRC.

Residential Identity Signs

10.5.12 Residential Identity Signs are designed to identify individual residential developments (Figure 13).

10.5.13 Residential Identity Signs may vary in size and design per the size of the property and DRC discretion.

10.5.14 Unless otherwise approved by the DRC, Residential Identity Signs shall be composed of the following elements: faux, blue-green copper patina sign panel; sandstone veneer columns; and light bronze halo illuminated typography and logos.

10.5.15 Each parcel is allowed one (1) Residential Identity Sign, unless otherwise approved by the DRC.

Mixed-Use District Center Signs

10.5.16 Mixed-Use District Center Signs are designed to identify the special district centers (Figure 14).

10.5.1 Mixed-Use District Center Signs may vary in

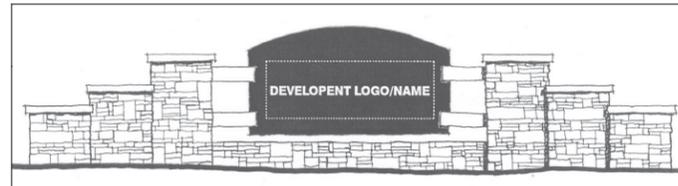


fig. 13 Residential Identity Sign

size and design per the size of the property and DRC discretion.

10.5.18 Unless otherwise approved by the DRC, Mixed-Use District Center Signs shall be composed of the following elements: faux, dark patina bronze finish sign panel; custom light fixture; large stacked buff sandstone columns; and light bronze halo illuminated typography and logos.

10.5.19 Letters on Mixed-Use District Center Signs shall be uniformly colored with the option of color variation in the back lighting that will be visible only at night.

11.0 Freestanding Directional Signs

(Note: On larger projects, the applicant may be required to provide the following signs. In many cases, these will be provided by the Master Developer and maintained by



fig. 14 Mixed-Use District Center Sign.

This sign has not been designed at the time of publication of this booklet.

the Master Association).

11.1 Centerra Community Directional Signs - General

11.1.1 Community Directional Signs throughout Centerra shall be uniform in materials and scale, but may vary slightly for the use area they serve, subject to DRC approval.

11.1.2 Community Directional Signs located in commercial, business park, and residential areas shall be composed of the following elements: faux, dark patina bronze finish, unless otherwise approved by the DRC.

11.1.3 All Community Directional Signs shall be composed of a neutral contrasting color (white, beige or similar) 3M Reflective vinyl typography, as approved by the DRC.

Community Pedestrian Directional Signs

11.1.4 Centerra shall contain two types of Community Pedestrian Directional Signs: Primary Pedestrian Directional Signs and Secondary Pedestrian Directional Signs (Figure 15).

11.1.5 Primary Pedestrian Directional Signs may occur in more urban areas of development, at major decision points.

11.1.6 Secondary Pedestrian Directional Signs may occur in parks, along trails, or other areas where a less noticeable sign is more appropriate.

11.1.7 All Community Pedestrian Directional Signs may be placed in the public ROW if necessary, based upon City of Loveland review and approval.

11.1.8 Installation, maintenance, and replacement of Community Pedestrian Directional Signs shall be the responsibility of the Master Association unless otherwise determined by mutual consent.

Community Vehicular Directional Signs

11.1.9 Centerra shall contain Vehicular Directional Signs oriented towards motorists (Figure 9 and 17).

11.1.10 Community Vehicular Directional Signs shall contain no advertising of specific business names, unless approved by the DRC.

11.1.11 Community Vehicular Directional Signs shall be limited to five (5) items of information. Three or four (3 or 4) items are preferred.

11.1.12 All Community Vehicular Directional Signs may be placed in the public ROW if necessary, based upon City of Loveland review and approval at minimum of 200' separation shall be provided between individual Community Vehicular Directional Signs.

11.1.13 Installation, maintenance, and replacement of Community Vehicular Directional Signs shall be the responsibility of the Master Association unless otherwise determined by mutual consent shall be maintained.

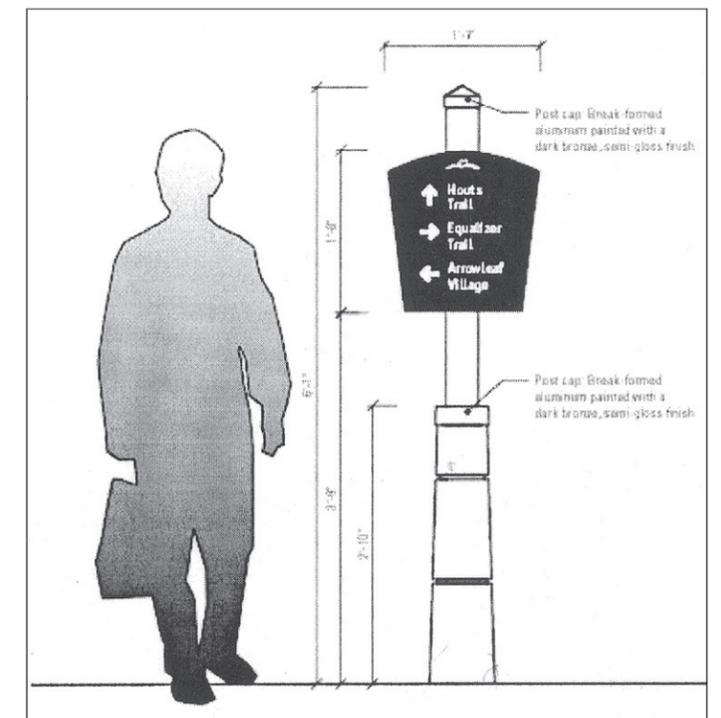


fig. 15 Community Pedestrian Directional Sign



fig. 16 Community Vehicular Directional Sign fig. 17 Community Vehicular Directional Sign

11.2 Project Directional Signs

Project Pedestrian Directional Signs

11.2.1 Project Pedestrian Directional Signs are intended to inform pedestrians about destinations within a project, designed to complement the overall signage theme of that project (Figure 18).

11.2.2 Project Pedestrian Directional Signs shall be reviewed on a case-by-case basis and shall be included in the total allowable sign area.

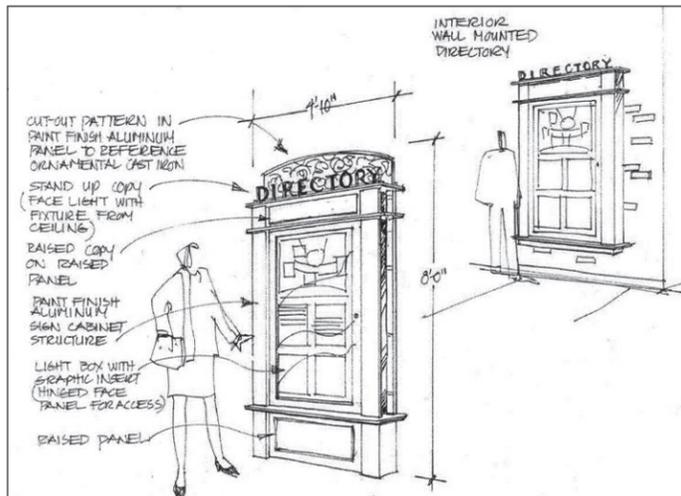


fig. 18 Pedestrian Directional Signs

Project Vehicular Directional Signs

11.2.3 Each Project Vehicular Directional Signs shall not exceed eight square feet in size and are included in the total allowable sign area.

11.2.4 Other signs that provide direction to destinations within a project are also allowed, and will be reviewed and approved by the DRC on a case-by-case basis.

11.2.5 Vehicular Project Directional Signs shall harmonize with the overall signage design theme created for that project (figure 19).

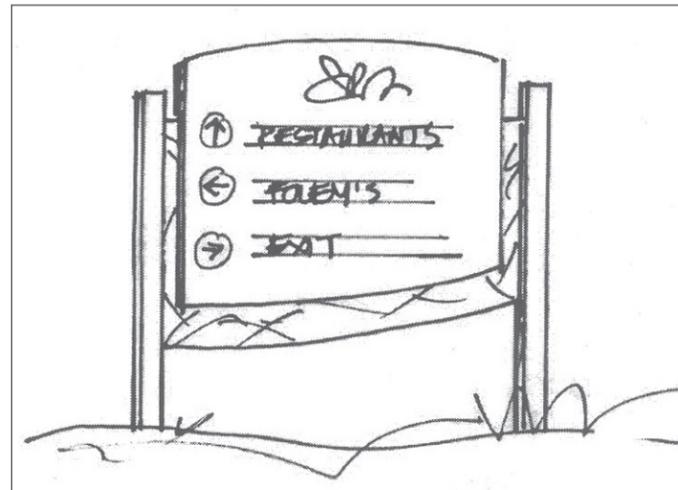


fig. 19 Vehicular Directional Sign

12.0 Building-Mounted Identity Signs

12.1 Size

12.1.1 Maximum sign area for all combined building-mounted signs shall be 15 percent of the wall surface on which they are mounted.

12.1.2 Maximum size of an individual sign shall not exceed 165 square feet per signable wall for each business, except as prohibited by size restrictions noted below, or as approved as part of a specific Project Master Sign Program.

12.2 Materials - Option 1

12.2.1 Individual channel letters and logos shall be formed of bronze-colored, welded aluminum (.036 minimum on sides and .080 minimum on

backs) with no exposed mounting hardware.

12.2.2 Letter and logo faces shall be a minimum one-eighth inch thick acrylic (non-yellowing material).

12.2.3 Color on Building Mounted Identity Signs shall be uniform, or the premise may be subject to Sign Area Penalty (See 8.0, above), unless specifically reviewed and approved by the DRC.

12.2.4 Letters shall be internally illuminated.

12.2.5 Provide 60 MA transformers for argon pumped tubes to ensure uniform lighting in cold temperatures.

12.3 Materials - Option 2

12.3.1 Individual letters and logos shall be dark, light, or patina-colored with halo illumination.

12.4 Materials - Option 3

12.4.1 Individual letters shall be a uniform color, cutout from an opaque fascia panel and backlit.

12.5 Primary Identification Sign at Office Building or Other Single-Use, Multi-Story Building Parapet

12.5.1 Only one (1) Primary Identification Sign that names the building or major tenant shall be permitted, located between the highest floor and top of the building parapet.

12.5.2 Signs shall be limited to a single line of copy with the name of the building or major tenant and/or logo.

12.5.3 Products or service descriptions shall not be permitted.

12.5.4 The height of the area on which the sign appears shall not be less than twice the height of the sign (Figure 20).

12.5.5 Primary Identification Sign area shall not exceed five percent of the building elevation on which it is located.

12.5.6 A minimum distance of three feet shall be maintained between the end of the sign and building corner (Figure 20)

12.5.7 Determine maximum letter/symbol height and maximum sign area, based upon the following formula:

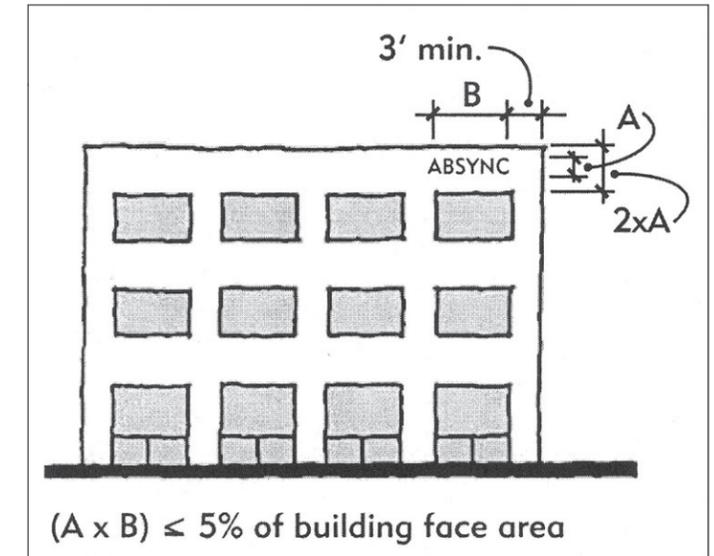


fig. 20 Primary Identification Sign at Building Parapet

Building Height (Stories)	Maximum Letter Height	Maximum Symbol Height
1	1' - 6"	2' - 0"
2	2' - 0"	2' - 6"
3	2' - 6"	3' - 0"
4	3' - 0"	3' - 6"
5	3' - 6"	4' - 0"

12.6 Single Story Buildings (Retail, Restaurant, Customer Service, Office, Light Industrial)

12.6.1 For buildings with multiple occupants, provide a sign containment area (sign band) between eight

and 20 feet above the finished floor as an integral part of the building architecture.

- 12.6.2 Signs shall be limited to a single line of copy with the business name and/or logo, only, unless specifically reviewed and approved by the DRC.
- 12.6.3 Products or service descriptions shall not be permitted.
- 12.6.4 The height of the area on which the sign appears shall not be less than twice the height of the sign.
- 12.6.5 One (1) main or front entrance sign shall be allowed for each individual tenant.
- 12.6.6 The allowable signage for each tenant shall be prorated based upon its proportionate share of the primary building frontage or as directed by the building owner representative, and reviewed and approved by the DRC. Unless otherwise modified by an approved Planned Sign Program, tenants under 10,000 sf in floor area may not exceed a maximum sign area of 150sf, and tenants over 10,000sf may not extend 165sf, subject to the locations of the calculation in 6.0 and 7.0. For example a single in-line tenant with 30' of store front may not exceed 66sf of sign area (30'x2.2)
- 12.6.7 Total sign area for the premise (including freestanding signs) shall be determined by Total Allowable Sign Area requirements (See 7.0, above).
- 12.6.8 Tenants with two distinct entrances on different facades shall be permitted a maximum of two signs (one (1) per entrance), subject to DRC review and approval.
- 12.6.9 Signs shall not be located any closer than 24 feet on-center, unless otherwise reviewed and approved by the DRC.

12.7 Secondary Signs on Mixed-Use Multi-Story Buildings (Office, Research and Development, Multi-Family Residential)

- 12.7.1 In addition to Primary Identification Signs, additional signs may be permitted if Retail, Restaurant, or Customer Service uses are contained within the building, subject to DRC review and approval.
- 12.7.2 Secondary Signs shall be placed between the first and second floors.
- 12.7.3 Maximum letter height shall not exceed 18 inches.
- 12.7.4 Primary Office Buildings shall be limited to one (1) ground floor Secondary Sign per building elevation, with a maximum of three signs per building. Consideration shall be given for a maximum of two Secondary Signs per building elevation, in situations where two major entrances occur on a building elevation.
- 12.7.5 The distance between Secondary Signs shall not be less than one-third of the building frontage on which the signs are located.
- 12.7.6 Building that have the entire ground floor devoted to Retail, Restaurant, or Customer Service uses shall follow the regulations contained in 12.6 Single Story Buildings, above.

12.8 Fuel/Convenience Store Canopy Signs

- 12.8.1 Signs on canopies associated with fuel/convenience stores shall be limited to one (1) corporate sign or logo associated with the principal use per canopy face. The maximum number of signs/logos per canopy is two.
- 12.8.2 Signs and logos shall have a vertical dimension of no greater than 75 percent of the vertical dimension of the canopy face, and shall not exceed a maximum sign area of 12 square feet.

12.9 Awnings

- 12.9.1 Signs on awnings shall not exceed eight (8) square feet in size and shall be applied to the building allowable sign area (Figure 21).



fig. 21 Awning Example



fig. 22 Projecting Sign Example

12.10 Projecting Signs - Retail or Main Street Setting

- 12.10.1 Individual tenants in a retail or main street setting, tenants may provide a one (1) wall or canopy mounted projecting (blade) sign. Tenants located on ends of buildings may have two blade signs, one (1) per façade. Blade signs shall not exceed 15 square feet per face and must be located no less than 24 feet apart. Blade sign area shall be applied to the building total allowable sign area.

12.11 Construction and Installation of Tenant Signage

13.0 Regulatory Signs

Specialty themed Regulatory Signs oriented towards motorists shall be used throughout Centerra. Regulatory Signs include standard MUTCD signs that can fit within the design theme established for Centerra. These regulatory signs may be placed in the right-of-way subject to City of Loveland approval (Figure 23).



fig. 23 Regulatory Sign Examples



fig. 24 Street Name Sign

13.1 Street Name Signs

- 13.1.1 Street Name Signs shall be green with white reflective lettering, placed on custom dark bronze painted supports (Figure 24).

13.2 Standard Regulatory Messages

- 13.2.1 Regulatory signs shall be placed in the ROW on custom dark bronze painted supports throughout Centerra.

14.0 Banners

14.1 Banners may be permitted, subject to DRC review and approval, on an individual case-by-case basis, based upon the following requirements:

- 14.1.1 Retail uses may be allowed one (1) banner per building, not-to-exceed seven calendar days announcing grand openings.
- 14.1.2 Office, Light Industrial, and Commercial uses shall be permitted a one (1) day Special Event Banner announcing open house/grand openings.
- 14.1.3 Additional restrictions or exceptions may be contained in the Covenants for special developments.

15.0 Window Signs

15.1 Window Signs shall be permitted, based upon the following requirements:

- 15.1.1 Painted windows shall not be permitted.
- 15.1.2 Each business shall be allowed one (1) neon "OPEN" sign. No other neon window signs shall be permitted.
- 15.1.3 Signs, decals, or decorations shall not be installed in doorways, windows, or other areas visible from public view.
- 15.1.4 Real Estate Window Signs intended to identify leaseable or retail office space shall be permitted (Figure 25).
- 15.1.5 Real Estate Window Sign message text shall be Gill Sans Medium typeface.
- 15.1.6 Real Estate Window Sign message text shall have a maximum height of one-and-one-half inches.
- 15.1.7 Real Estate Window Sign message text shall be machine cut 3M Dark Bronze vinyl Matthews #26A-1A.

15.1.8 The Real Estate Window Sign message panel shall be composed of one-quarter inch thick smooth finish PVC Sintra. Message panel paint color shall match Beige #220-49 with a satin finish.

16.0 Temporary Signs

16.1 Temporary Signs - General

- 16.1.1 Temporary Project Information (construction and real estate) Signs shall be permitted in non-residential areas (Figures 26 and 27).
- 16.1.2 Temporary Project Information (construction and real estate) Signs shall be used where land or leaseable space is available and to identify project and future development prior to and during construction. These signs shall be placed in a location on the property and of a design reviewed and approved by the DRC.
- 16.1.3 Color of message text for Temporary Signs may vary and may have individual graphics as approved by the DRC.
- 16.1.4 Temporary Real Estate Project Sign message panels shall be composed of exterior grade MDO plywood or aluminum.
- 16.1.5 Seams shall be sealed and finished smooth prior to primer and paint application.
- 16.1.6 Centerra logo panel shall be painted "Matthews Chocolate Chip" # 25A-1A
- 16.1.7 Angle brackets shall be constructed of one-and-one-half inch, by one-and-one-half inch steel, painted "Matthews Chocolate Chip" # 25A-1A.
- 16.1.8 Posts shall be constructed of ten-by-ten inch steel, painted "Matthews Bracken Brown" # 25C-2T.
- 16.1.9 The sign fabricator shall provide the required subgrade foundation to ensure that the sign will withstand wind loads.



fig. 25 Real Estate Window Sign



fig. 26 Temporary Project Information Sign

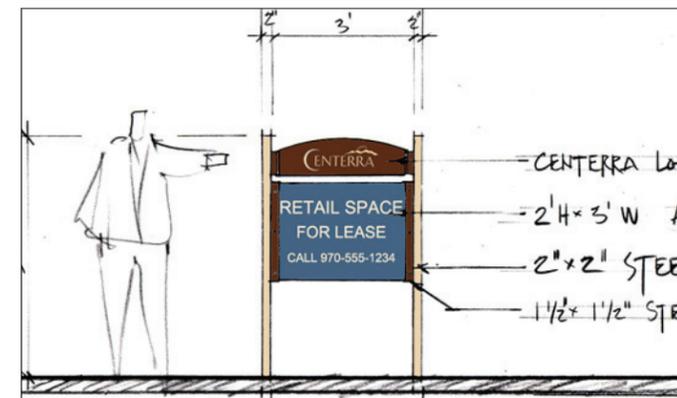


fig. 27 Tenant Project Information Sign

16.1.9 Dimension of Project Information Signs may vary. Refer to Centerra Planned Sign program for additional information.

17.0 Building Entry Information Signs

17.1 Building Entry Window Signs - General

- 17.1.1 Each business shall be permitted to post information including building or occupant names, hours of operation, emergency information, delivery hours, and other required notices, adjacent to the main exterior entrance on a wall or glass side-light adjacent to the entrance door.
- 17.1.2 Glass sidelight letters shall be die-cut vinyl, silk-screened, or gold/silver leaf.
- 17.1.3 Maximum letter height shall be one-inch for basic information.
- 17.1.4 Maximum letter height for building names or occupants may be three-inches.
- 17.1.5 Logos shall be a maximum height of six inches.
- 17.1.6 All type shall fit within a maximum two-foot-by-two-foot area.
- 17.1.7 Typestyle shall be consistent with other building signs.

17.2 Building Entry Wall Mounted Signs

- 17.1.8 Wall mounted signs shall be applied to a panel that is compatible with surrounding wall treatments.
- 17.1.9 Panel area shall not exceed four square feet.
- 17.1.10 Decals, credit card information, or hand painted signs shall not be permitted unless reviewed and approved by the DRC.

17.3 Building Entry Service Entrance Signs

17.1.11 Buildings that provide service entrances shall be permitted an additional sign on or adjacent to each delivery door.

17.1.12 Information area shall not exceed two (2) square feet and may include tenant name and suite number.

17.1.13 Sign design shall be consistent with all exterior doors of the building.

18.0 Flags and Pennants

18.1 Flags and Pennants - General

18.1.1 Flagpoles are not permitted, except when associated with a public facility.

18.1.2 Flags and pennants that project a maximum of four feet from the building face, shall be permitted on retail, entertainment, service, or commercial buildings only when associated with an approved special district sign program.

18.1.3 All flag and pennant faces shall count as part of the Total Allowable Sign Area (See Total Allowable Sign Area, 7.0).

19.0 Menu Boards

19.1.1 A maximum of two Menu Boards shall be permitted per premise.

19.1.2 Maximum Menu Board height is six feet.

19.1.3 Maximum Menu Board area is 25 square feet.

19.1.4 Freestanding Menu Board area shall be included in the Total Allowable Sign Area for the premise (See 7.0, above).

19.1.5 Wall Mounted Menu Board area (25 square feet) is allowed in addition to other wall mounted signs.

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