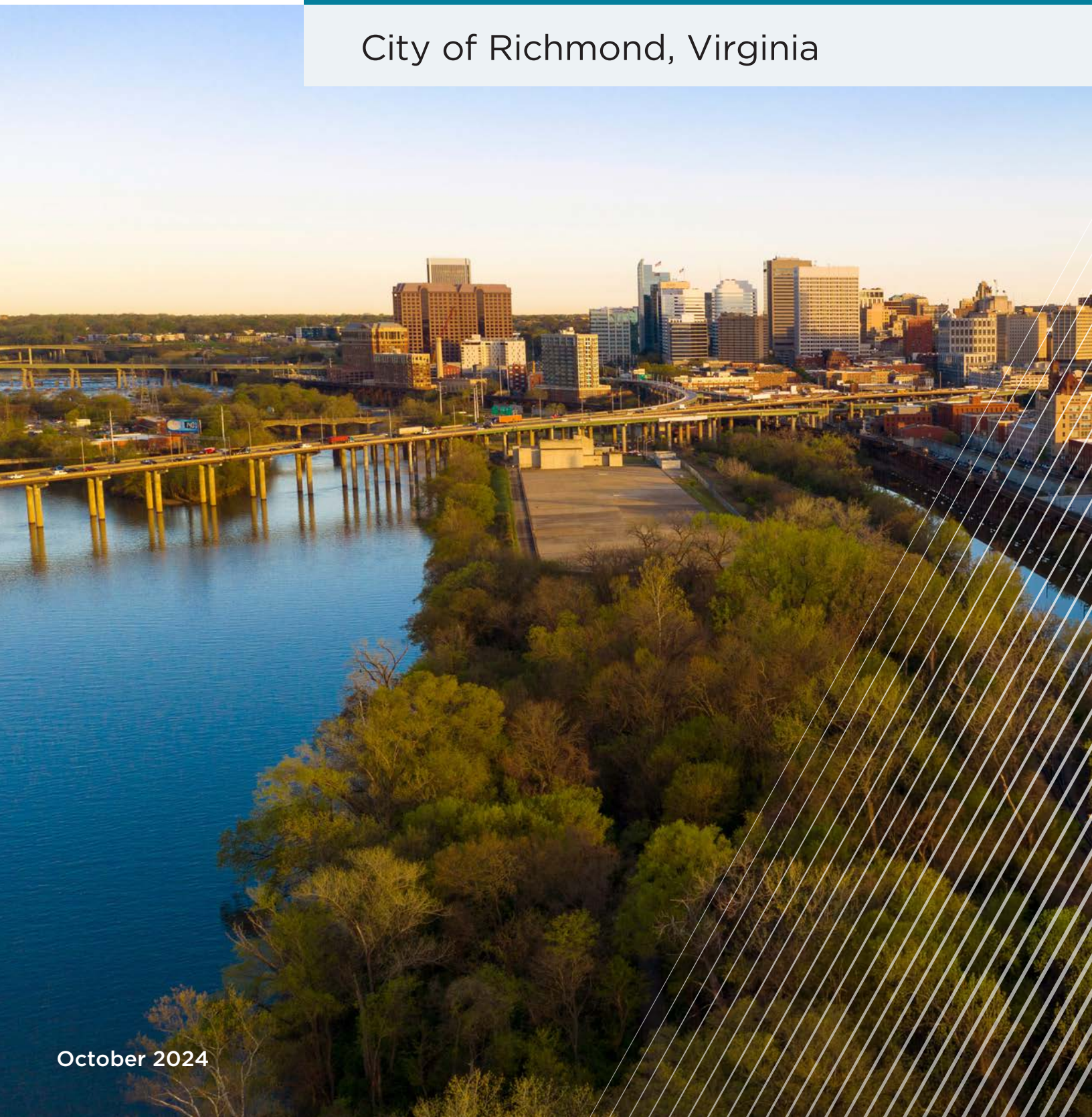
Richmond Sustainable Design Standards

City of Richmond, Virginia



October 2024

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Acronyms and Abbreviations

A/E	Architectural/Engineering
ADA	Americans with Disabilities Act
ANSI	American National Standards Institute
AP	Accredited Professional
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
BAS	Building Automation System
BD+C	Building Design and Construction
BMP	Best Management Practice
City	City of Richmond
CO	carbon monoxide
CPTED	crime prevention through environmental design
CRZ	critical root zone
DBE	Disadvantaged Business Enterprise
DBH	diameter at breast height
DCV	demand-controlled ventilation
DPW	Department of Public Works
ENV SP	Envision Sustainability Professional

EPA	U.S. Environmental Protection Agency
ESB	Emerging Small Business
EV	electric vehicle
FEMA	Federal Emergency Management Agency
FSC	Forest Stewardship Council
GPF	gallons per flush
GPM	gallons per minute
HVAC	heating, ventilation and air conditioning
ID+C	Building Interior Design and Construction
IECC	International Energy Conservation Code
IGCC	International Green Construction Code
IPM	integrated pest management
IUCN	International Union for Conservation of Nature
LED	light-emitting diode
LEED	Leadership in Energy and Environmental Design
LPD	Lighting Power Density
MERV	Minimum Efficiency Reporting Value
MPH	miles per hour
ND	Neighborhood Development - LEED
NEMA	National Electrical Manufacturers Association
O&M	operations and maintenance
O+M	Building Operations and Maintenance
PDR	Planning & Development Review
PRCF	Parks, Recreation, and Community Facilities
PV	photovoltaic
SDS	Sustainable Design Standards
SF	square feet
SOV	single-occupancy vehicle
SR	solar reflectance
TDM	Transportation Demand Management
USGBC	U.S. Green Building Council
VA	Virginia
VOC	Volatile Organic Compound

Glossary

Climate change	A long-term shift in temperatures and weather patterns.
CPTED	Crime prevention through environmental design (CPTED) is the multi-disciplinary approach to deterring criminal behavior through environmental design. The four main principles are natural surveillance, natural access control, territoriality (the space is owned and cared for), and maintenance.
Critical root zone	The area as measured by a 1-foot radius from the base of the tree's trunk for each 1 inch of the tree's diameter at breast height (DBH). The critical root zone (CRZ) may not be less than the diameter of the tree's canopy (referred to as the dripline).
DBH	The diameter at breast height for a tree is measured at 4.5 feet above-grade. On slopes this is measured from the ground on the upper side.
Dwelling unit	A single unit providing complete independent living facilities for one or more persons, including permanent provisions for living, sleeping, eating, cooking, and sanitation.
Embodied carbon	Greenhouse gas emissions from the manufacture, transportation, installation, maintenance, and disposal of building materials.
Green infrastructure	The range of measures that use plant or soil systems, permeable pavement or other permeable surfaces or substrates, stormwater harvest and reuse, or landscaping to store, infiltrate, or evapotranspirate stormwater and reduce flows to sewer systems or to surface waters.
Greenway	A linear open space that includes a natural or landscaped trail for pedestrians and/or bicycles.
Native plant	Indigenous plant that occurs naturally in a particular region, ecosystem, or habitat without human intervention. Native plants and native plant communities are best adapted to the local soils, climate, wildlife, and each other. Native plants are most successful in the sunlight, water, and nutrient conditions of their natural local habitat.
Operational carbon	Greenhouse gas emissions from all energy sources used to keep buildings warm, cool, ventilated, lighted, and powered.
Red List (2)	1. The Red List as it refers to plants and animal species. International Union for Conservation of Nature (IUCN) "Red List of Threatened Species". 2. The Red List for building materials represents materials, chemicals, and elements that are of serious risk to human health and the planet's ecosystems. These materials are to be avoided. The International Living Future Institute, Living Building Challenge Red List is updated annually and available at **https://living-future.org/red-list/**.
Renewable Energy	Energy sources, such as biomass, geothermal resources, sunlight, water, and wind, that are naturally occurring resources that can be converted into types of clean, usable energy.
Resilience	The ability of a system (e.g., family, neighborhood, community, country, biosphere) to cope with short-term disruptions and adapt to long-term changes without losing its essential character and while respecting its history and development.

1. Introduction

The purpose of the Richmond **Sustainable Design Standards** (SDS) is to ensure that new City development projects not only meet the functional requirements, and community needs but also align with the long-term vision for an equitable, sustainable, and vibrant Richmond. These standards provide a framework for integrating environmental responsibility, economic resilience, and social equity into every project, from multistory office buildings and affordable housing developments to parking garages and park facilities. By adhering to these standards, the City aims to create developments that enhance quality of life, reduce environmental impact, and contribute to Richmond's legacy as a forward-thinking, inclusive city leading up to its 300th anniversary in 2037.


WILLIAMS MULLEN

1.1 History and Vision

Richmonders have invested deeply in shaping a collective vision for an equitable, sustainable, and vibrant city. Through community input, thoughtful leadership, and collaboration, Richmond strives to create high-quality places with inclusive housing, equitable transportation, a diverse economy, and a thriving environment.

This vision is anchored in **Richmond 300**, the City's Comprehensive Plan, which serves as a guide for future growth. Richmond 300 emphasizes a thriving environment where "the City is positively adapting to the effects of a changing climate, with a built environment that enhances and protects natural assets, including the James River. All residents have equitable access to nature and a healthy community."

To turn this vision into reality, **RVAgreen 2050**, the City's Climate Equity Action Plan, has set ambitious goals, including reducing greenhouse gas emissions by 45% below 2008 levels by 2030, and achieving net-zero emissions by 2050. Among the specific actions in RVAgreen 2050 is Strategy BE-1.2, Action iii, which mandates that all new municipal buildings meet green building standards, achieve net-zero energy, and incorporate solar-ready infrastructure, EV charger wiring, and demand-response capabilities.

This document outlines how these action items—and many others from RVAgreen 2050—will be realized. The Richmond **Sustainable Design Standards** (SDS) establishes planning, design, construction, and operations and maintenance (O&M) targets that move Richmond's sustainability vision from broad goals into concrete strategies. The SDS provide guidance on community outreach, site selection, and impact avoidance during project planning, while also setting clear standards for water use, energy efficiency, indoor environmental quality, transportation, stormwater management, landscaping, and architectural design.

RICHMOND 300
A GUIDE FOR GROWTH

City of Richmond RVAgreen 2050

1.2 Core Concepts

Sustainability

Sustainability can be interpreted in various ways, but for the purposes of this document, it is defined as:

"The ability to improve and maintain equitable and just living conditions for all communities while restoring natural resources for future generations."

This definition emphasizes that sustainability is not just about environmental preservation—it encompasses housing, the economy, and the well-being of people. It reflects a mindset that considers how all systems—social, economic, and environmental—are interconnected. True sustainability requires systems thinking, where decisions are made with an understanding of their broader impact on both present and future communities.

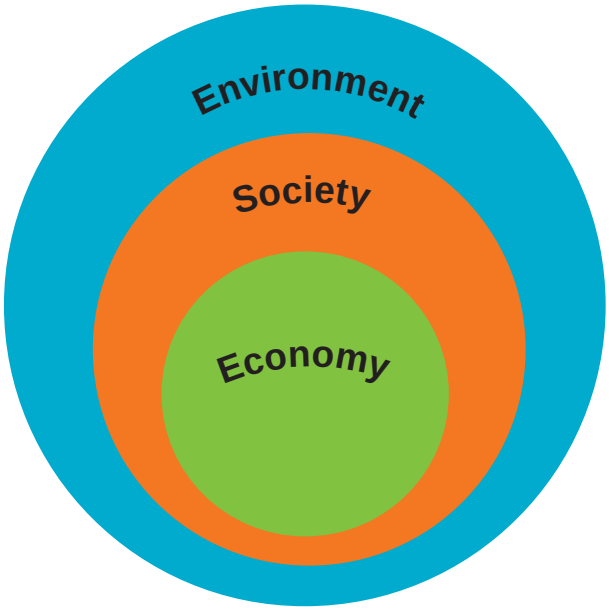


Figure 2-1 // **Nested Model of Sustainability**

Resilience

Resilience is often misunderstood as merely the ability to withstand hazards like storms. However, in this context, resilience is broader and refers to:

"The ability of a system (e.g., family, neighborhood, community, or ecosystem) to cope with short-term disruptions and adapt to long-term changes without losing its essential character, while honoring its history and evolution."

Resilience is about ensuring that systems—whether they are social or environmental—remain adaptable and strong in the face of challenges. It is not just about surviving an immediate crisis but about building adaptive capacity over time.

Figure 2-2 //**Resilience as Social Determinants of Health**

Environmental Justice

Environmental Justice is integral to creating a sustainable and resilient city. A truly resilient community cannot exist without equity and fairness. For the purposes of this document, environmental justice is defined as:

"The fair treatment and meaningful involvement of all people—regardless of race, color, national origin, age, gender, sexual orientation, income, or other factors—in the development, implementation, and enforcement of sustainable and resilient laws, regulations, policies, and practices."

This means that the vulnerability of any part of our community diminishes the resilience of the whole. To build a just and sustainable future, we must ensure that our policies and programs uplift and protect the most vulnerable, paving the way for Richmond to become the greenest, most inclusive city on the East Coast.

1.3 Sustainable Design Standards: Applicable Projects

Vertical Projects

Vertical Projects involve the construction or renovation of structures that rise above ground level, such as office buildings, residential housing, and other facilities. These projects focus on elements like materials, landscaping, water efficiency, energy efficiency, interior design, and occupant comfort.

The Sustainable Design Standards (SDS) apply to vertical projects that meet one or more of the following criteria:

1. **New Building Construction** over 10,000 Square Feet: This includes the site preparation and construction of new buildings or extensions to existing buildings, whether the site was previously developed or not.
2. **Major Building Renovation/ Reconstruction:** Renovations involving the replacement or rehabilitation of four or more major building systems, including roofs, ceilings, windows, building envelope, plumbing, site work, HVAC, electrical systems, and elevators/escalators.
3. **Small Project Renovation:** Applies to renovations of buildings between 10,000 and 20,000 square feet.

Horizontal Projects

Horizontal Projects, in contrast, extend across land, such as parks, transportation networks, roads, utilities, and stormwater systems. These projects emphasize land use, environmental integration, accessibility, and community connectivity.

The following horizontal project types are required to comply with the SDS:

1. **Right-of-Way Projects** costing $5 million or more.
2. **Parks and Community Space** Projects with a budget of $3.5 million or more.
3. **Utility and Wastewater Facility Projects** ("Inside the Fence") with a budget of $50 million or more.

Both vertical and horizontal projects are essential to shaping Richmond's sustainable future, addressing community needs, and enhancing the city's livability. All City infrastructure projects, regardless of type or size, should incorporate these standards to the greatest extent possible.

Exemptions

Certain projects are not required to comply with the Richmond SDS but are encouraged to adopt sustainable practices when feasible. These projects include:

1. New Building or Renovation Projects under 10,000 square feet.
2. Emergency Repairs.
3. Small Infrastructure Projects with less than 10,000 square feet of land disturbance.
4. Utility Maintenance and Repair Projects.
5. Parks and Community Space Projects under 0.5 acres.

2. SDS Project Management Guide

This section describes how to effectively integrate and apply the Richmond Sustainable Design Standards (SDS) throughout the project lifecycle. Each project must incorporate the SDS principles, and project teams are responsible for demonstrating their progress toward compliance.

Planning Phase. From the beginning of the project, the project team should begin integrating the SDS principles. During the Planning phase, the team must:

- **Site Selection:** Apply SDS criteria to select sites that align with sustainability goals.
- **Community Outreach:** Engage with the community in accordance with SDS guidelines, documenting all outreach efforts and feedback.
- **Apply LEED Integrative Process and Envision Planning Credits.**

Design Phase. In the Design phase, the project team should:

- **Use the SDS Checklist**: Review and understand all applicable SDS requirements.
- **Apply LEED Checlist to Vertical Projects**: Involve all relevant stakeholders, including construction, operations, and facility management staff, in key decision-making stages to leverage their insights and experiences.
- **Apply ENVISION Checklist to Horizontal Projects**.

Construction Phase. During the Construction phase, the construction team is responsible for:

- **Implementation:** Ensure that SDS requirements identified during design are fully implemented.
- **Documentation and Reporting:** Track and report progress, and work with vendors, manufacturers, and subcontractors to meet SDS standards.

By adhering to these practices, projects will not only comply with the SDS but also contribute to the City's vision of sustainability and resilience.

2.1 Roles and Responsibilities

The City recognizes that each project participant has a critical role to play to ensure a successful sustainability outcome. The roles and responsibilities summarized in Table 3-1 are not an exhaustive list, but are intended as a guide to assist project team members in understanding their roles and responsibilities.

Table 2-1 // **Roles and Responsibilities**

Role	Responsibilities
City of Richmond	Ensures integration of SDS into all project solicitations. Demonstrates commitment to SDS principles across all projects.
City of Richmond Project Manager	Acts as the primary point of contact for project teams, unless a delegate is assigned. Reviews and approves the initial SDS Checklist. Attends project SDS meetings. Provides guidance and direction as needed. Oversees quality controls Reports real-time updates to stakeholders.
Design Team Sustainability Professional	Either a LEED Accredited Professional (AP) specializing in Building Design and Construction (BD+C) or Envision Sustainability Professional (ENV SP) who leads the SDS planning and design-related tasks throughout the duration of the project. The Design LEED AP BD+C or ENV SP is responsible for all design-related SDS deliverables, including those required for third-party certification. Leads regular SDS meetings, both internally and with the City, during design. Ensures the design team and all subconsultants are informed of the SDS and trained as needed when required to complete documentation for SDS compliance
Construction Team Sustainability Manager	Either a LEED AP specializing in B+C or a Envision Sustainability Professional (ENV SP) who leads the SDS construction-related tasks throughout the duration of the project. The Construction LEED AP BD+C or ENV SP is responsible for all construction-related deliverables, including those required for third-party certification. Leads regular SDS meetings, both internally and with the City, during construction. Ensures the construction team and all subcontractors are informed of the SDS and trained as needed when required to complete documentation for SDS compliance.
Independent Third-Party Commissioning Authority	LEED Prerequisites and Silver Certification: Responsible for achieving the LEED prerequisite credit for Fundamental Commissioning and Verification and for meeting the Enhanced Commissioning and Building Envelope Commissioning requirements. ENVISION: Responsible for implementing the Envision Framework and achieving ENVISION Certification.
City of Richmond Facility Manager	Collects, maintains, and tracks project performance during occupancy.

2.2 Milestones and Deliverables

The SDS milestones and deliverables listed in Table 3-2 have been established to ensure the continued focus on SDS compliance and are intended to follow a project's submission schedule. These milestones do not refer to key project milestones such as site selection.

Table 2-2 // **SDS Milestones and Deliverables**

Milestone	Deliverable	Intent
Schematic Design	SDS Checklist	Complete the SDS Checklist for discussion at the SDS Kick-off Meeting to assist in planning for SDS compliance.
	SDS Kick-off Meeting	Review preliminary SDS Checklist and agree on SDS requirements and third-party certification.
	SDS Kick-off Meeting Minutes	Document key outcomes and decisions of the SDS Kick-off Meeting.
	SDS Schedule of Deliverables	Set all milestones and their accompanying SDS submissions.
	Basis of Design Report (or similar)	Develop a section for Sustainable Design to include key sustainability strategies and an SDS Checklist.
	SDS Workshop/LEED or Envision Charrette	Hold interdisciplinary workshop to review SDS requirements.
	SDS Summary Memo	Provide up-to-date SDS Checklist, LEED Scorecard, and summary information on progress, including any challenges, risks, and obstacles.
	Register for LEED or Envision	Confirm project name with City of Richmond Project Manager and register project.
Design Development	SDS Summary Memo	Provide up-to-date SDS Checklist, LEED Scorecard, and summary information on progress, including any challenges, risks, and obstacles.
Construction Documents	SDS Summary Memo	Provide up-to-date SDS Checklist, LEED Scorecard, and summary information on progress, including any challenges, risks, and obstacles.
	LEED or Envision design submittal	Complete and submit all third-party certification document requirements
Construction Completion	LEED or Envision construction submittal	Complete and submit all third-party certification document requirements

2.3 City of Richmond SDS Checklist

Project teams are required to complete and submit the SDS Checklist at each project milestone to plan appropriately for SDS compliance.

Should any part of the SDS not be achievable, the project team will bring this to the attention of the City of Richmond's Project Manager as soon as possible, with an explanation of why the requirement cannot be achieved. This manager will be provided in writing and should detail the reasons for noncompliance and any alternative solutions proposed. This documentation should be provided during any internal PDR review processes.

3. Community Outreach Requirements

Community outreach is essential at all stages of a project—from site selection through design, construction, and operations. The City must consider physical climate risks, environmental justice, equity, and community benefits while planning new buildings or facilities. This section provides guidance for incorporating community input into the planning process.

The City's **Equity Agenda** defines equity as the empowerment of communities that have experienced past injustices by removing barriers to access and opportunity. The goal is to strengthen engagement and trust between the City and its residents. To achieve this, the following objectives guide community outreach:

- Incorporate outreach throughout the project lifecycle (planning, design, construction, operations, and maintenance).
- Ensure outreach is inclusive, transparent, and equitable.
- Engage communities in decision-making.
- Define outcomes to ensure community priorities are addressed.

Outreach should be transparent, accessible, and representative of the City's demographics. Barriers such as mobility challenges, language differences, or childcare needs must be addressed. Provisions might include:

- Holding meetings near public transit for communities with limited vehicle access.
- Ensuring accessibility for people with disabilities.
- Providing materials in multiple languages for non-English-speaking populations.

Engagement should occur early and consistently, with clear reporting on how input is used. Each project should have designated outreach activities for key milestones, including construction and post-project. Clear roles for community partners should be defined, and all outreach efforts should be documented, including feedback and project team responses.

3.1 Site Selection Guidances

Equitable site selection is a key component of the City's redevelopment strategy, aligned with the goals of the Richmond **Equity Agenda** and **Richmond 300**. This process should consider community needs, environmental burdens, and social vulnerability, using tools like EPA's EJScreen and the RVAgreen 2050 Climate Equity Index.

Sites should be selected to maximize positive impacts while minimizing harm to disadvantaged communities. Factors to consider include:

- Physical safety and health impacts.
- Proximity to community assets.
- Effect of environmental hazards.
- Access to education and economic opportunities.

Site selection must avoid displacement and include protections for communities vulnerable to gentrification. Tools like the Virginia Community Voice's Equitable Development Scorecard and the Climate Equity Index should be used to guide decisions.

3.2 Operations and Maintenance (O&M)

O&M plays a critical role in extending the longevity of buildings and ensuring performance. O&M personnel should be involved in project planning to ensure consistency in materials and parts across City facilities. A comprehensive O&M plan should be developed early and updated throughout the design process.

3.3 Impact Avoidance

Once a site is selected, efforts to minimize negative impacts and maximize community benefits should begin. Mitigation strategies should be developed with input from the affected communities and might include:

- Using low-emission construction equipment.
- Enhancing flood resilience and air quality.
- Improving access to green spaces and community assets.
- Routing construction traffic to minimize neighborhood disruption.

3.4 Community Benefits Agreements (CBAs)

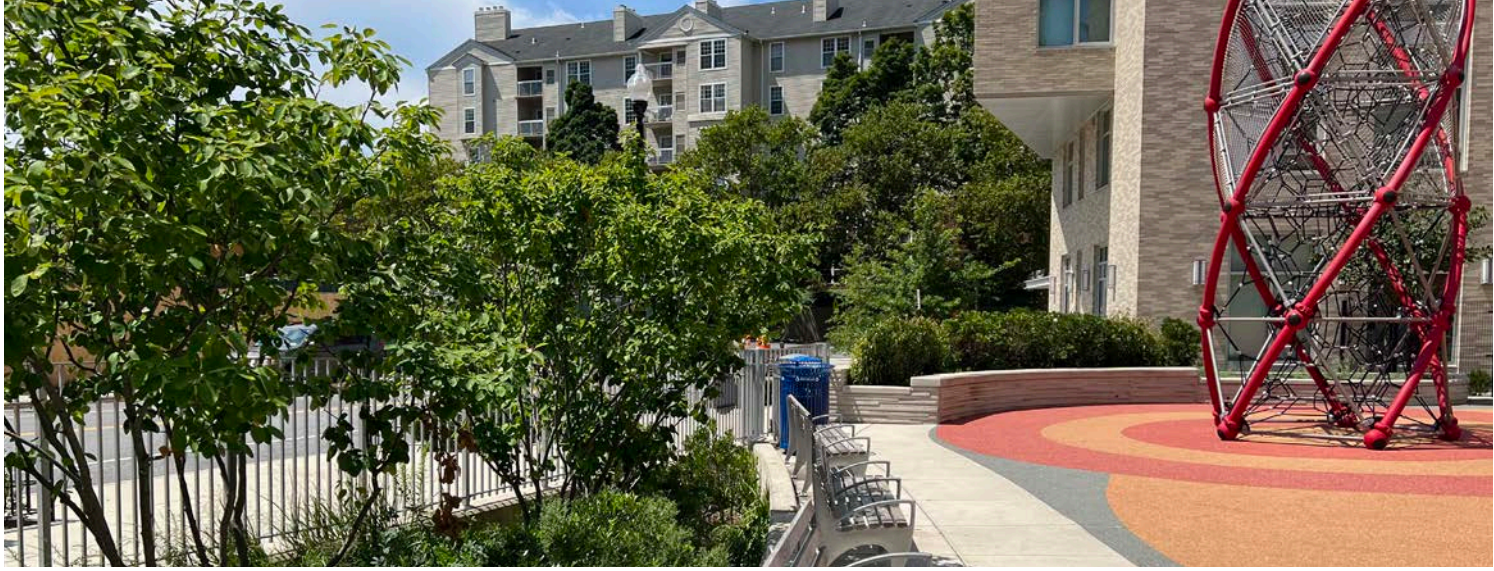
RVAgreen 2050, the City's Climate Equity Action Plan, highlights the Community Benefits Scorecard and Community Benefits Agreements as key tools for aligning City development projects with community needs and priorities. CBAs specify how projects will benefit the community and outline the City's commitments to address potential negative impacts.

Key outcomes identified in RVAgreen2050 provide the scaffolding for a CBA template as follows:

1. Advanced green economy
2. Cleaner and more efficient buildings
3. Cleaner and more efficient transportation
4. Climate-ready community
5. Engaged and involved community
6. Improved air quality
7. Increased flood resilience
8. Increased heat resilience
9. Increased support for climate action and resilience
10. Less landfill waste
11. Lower greenhouse gas emissions
12. More green space and trees

While developing a CBA, it is imperative to uphold key values as follows:

- **Inclusiveness:** Ensuring underrepresented communities are heard.
- **Transparency:** Clear documentation of benefits and commitments.
- **Coalition-Building:** Fostering alliances among diverse community groups.
- **Efficiency:** Streamlining project approvals with early and often community engagement.
- **Clarity of Outcomes:** Providing measurable, tangible benefits like job creation and environmental improvements.



4. Third-Party Certifications

Sustainability initiatives built into Richmond's projects will continue to improve the City's green footprint. The third-party standard for measuring these initiatives is the U.S. Green Building Council's (USGBC's) Leadership in Energy and Environmental Design rating system for vertical construction and the Institute for Sustainable Infrastructure's (ISI's) Envision rating system for horizontal infrastructure.

4. 1 Vertical Projects: LEED Certification

LEED Silver Rating

All eligible Vertical Projects must achieve **LEED Silver** at a minimum of the most current version of LEED available at the time of project design start. LEED Silver ensures that a project has met all foundation prerequisites related to energy performance, water efficiency, sustainable site development, and indoor environmental quality.

All eligible Vertical Projects shall achieve all **LEED Prerequisites** as required by specific rating systems. LEED prerequisites are applicable to both the design and construction phases of the project. All LEED prerequisites shall be met to achieve any credit within the LEED rating system. If any prerequisites are not met, the entire LEED rating pursuit for that project is jeopardized.

Beyond the LEED Preqequisite requirements, a project must earn a **minimum of 50 points** by iincorporating additional green building practices. LEED Silver certification strikes a balance between rigorous sustainability goals and practical, cost-effective design strategies, making it a solid choice for projects aiming to enhance their environmental impact while aligning with industry standards.

An appropriate rating system should be chosen based on project type, as summarized in Table 4-1. For mixed use projects that are split between two project types, use LEED's 60/40 rule to determine the best fit for the project.

Table 4-1 // **LEED Rating Systems and Project Types Types**

Project Type	LEED Rating System
New construction and major renovations, including offices, libraries, police stations, fire/rescue stations, schools (K-12), data centers, warehouses, and healthcare	Building Design and Construction (BD+C)
Interior fit-out projects	Interior Design and Construction (ID+C)
Existing buildings	Building Operations and Maintenance (O+M)
For single-family homes, low-rise multi-family (one to three stories) or mid-rise multi-family (four or more stories)	Homes

Mandatory LEED Credits

When pursuing LEED Silver certification , projects are **required** to fulfill the following **LEED Credit Categories for a minimum of 50 points.**

Section 5 of this document provides the CIty of Richmond Sustainable Design Standards. These standards can be applied in tandem with LEED Credits to maximize the amount of point a project can recieve..

Integrative Process. The integrative process ensures the project teams communicate across all lines from designers and engineers to general contractors and building operators. A LEED charrette early in the design process will spark the greatest return on synergies and cross-pollination of the team and sustainable strategies.

Location and Transportation.

- **Electric Vehicles.** Locate Level 2 charging at primary locations for public and private use. Appropriate charging rates may be applied for public use. Consider discounted charging rates as an employee benefit and incentive for city employees.
- **Two Additional Location and Transportation LEED Credits.** Depending on the project and site constraints, two additional Location and Transportation LEED Credits are required. The application of these credits are discretionary and should focus on the best location to add value to the project by making it accessible to local services, public transportation, and in appropriate communities.

Sustainability Sites.

- **Site Assessment.** Assess the project site early in the planning stage for maximum benefit from site features such as existing trees, solar orientation, prevailing winds, water features, and any human or wildlife interactions on the existing site.

Energy and Atmosphere.

- **Enhanced Commissioning.** Enhanced commissioning and building envelope commissioning are mandatory for City of Richmond building projects. Engage an independent third-party commissioning authority. Contracts for commissioning will be directly with the City.

- **Renewable Energy.** All building projects will include at a minimum 10% of the total building energy as renewable on-site energy production. Rooftop-mounted solar is preferred.
- **Two Additional Energy and Atmosphere LEED Credits.** Depending on the project and site constraints, two additional Energy and Atmosphere LEED Credits are required. The application of these credits are discretionary and should contribute to the the greatest amount of energy reduction for the project.

Water Efficiency.

- **Four Water Efficiency LEED Credits.** Depending on the project and site constraints, projects must acheive four Water Efficiency LEED Credits. The application of these credits are discretionary and should focus on reducing the amount of water used both in exterior and interior applications. The goal is to reduce the burden on the City's potable water supply. The greatest synergy can be achieved with rainwater collection and reuse when appropriate and budgeted.

Additional Credit Categories

In addition to meeting core sustainability goals, LEED offers the opportunity to earn extra points through the Regional Priority and Innovation credit categories.

Regional Priority Credits is a category aimed to ddress geographically specific environmental, social equity, and public health priorities that are unique to the project's geographic location. These credits vary based on zip codes. The entire City of Richmond is eligible for the following credits:

- **High Priority Site and Equitable Development** (Location and Transportation)
- **Rainwater management** (Sustainable Sites)
- **Protect and Restore Habitat** (Sustainable Sites)
- **Outdoor Water Use Reduction** (Water Efficiency)
- **Renewable Energy** (Energy and Atmosphere)
- **Building Life-Cycle Impact Reduction** (Materials and Resources)

Innovation Credits reward projects for creative approaches that go beyond standard LEED requirements. This can include pioneering technologies, new methods of sustainability, or exceptional performance in existing LEED credits. Innovation credits foster cutting-edge solutions, encouraging continuous improvement and pushing the boundaries of sustainable design.

4.2 Horizontal Projects: Envision Certification

The Institute for Sustainable Infrastructure's (ISI) Envision framework provides a comprehensive tool to support high-performance infrastructure development by promoting sustainable, resilient, and equitable outcomes. The Envision framework shall be applied to all horizontal projects, regardless of size, ensuring that sustainable practices are integrated throughout planning, design, construction, and operation.

Envision Certification is required for all horizontal projects (as defined on page XX) in the City of Richmond to guide decision-making in infrastructure development and ensure that projects align with the City's sustainability goals. The Envision framework helps project teams:

- Identify and implement best practices in sustainability.
- Prioritize equity and resilience during project development.
- Extend sustainable practices throughout the project lifecycle, from construction to operations and eventual decommissioning.

A completed Envision checklist must be reviewed with the City of Richmond's Project Manager to identify and confirm the necessary sustainable infrastructure practices for the project.

Special Considerations for "Outside the Fence" and "Inside the Fence" Projects

- **"Outside the Fence" Projects:** Infrastructure projects such as water or wastewater pipelines must follow the Envision framework. City manuals (e.g., the "Stormwater Management Design and Construction Standards Manual") must be used to align with the Climate Equity Index and Envision requirements.
- **"Inside the Fence" Projects:** For infrastructure projects within facility boundaries (e.g., Wastewater Treatment Plant repairs), where vertical construction (a building) is included but not designed for occupancy, the Envision certification process applies instead of LEED requirements.

Projects that include site selection, where it is not already pre-determined shall follow the Community Outreach Requirements (Section 2). All projects shall maintain alignment with the City's Better Streets Manual which this document shall not be in conflict with. All emergency/safety repair projects shall be exceptions to the SDSs.

Site Selection and Compliance with City Plans

Projects involving site selection (when not predetermined) must comply with this document regarding community engagement and site selection requirements. All projects must align with the **City's Better Streets Manual**, ensuring there are no conflicts between this document and the manual.

5. City of Richmond SDS

In addition to the third-party certification process, all eligible Vertical and Horizontal projects are shall review the application of the City of Richmond Sustainable Design Standards

Priorities are required to be considered as part of the project scope at the onset of the project. *They may fall out off scope if they are not technically or physically feasible or otherwise exorbitantly prohibitive.*

Recommendations are recommended to be considered as part of the project scope at the onset of the project.

Project managers shall reference Appendix A for a list of material specifications, organized by Division, that shall be followed. These specification requirements list materials that are acceptable and not acceptable for City of Richmond projects, and designers shall reference these material requirements when developing specifications for a project.

5.1 Water

5.1.1 Indoor Fixtures

Reduce water consumption by installing water-efficient, low-flow plumbing fixtures. Using fixtures that are specifically designed to limit water waste not only saves water, but also reduces the energy consumption associated with the production and distribution of potable water. Less water means less pumping energy, less water heating, and less load on the municipal infrastructure.

WaterSense is a voluntary program sponsored by the EPA that labels fixtures that use 20% less water than standard plumbing fixtures.

Priorities:

- Provide plumbing fixtures that are WaterSense labeled. WaterSense does not provide minimum flow requirements for kitchen faucets and lavatory faucets in public spaces. In those instances, the maximum allowable flow rate shall match the LEED baseline flow rate for each fixture type.

Recommendations:

- Provide 0.35 GPM public lavatory faucets.
- Provide 0.125 GPF urinal flush valves.
- Consider providing alternative restroom facilities, such as waterless composting toilets and non-flushing urinals, for Richmond Park facilities

5.1.2 Outdoor Water Use

See ***Site and Landscape***.

5.1.3 Hot Water Recirculation

While waiting for hot water to arrive at a fixture, a significant amount of water can be wasted by the user. A domestic hot water recirculation system that circulates hot water continuously through a closed loop to supply readily available hot water to plumbing fixtures and maintain water temperature minimizes the time it takes for hot water to reach the fixture. By reducing the amount of time it takes for hot water to reach each fixture, the hot water circulation system can conserve water and reduce energy costs.

A pump is used to maintain the required water temperature in the system by recirculating water through the domestic hot water system from the heating water source to the plumbing fixtures and then returning the water to the heating water source.

Priorities:

- Hot water recirculation systems shall be provided as indicated in the *International Energy Conservation Code* (IECC). Two compliant methods are listed in the code.
  - The first method is not to exceed the maximum allowable length of piping from the fixture to the nearest heated water source per the chart listed in the code.
  - The second allowable method indicates the maximum allowable volume of water in the pipe from the fixture to the source.
- For a public lavatory faucet, no more than 2 ounces is allowed, and for all other plumbing fixtures, no more than 64 ounces is allowed. This volume is potentially the amount of water that will discharge to the drain before hot water arrives.

Recommendation:

- Provide a hot water system compliant with the *International Green Construction Code* (IGCC). Limit the maximum volume of water in pipes from non-lavatory plumbing fixtures to the recirculation loop to 24 ounces. If the source of hot water is a water heater, the maximum volume is 64 ounces.

5.1.4 Water Metering

The incoming potable water service to a building is metered at the utility building entry, so that a provider has an accurate reading of the building's potable water consumption. Sub-meters are used in water subsystems downstream of the main water meter. These subsystems include HVAC makeup water, domestic hot water, reclaimed water, irrigation water, and process water. Benchmarking a facility's water can aid in leak detection and point to potential water-saving opportunities.

Priorities:

- Install water meters at incoming water service entrances to measure total potable water usage. Install a water meter for each water subsystem.
- Track trends and benchmark water use for comparison with other City of Richmond facilities to assess water usage.

5.1.5 Water Capture and Reuse (Non-Potable Uses)

Graywater should be prioritized for toilet and urinal use when implemented as part of a project. Rainwater harvesting systems collect water from approved roofing materials, publicly accessible roofs, and subsurface collection systems. Rainwater collected from non-approved surfaces could potentially introduce contaminants into the rainwater collection system. Rainwater can be collected, filtered, and treated to be used as a source of non-potable water, such as for irrigation, sewage conveyance (flushing urinals and water closets), or cooling tower water makeup. Refer to the *Virginia Plumbing Code* for codes governing rainwater non-potable water systems. Graywater is defined as untreated waste discharged from lavatories, showers/bathtubs, laundry trays, or clothes washers. Graywater has not come into contact with toilet water, urinal waste, kitchen waste, or other contaminated waste. Graywater can be collected, filtered, and treated to be used as a source of non-potable water, such as for irrigation and sewage conveyance. Refer to the *Virginia Plumbing Code* for codes governing graywater non-potable water systems.

In addition, condensate from HVAC equipment can be collected, treated, and used to provide water for irrigation and process water for cooling towers or used for sewage conveyance. Warm air is cooled by the air-conditioning system, then goes through a cooling coil and humidity in the air will condense to form water.

Recommendation:

- There are no requirements for water capture and reuse, as these practices are recommended but not mandatory. Due to the monetary and space requirements of water capture and reuse, water capture and reuse is recommended only for large-scale projects, and its use should be explored during the early planning stages of the project.

5.1.6 Personal Use Bottle Fillers

Water bottle filling stations are drinking fountains with spouts at the top of the fixture that discharge drinking water from the top of the fixture into a bottle or container that can be stand-alone or integral with conventional drinking fountains. Water bottle filling stations provide clean, filtered water, and enhance sustainable initiatives by reducing consumption and disposal of single-use bottles.

Priority:

- Install water bottle filling stations as part of consolidated drinking fountains or alongside at least 50% of drinking fountains.

5.2 Energy

5.2.1 Sub-Metering

All utilities serving a building are metered at the utility building entry so that a provider has an accurate reading of the building's consumption. Sub-metering provides building owners the opportunity to compartmentalize a utility by the system(s) it serves, thus indicating a system's consumption of that utility relative to that of the building as a whole. This can aid in the identification of possible energy cost-saving measures that can be implemented in a building to reduce its annual expenses (and carbon footprint).

Priorities:

- Provide a separate meter for any building system that represents 10% or more of the building's annual energy consumption. Systems requiring metering can be identified through development of an energy model.
- Track trends and benchmark energy use for the metered systems to compare them to other municipal facilities to assess energy consumption.
- Use building controls that can incldue set points and programming controls

5.2.2 Building Envelope

A proper building envelope enables a facility to resist its environment (e.g., temperature, moisture, humidity, pollutants). Building envelopes are specified by climate zone by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) in *Standard 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings* and *Standard 90.2 – Energy-Efficient Design of Low-Rise Residential Buildings*.

Priorities:

- Building envelopes shall exceed minimum performance requirements by the amounts shown in Table 5-2. Requirements are specified by the adopted version of ASHRAE *Standard 90.1* or *Standard 90.2* (depending on applicability).

Table 5-2 // **Minimum Building Envelope Improvements over Code**

	Warehouse	Dwelling	Office/Administrative	All Others
Façade Glazing	20%	15%	5%	5%
Roof	5%	5%	5%	5%
Exterior Walls	5%	10%	15%	5%

Table 5-3 // **ASHRAE 90.1 U Values**

Per Table G3.4-3 Performance Rating Method Building Envelope Requirements for Climate Zone3 (A,B,C)

Facade Glazing (under Fenestration)				
	Warehouse	**Dwelling**	**Office/Administrative**	**All Others**
Roof	0.063	0.063	0.063	0.063
Exterior Walls, Above Grade	0.124	0.084	0.124	0.124
Exterior Walls, Below Grade	1.140	1.140	1.140	1.140
Floors	0.052	0.052	0.052	0.052
Slab on Grade	0.730	0.730	0.730	0.730
Doors	0.700	0.700	0.700	0.700
Fenestration	0.570	0.570	0.570	0.570
Skylight	0.690	0.690	0.690	0.690

U-Value with Improvement

Facade Glazing (under Fenestration)				
	Warehouse	**Dwelling**	**Office/Administrative**	**All Others**
Roof	0.050	0.054	0.060	0.060
Exterior Walls, Above Grade	0.118	0.076	0.105	0.118
Exterior Walls, Below Grade	1.083	1.026	0.969	1.083
Floors	0.049	0.047	0.044	0.049
Slab on Grade	0.694	0.657	0.595	0.665
Doors	0.665	0.630	0.595	0.665
Fenestration	0.456	0.485	0.542	0.542
Skylight	0.552	0.587	0.656	0.656

5.2.3 Mechanical/HVAC Systems

Mechanical and HVAC systems are the largest energy end-users in commercial buildings. ASHRAE specifies minimum efficiencies for mechanical equipment by equipment type in *Standard 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings* and *Standard 90.2 – Energy-Efficient Design of Low-Rise Residential Buildings*.

Priorities:

- Mechanical/HVAC systems shall exceed equipment minimum efficiency requirements over the standard by the percentages specified in Table 5-3. Requirements are specified by the adopted version of *Standard 90.1* and *Standard 90.2* (depending on applicability). All motors for airside and waterside equipment shall be premium efficiency motors or exceed the National Electrical Manufacturers Association (NEMA) minimums (whichever is greater).

Recommendations:

- Ensure that motors are electronically commutated or have a variable-frequency drive.
- Use multiple pumps for greater turndown in all applications (parallel-pumping).
- For variable air volume applications, implement fan arrays into air distribution equipment to optimize equipment turndown and provide redundancy to equipment.
- For air distribution equipment, use pressure-independent control valves at hydronic coil connections. Avoid three-way valves in systems.
- For packaged units, provide air-source heat pump options.
- Consider premium efficiency chiller options, including magnetic-bearing or ceramic-bearing chillers, which can ramp down to 10% of maximum load.
- Consider control strategies to reduce equipment energy consumption, such as a supply air temperature reset or an airside economizer.
- Ensure that boiler systems are at least 90% efficient.

Table 5-4 // **HVAC Equipment Minimum Efficiency Requirements Improvements over Code**

Warehouse	Dwelling	Office/Administrative	All Others
5%	20%	15%	5%

5.2.4 Lighting

Lighting systems are some of the largest energy users in a building. Lighting density requirements (watts per square foot) differ by space type or building area type, based on the tasks to be completed in the area.

Priority:

- Lighting design and lighting control systems shall be designed by a professional lighting designer and be an improvement over code-required lighting power density values per building area. All lights shall be LED-type fixtures for the interior and exterior of buildings. The specified percentages by building type are listed in Table 5-4.
- Utilize CPC approved 3000k warmth or warmer LED lighting for exterior lighting, including the ROW.
- All exterior lighting shall comply with International Dark Sky standards.

Recommendations:

- Use fixtures with dimmable drivers.
- For outdoor fixtures, use solar when possible.
- Consider cascading lighting fixtures via occupancy controls for parking decks and pathways connecting buildings. A minimum, predetermined lighting level should be provided continuously for public safety.
- Use responsive exterior lighting to the greatest extent possible"

Table 5-5 // **Minimum Lighting Power Density (LPD) Improvements over Code**

	Warehouse	Dwelling	Office/Administrative	All Others
LPD Reduction	Use baseline	5% Reduction	10% Reduction	10% Reduction

5.2.5 Renewable Energy

Renewable energy systems are systems that produce energy from sources that are naturally replenished and do not run out; examples include solar, wind, hydroelectricity, geothermal, and biomass. These systems continue to become more cost-effective and energy-efficient and should be considered in a building's design to reduce its environmental impact. A solar system feasibility analysis will determine the energy production potential. For example, structures and trees that surround building sites should be evaluated for the amount of shade that they create during different seasons. In addition, the historical numbers of cloudy or rainy/snowy days at the proposed site should be evaluated. Solar mounting options include roof-mounted or ground-mounted racking. Roof mounts use the existing roof structure and therefore take up less space. Ground mounts need more space on the site; however, they are easier to access for installation and maintenance. One of the best locations for solar systems is in parking lots because the solar arrays also provide protection from sunlight. Where an on-site solar or other renewable energy system is not possible, off-site renewable power generation should be provided.

Priority:

- A feasibility analysis shall be conducted by the A/E designers at proposed project sites to assess the potential energy generation from the renewable energy sources at the project site. Renewable designs such as solar PV systems shall be designed by a professional electrical designer and generate a specified percentage of the building's estimated power consumption (on-site or off-site); this percentage is shown in Table 5-5. A monitoring system shall be included to track the solar PV system's performance and ensure it is operating efficiently. Building renovations, including roof replacements or improvements, will trigger the need for solar PV incorporation compliant with this standard. If an existing structure cannot support an on-site solar array, all solar PV shall be provided off-site.
- All parking garages shall provide a solar canopy on their top level.
- All new construction shall include renewable energy installation
- If an on-site solar system cannot comply with the percentages specified in Table 5-5 (and an off-site system is not an option preferred by the City), off-site solar generation or a solar PV system occupying 70% of the available roof area shall be implemented.
- All new construction for at minimum warehouses, dwellings, office and administrative buildings, and schoools shall achieve net zero energy and compatible for demand respons program enrollement.

Table 5-6 // **Minimum Renewable Energy Provision**

	Warehouse	Dwelling	Office/Administrative	All Others
% of Annual Estimated Energy	25%	10%	10%	10%

5.2.6 Energy Resilience – Peak Demand Controls

Peak demand controls are measures taken to manage and reduce peak energy demand during times of high stress on the electrical grids. Demand response programs allow utilities to reduce energy consumption during periods of high demand by incentivizing customers to reduce their energy usage during these times

Priority:

- Peak demand controls system shall be provided as part of the electrical system. This system shall be used to reduce energy consumption during peak demand periods. Load shedding will include shutting down non-essential equipment or reducing the power consumption of certain devices during periods of high demand. All new generators shall be Tier 4 generators to qualify for demand response programs.

5.2.7 Energy Resilience – Backup Power and Utility Redundancy

Energy resilience is becoming increasingly important as the City faces more frequent extreme weather events and power outages and emergency electrical loads for projects that require backup systems such as those used for emergency management, those intended for use as Resilience Hubs, etc. A battery backup system can store energy from the grid during periods of low demand, such as at night, and then release that energy during periods of high demand or during an outage. This allows the building to operate independently of the grid for a period of time, ensuring that critical systems, such as emergency lighting and communications equipment, remain operational in case of power outages. Furthermore, this battery backup system can help reduce the need for additional power generation from centralized utility power plants.

Priority:

- Energy storage systems shall be designed by a professional electrical engineer to determine all the critical and emergency electrical loads. These storage systems shall be a minimum of 10% of a building's estimated power demand as determined by an energy model. All emergency generators shall be fuled by the lowest carbon intensive option., if possible. All new generators shall be Tier 4 generators to qualify for demand response programs.

5.3 Indoor Environmental Quality

5.3.1 Air Monitoring

The continuous analysis of recirculated air through a building promotes occupant health and a thriving indoor air environment. Air-monitoring devices can be specific to a building's particular concerns; however, most commonly, air-monitoring devices analyze concentrations of carbon dioxide (CO_2), carbon monoxide (CO), and nitrogen dioxide (NO_2).

Priority:

- For all densely occupied building spaces, air-monitoring equipment shall be provided with a monitoring capability for CO_2, at minimum. This monitor shall be interconnected with the Building Automation System (BAS) to modulate the supply of outside air to building spaces according to occupancy (demand-controlled ventilation [DCV] per ASHRAE 62.1 [adopted version]) and shall send an alarm when the setpoint is exceeded.

Recommendation:

- Selected chemicals and products to be stored for facility and site O&M, in accordance with the City's clean air and healthy workspace goals, should be environmentally friendly products.

5.3.2 Ventilation

Ensuring an adequate supply of outside air to a building provides occupants with air containing lower concentrations of particulate matter in all areas of the building, regardless of the different exhaust requirements between spaces. The airflow measurement device requires measuring the incoming outside air and ensures the minimum design outside air is supplied to remove building contaminants and maintain design building pressurization.

Priorities:

- Provide airflow monitoring stations on outside air intake/ductwork for all mechanical equipment serving the building. Connect all airflow stations into the BAS. The BAS sequence shall comply with the air change requirements specified in the *Construction and Professional Services Manual* authored by the Department of General Services (Commonwealth of Virginia, 2023).
- Track these data to compare them with other facilities to assess building utilization and indoor air conditions.

5.3.3 Air Treatment (Filtration)

Proper filtration of the air supplied to condition a building promotes occupant health by removing particulate matter from the air stream. Airborne particulates come in an array of sizes in breathable air, and different filter ratings remove different particulate sizes at different efficiencies from the air that building occupants breathe.

Priority:

Mechanical equipment serving occupied spaces shall comply with a minimum filtration efficiency equal to that of MERV-13.

5.3.4 Daylighting and Controls

Lighting systems for a building include the lighting provided for internal spaces as well as the facility lighting around the exterior and parking lot. Implementing daylighting controls to detect space lighting levels and adjust fixture input power accordingly can reduce annual lighting energy usage.

Priority:

- Install dimmable drivers for LED fixtures. Intermittently occupied areas shall be controlled using vacancy sensors rather than occupancy sensors. All lighting systems shall be provided with operation schedules to de-energize during unoccupied building hours (with the exception of security lights).

Recommendation:

- Provide photocell control for all facility exterior lighting.

5.3.5 Acoustics

Minimizing sound transmission through a building affords a better indoor environment for its occupants. Noise transmission can be generated from HVAC equipment, adjacent spaces, and outdoor spaces.

Priority:

- All mechanical equipment shall have a maximum sound power rating of 85 dBA at 5 feet or below to meet room requirements.

5.4 Transportation

5.4.1 Resilience Planning

Unpredictable emergencies, major weather events, and flash flooding from heavy rainfall can reduce travel options and limit evacuation routes to and from key destinations. Resilience planning adds resilience through variety; treats transportation as the movement of people of all ages and abilities rather than of vehicles; and prioritizes pedestrians, bicycles, and transit over single-occupancy vehicles (SOVs). Redundant and alternative routes and means of transportation can maintain the movement of people and essential services by transit, foot, and all street- and sidewalk-legal wheeled devices.

Priorities:

- Provide street-to-door ingress/egress routes for foot, wheelchair, and bicycle (bicycle/pedestrian) traffic.
- Dedicated vehicle routes shall not interfere with provision of pedestrian safety features.
- Connect walkways to trails system and transit stops where available.

Recommendations:

- Provide more than one access point for vehicles and bicycle/pedestrian travel.
- Dedicate space from City parcel to the ROW to facilitate adequate space for shelters and supporting infrastructure.

5.4.2 Transit Access Planning and Design

A multi-modal transportation network offers resilience by providing flexible options from beginning to destination and the connections in between. Public transportation can reduce traffic-related injuries and air pollution. To be a desirable choice, transit shall be easy and pleasant for residents and tourists.

Priorities:

- At transit stops with shelters, prioritize safety and high-quality design. Take into account architectural features, art, lighting, regional materials or references, directional signage, and clear sight lines. Install shelters, seating, waste receptacles, and bicycle parking.
- Access and stops shall meet Americans with Disabilities Act (ADA) requirements for accessibility.

Recommendations:

- Locate transit stops to prevent “last mile” gaps between stop and key destination(s). Connect to a bicycle/pedestrian network.
- Work with transit agencies to provide stops with real-time information on connections and travel times.

5.4.3 Pedestrian Access Planning and Design

A resilient city is a walkable city. Prioritizing the movement of people over vehicles improves access to community assets for everyone, including children, tourists, the elderly, dog walkers, people without a license, and the second adult in a one-car family. Recreational and commuting access to and through a network of quality green spaces enhances health, property values, and biodiversity. Off-road routes reduce conflicts with vehicles. Moreover, eyes on the street can improve public safety and build community.

Priorities:

- Install sidewalks in public rights-ofway and from street to building (to standards set forth in the Better Street Manual). All crosswalks shall meet applicable codes.
- Provide amenities such as shade trees, bicycle parking and sharing, signage, public art, street furniture, and pedestrian lighting as appropriate to enhance walkability and improve pedestrian crossings.
- Provide sidewalk along the full street frontage adjacent to the parcel of the project.

Recommendations:

- Add and connect to Safe Routes to School programs where applicable.
- Connect parks, playgrounds, and natural areas with greenways. Include a paved trail that is ADA-accessible and a minimum of 8 feet wide. Design greenways for use as animal habitat corridors.
- Include walking trails and routes around projects for convenient lunch breaks and walking meetings.

Shared-use path

5.4.4 Bicycle Access and Parking Planning and Design

A resilient city is a bikeable city for the same reasons as a walkable city. Riding a bicycle offers the autonomy drivers enjoy in SOVs, but bicycles can go where vehicles cannot and are cheaper and pollution-free. A bikeable city is more livable for everyone.

Priority:

- Design bicycle facilities to meet or exceed all applicable national, state, and local regulations. Provide bike racks at building entrances, transit stops, trailheads, recreation areas, playgrounds, and plazas in locations that are easily visible from primary access points(s) and that afford maximum visual surveillance. Provide space for recumbent bicycles and scooters at key destinations. Bike racks shall provide two points of contact parallel to the bicycle frame to support the bike and allow locking of the frame and at least one wheel with a U-lock. The clearance around bike racks shall allow for unimpeded use of bike racks, sidewalks, and car doors.

Recommendations:

- Provide space, pavement, and access for bicycle share stations.
- Provide covered and secure (enclosed) bicycle parking and lockers.
- Provide additional amenities (e.g., shelters, benches, maintenance tools, restrooms, bottle-refill water fountains) at key bicycle destinations.
- Break up large blocks and provide bicycle connections where roadway connections are not possible. Connect City Nodes, neighborhoods, parks, and greenways.
- Provide a shared-use path with a 10-foot minimum width. Provide 5-foot minimum separation from the vehicular curb or edge of the pavement. Design for maintenance and emergency vehicle access.
- Along streetscapes, include separated, buffered bike lane(s). Shared lanes or sharrows are not considered adequate.

5.4.5 Electric Vehicle Charging

The City of Richmond prefers transit and alternative modes of transportation and encourages non-fossil-fuel-burning transportation. Transportation Demand Management (TDM) strategies to shift individuals from SOVs and increase the number of low-emission vehicles include promoting electric cars and bicycles.

Priority:

- Provide at least one dual Level 2 charging station for vehicles and bicycles. Incorporate renewable energy at stations. At least one vehicle charging station shall be ADA Accessible. Comply with the requirements of the latest version of the *Construction and Professional Services Manual* (Commonwealth of Virginia, 2023) and LEED. For EVs, provide Level 2 charging with a Type 1 vehicle connector.

Recommendation:

- For City of Richmond fleet vehicles, provide a minimum of two charging stations (could be one dual-port station) at work-related destinations such as parks and recreation areas.

5.4.6 Operations and Maintenance

Providing updated signage, information, and other materials to building users is key in ensuring long term reduction of vehicle miles traveled.

Priority:

- Provide updated signage inside the facility regarding alternative modes of trnapsortation for building users.

5.4.7 Vehicular Parking Planning and Design

Impervious pavement contributes to the urban heat island effect and untreated stormwater runoff velocity and volume. Large, single-use paved spaces such as parking lots displace natural areas and systems. However, available infrastructure influences transportation choices, and to promote resilience, surface parking shall be designed to effectively manage supply and demand as part of the multi-modal transportation network. For additional requirements and recommendations for pavement and signage materials, see ***Materials (Paving and Signage)*** and ***Planting Design.***

Priorities:

- Provide and prioritize the location the location and quantity of spaces for bicycles, EVs, mobility-impaired and Purple Heart drivers, and ride-sharing.
- Screen parking from bicycle and pedestrian networks. Use alley access.

Recommendations:

- Design for more than one benefit. For example, integrate bicycle and pedestrian facilities with covered seating, shade trees, stormwater plantings, special pavement, and pedestrian lighting.
- Limit the amount of real estate devoted to parking by sharing spaces and limiting parking for SOVs rather than designing for peak demand. Designate smaller spaces for compact cars and motorcycles.
- Avoid parking facing the street.
- Minimize and share driveways and curb cuts. Implement traffic-calming measures.
- Provide marked, dedicated curb space for deliveries and ride-share drop-offs.
- Install equipment for on-street, fee-for-use parking. Equipment shall provide real-time data.

5.4.8 Materials (Pavement, Signage)

Materials are integral to placemaking and wayfinding, as well as community identity and resilience.

Priorities:

- Preserve cultural, historical, and architectural materials that contribute to Richmond's authenticity.
- where a pavement is necessary, install permeable pavers to the greatest extend possible, including in the public ROW. Pervious pavement systems shall maximize the distance between pavers to the greatest extent possible while maintaining ADA compliance.
- When redeveloping a site, prioritize depaving wherever possible.

Recommendations:

- Install pavements with high solar reflectance (SR) in sunny areas.
- Square-edge pavers with hand-tight joints are preferred for accessible routes to beveled pavers and sub-flush joints.
- Add alleyways to expand street grid options. Install permeable pavement with underground infiltration/ underdrain systems per the Green Alley Program.
- Provide directional signage according to City Node branding.
- Consider infrastructure signage (e.g., wetland swale, no dumping in drains to the river).

5.4.9 Reporting

Data on deletions, additions, and improvements are essential for mapmaking, budgeting, and maintenance.

Priorities:

- Report to Planning & Development Review (PDR) if the project site is within a ½ mile of high-frequency transit or if the project is adding a transit stop.
- Report to DPW the miles of added sidewalks for the Sidewalk Inventory.
- Report to DPW the miles of added bicycle lanes.

5.5 Stormwater

5.5.1 Resilience Planning

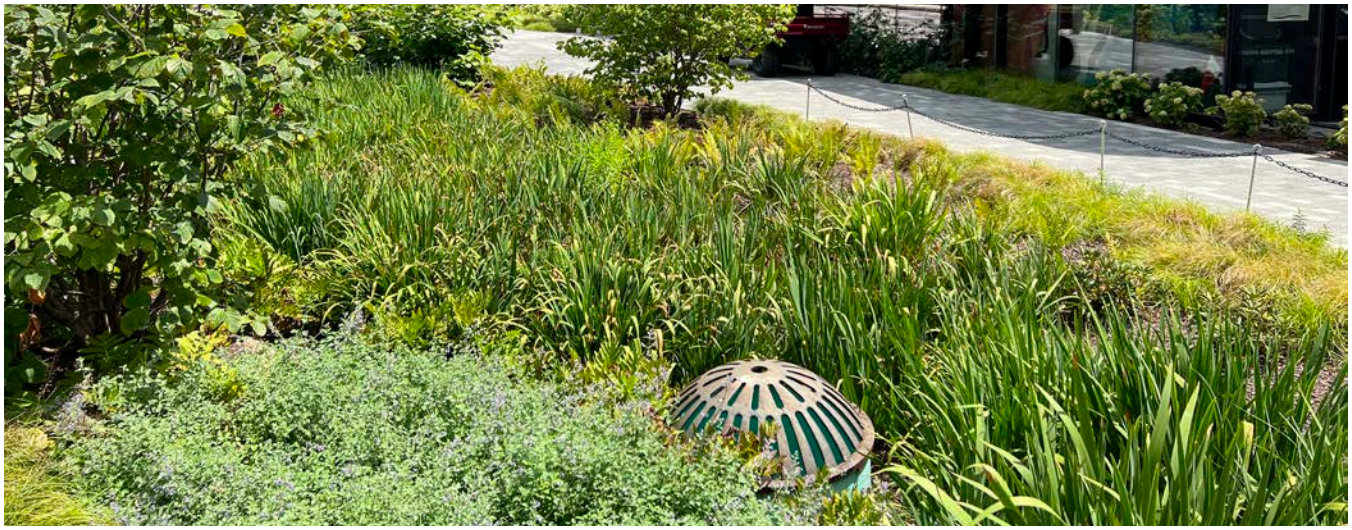
The climate impacts of extreme heat, precipitation, and flooding should be considered during site planning for stormwater management. Lessening the impacts from development through resilient site planning and designing stormwater systems for future conditions will help Richmond to adapt to climate change.

Priorities:

- Maintain intact, healhty, native landscapes and avoid disconnections to avert fragmentation of natural habitat, degradation of ecosystems that enhance air and water quality, or negative impacts on buffers that assist in climate regulation and alleviate natural disasters.
- Increase the design storm precipitation totals and shorten the storm duration to be used in the sizing of stormwater infrastructure in flood-prone areas.
- Utilize climate change projections to estimate future flooding conditions for the end of the projects life cycle.
- Increase infiltration opportunities with rain gardens, bioretention facilities, or other infiltration practices.

Recommendations:

- Plant trees to increase the urban canopy, intercept precipitation, and maximize evaporation before precipitation reaches the ground level.



Bioretention garden

5.5.2 Green Infrastructure

Pollutants are collected by stormwater runoff and carried to the James River or the combined sewer. The water quality and aquatic conditions degrade due to polluted runoff. Goal 16 of the *Richmond 300: A Guide for Growth* (City of Richmond, 2020) Master Plan strives to improve local water quality and manage the built environment to enhance and protect natural assets such as the James River. The incorporation of green infrastructure into City projects helps to support water quality improvement goals by connecting natural systems and ecological processes to filter pollutants from stormwater runoff and by reducing the volume of water flowing to the City's Combine Sewer System.

Priorities:

- Stormwater management on-site shall be provided by green infrastructure to the maximum extent practicable. This is required for all new construction and major reconstruction projects. Refer to the Virginia Stormwater BMP Clearinghouse (DEQ and VWRRC, n.d.) for green infrastructure design standards. Green infrastructure may include bioretention basins, green/vegetated roofs, rainwater harvesting, permeable pavers, infiltration basins, bioswales, living shorelines, tree box filters, and other practices approved by the City of Richmond.
- For planting requirements, see ***Planting Design***.

5.5.3 Flood Control

Development patterns with highly impervious land cover coupled with larger, more intense rainfall events due to climate change have resulted in more frequent flooding events, even in areas outside of the Federal Emergency Management Agency (FEMA) floodplain. This is common in areas where the storm drain infrastructure is not sufficient to convey flows from more intense, larger rainfall events. New development and redevelopment projects offer an opportunity to provide additional stormwater volume control, which can help mitigate downstream flooding of the City's Municipal Separate Storm Sewer System (MS4) and reduce the volume of water that enters the City's Combined Sewer System.

Priorities:

- All new construction and redevelopment projects are required to capture the first 1.25 inches of runoff from impervious surfaces on-site for reuse or infiltration. The on-site stormwater management shall be provided by green infrastructure to the maximum extent practicable and is required for all new construction and redevelopment projects.

Recommendations:

- Promote rainwater collection and reuse systems. Collected rainwater can be used for irrigation and other non-potable uses like vehicle wash water and flushing toilets.
- In flood-prone areas, evaluate the potential for additional stormwater volume storage on-site to alleviate downstream flooding.
- Evaluate the receiving storm drain and inlet system to determine whether it is functioning properly and adequately sized to accommodate runoff from the planned development project.

5.5.4 Operations and Maintenance

Planning for long-term maintenance of stormwater management facilities shall be considered during design. In addition, proper construction and installation of stormwater management facilities are critical to ensure that facilities will function as designed.

Priorities:

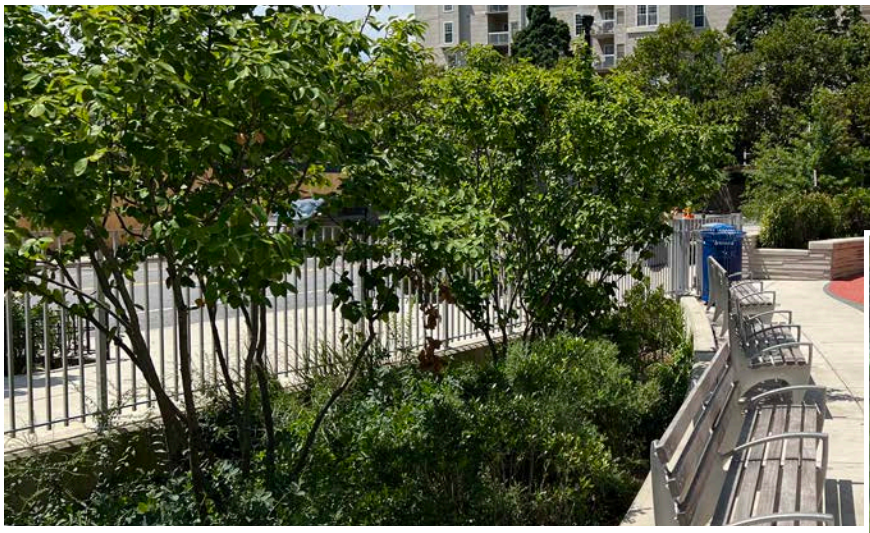
- Prepare long-term operations and maintenance plans for all stormwater management facilities and establish maintenance agreements to document the parties responsible for inspection and maintenance.
- Require documentation from a certified professional that stormwater management facilities have been properly installed and constructed.

5.5.5 Commissioning and Reporting

Some stormwater management facilities require additional planning and training to ensure that inspection and maintenance are done properly.

Requirement:

- Early in the project, develop a list of site-related systems for commissioning-related activities. Include measurement and performance verification of complex site systems, and necessary staff education. This requirement is applicable for sites that include water harvesting (tanks, pumps, controllers, water quality systems), stormwater storage (collection, conveyance, filters/cartridges), drainage systems and structures, and vegetative roofs.



A bioretention planter used as separation between a playground and the street

Stone splash pad where stormwater enters planter

5.6 Site and Landscape

5.6.1 Site Planning and Design

A thriving environment is resilient. Preserving and enhancing natural features, such as the tree canopy, soils, topography, wildlife corridors, and drainageways, aid stormwater management and biodiversity and reduce impacts from heat and drought. Locating structures, utilities, and amenities to best support natural systems and human convenience maximizes community benefits for the site.

Priorities:

- Conduct a pre-design site analysis that includes views.
- Do not remove healthy native Heritage Trees 100 inches in circumference (31.8 inches DBH) or greater.
- Replace on-site or in a City-designated recipient location any healthy trees that are removed with a native tree with an expected mature size of equal or larger canopy spread. Replace at a rate of one tree for every tree less than 10 inches. DBH, and two trees for every tree 10 nches DBH or greater.
- Coordinate tree work with above- and below-ground utility locations. Provide broadband internet. Bury utilities and power lines. Provide electrical receptacles in public plazas, food truck locations, and festival sites for authorized use via lockable, weatherproof receptacles and light poles.
- Implement principles of CPTED, such as proper lighting and visibility, rather than relying on police presence.
- Provide broadband internet. Bury utilities and power lines. Provide electrical receptacles in public plazas, food truck locations, and festival sites for authorized use via lockable, weatherproof receptacles and light poles.
- Priority replacement locations are on-site or in the public right-of-way in a heat island community as identified by RVAgreen 2050.
- Screen utilities per Zoning Code with native landscaping

Recommendations:

- Do not remove healthy native trees above 14 inches DBH. If removed, replace healthy trees with a native tree with an expected mature size of equal or larger canopy spread. Replacement trees may be located on-site or in the public right-or-way in a heat island community.
- Protect healthy, non-invasive trees, including their CRZs.
- Protect existing communities of native vegetation.
- Transplant salvaged native plant material, potentially off-site.
- Plant trees to increase the tree canopy to 60% city-wide and to 30% in all neighborhoods. Prioritize tree planting at project sites in neighborhoods with less tree canopy.
- Avoid substantial changes to topography.
- Incorporate perimeter security features in the landscape to protect people, buildings, and important assets.
- Screen utilities.
- Design stormwater green infrastructure facilities with pedestrian amenities and intentional design features.
- Provide outdoor gathering spaces for eating, working, and playing.
- At canal-facing and riverfront sites, provide public amenities (such as walkways, a boat ramp, and picnic facilities).

5.6.2 Soils

Native flora and fauna rely on native soils. Keeping native soils on-site through planning, erosion, and sediment control, and site design protects an important natural resource.

Priorities:

- Conduct pre-design site analysis. Develop a soil management plan to protect, restore, and maintain the soil. Stockpile topsoil for reuse.
- Prevent erosion and sedimentation to protect existing soils and waterways.
- Do not use peat moss. Do not use topsoil harvested from agricultural lands. Imported topsoil shall be sustainably sourced, commercial topsoil.
- Provide trees with an adequate volume of planting soil.

Recommendations:

- Restore the top 12 inches, minimum, of soils that the project disturbs. Aerate compacted soils in planting areas. Add organics or other soil amendments as needed to improve water retention, fertility, and the soils' chemical characteristics.
- Provide structural or engineered soils to promote tree health and green infrastructure in paved areas.

5.6.3 Outdoor Water Use

A well-designed landscape with healthy soils and native plants should not require watering beyond the plants' establishment period under normal circumstances. Relying on treated or well water to maintain exterior plants is not a resilient practice. Planting design should anticipate issues related to increasing periods of drought and heat.

Priority:

- Reduce outdoor water use by 50%. Maximize on-site use of rainwater. Limit irrigation; if irrigation is used, install climate-based controllers.

Recommendations:

- Eliminate irrigation; design for drought tolerance.
- Install rainwater collection and reuse systems.
- Install a graywater system(s).
- If irrigation is provided, use solar power.
- Provide a clean water source at community gardens.
- Provide an on-site water source to reduce reliance on water trucks for the plants' establishment period.

5.6.4 Planting Design

Healthy planting design is a means to and goal of resilient landscapes. The preservation and enhancement of local plant communities can increase biodiversity, provide a green infrastructure function, supplement the tree canopy, and support native wildlife and waterway health. Planting design can reduce urban heat and water consumption and minimize building energy use. Community gardens and edible plants enhance access to a local healthy food system.

Priorities:

- Plant native plants for not less than 80% of total plants.
- Soil and mulch shall not cover the root flare or be mounded against woody stems.
- Provide a 10% minimum tree coverage of surface parking lots "in coordination with the Zoning Code.
- Limit areas of turf grass to passive and active recreation. Plant regionally appropriate turf grasses and regional native plants that can be reasonably expected to withstand periods of heat and drought as well as increasing temperatures and rain events due to climate change.
- Locate plants to allow for a perpetual 3-foot minimum width maintenance access into planted stormwater management facilities.
- Avoid conflicts with utilities, structures, and water features.
- In riparian areas, limit parking and increase plantings.
- Select plant material to comply with current requirements of the American Standard for Nursery Stock (ANSI Z60.1).

Recommendations:

- Install plants that require no irrigation or supplemental watering after the establishment period.
- Locate trees to shade buildings and shield them from winds. Locate fruiting trees and shrubs away from reflective windows and glazing to minimize bird strikes. Locate trees to provide shade over pavement. Avoid nuisance fruiting; however, do not exclude female trees, as pollen loads from male trees can contribute to air quality issues.
- Size narrow turf areas to the width of mowers. Coordinate with O&M personnel.
- Favor underused native plants to maximize biodiversity. Factor in lead times and commercial availability in necessary quantities and sizes. Refer to ***Landscape Materials***, for regional planting materials requirements.
- To avoid losses due to pathogens or insects, use a varied plant palette with a 10% maximum of any species, 20% of any genus, and 30% of any family, taking into consideration adjacent plantings.
- Plant native species for wildlife habitat and food, and nectar and larval hosts for pollinators. Provide plants with varying bloom times. Favor straight species with their original flower and fruit size and type for maximum wildlife benefit.
- Avoid planting container-grown or larger plants within the CRZ of healthy native trees to limit damage to roots and competition for nutrients and water. Mulch is preferred over mown lawn within 6 feet of tree trunks.
- Plant to create wildlife corridors and contiguous green spaces along buffers, greenways, streets, trails, and parks.
- Plant companion species to promote integrated pest management (IPM).
- Design for microclimates and increasing shade as trees grow.
- Install, establish, maintain, and warrant plantings under a separate contract due to the timing of planting seasons and long establishment and warranty periods.
- Provide composting facilities.

5.6.5 Site Furnishings, Lighting, and Signage

High-quality places provide beauty and inspiration along with function. Hardscape elements in the landscape can positively impact livability by minimizing visual clutter; increasing education and awareness; reducing landfill waste, energy use, and light pollution; and supporting local industry and craft.

Priorities:

- Convert lights to LED and/or install solar-powered lighting that is 3000k or warmer.
- Adhere to International Dark-Sky Association standards. Turn off lights when not needed, and only light areas that need it; use photocells, dimming and appropriate bulbs so light is no brighter than necessary; minimize blue light emissions; and eliminate upward-directed light by installing hooded light fixtures.
- Provide recycling and composting receptables wherever trash receptables are provided. Receptacles shall have a means of securing lids or shall have side openings to reduce stray litter from wind, animals, or people.
- For wood and recycled content requirements, refer to ***Landscape Materials***.

Recommendations:

- Provide informational signage explaining the history of a site or feature and its ecology, maintenance, or economic or environmental benefits.
- Use the branding and graphics for the Node where wayfinding signage is located. Refer to the *Richmond 300: A Guide for Growth* (City of Richmond, 2020) for more information on Nodes.
- Provide waste receptacles for the fishing line at public waterfront facilities.
- Integrate solar options for outdoor lighting where feasible.
- Provide for additional waste stream storage and recycling as appropriate on site, such as plastic bags, metals, electronics, etc.

Integrated site furnishings, lighting, and signage

5.6.6 Landscape Materials

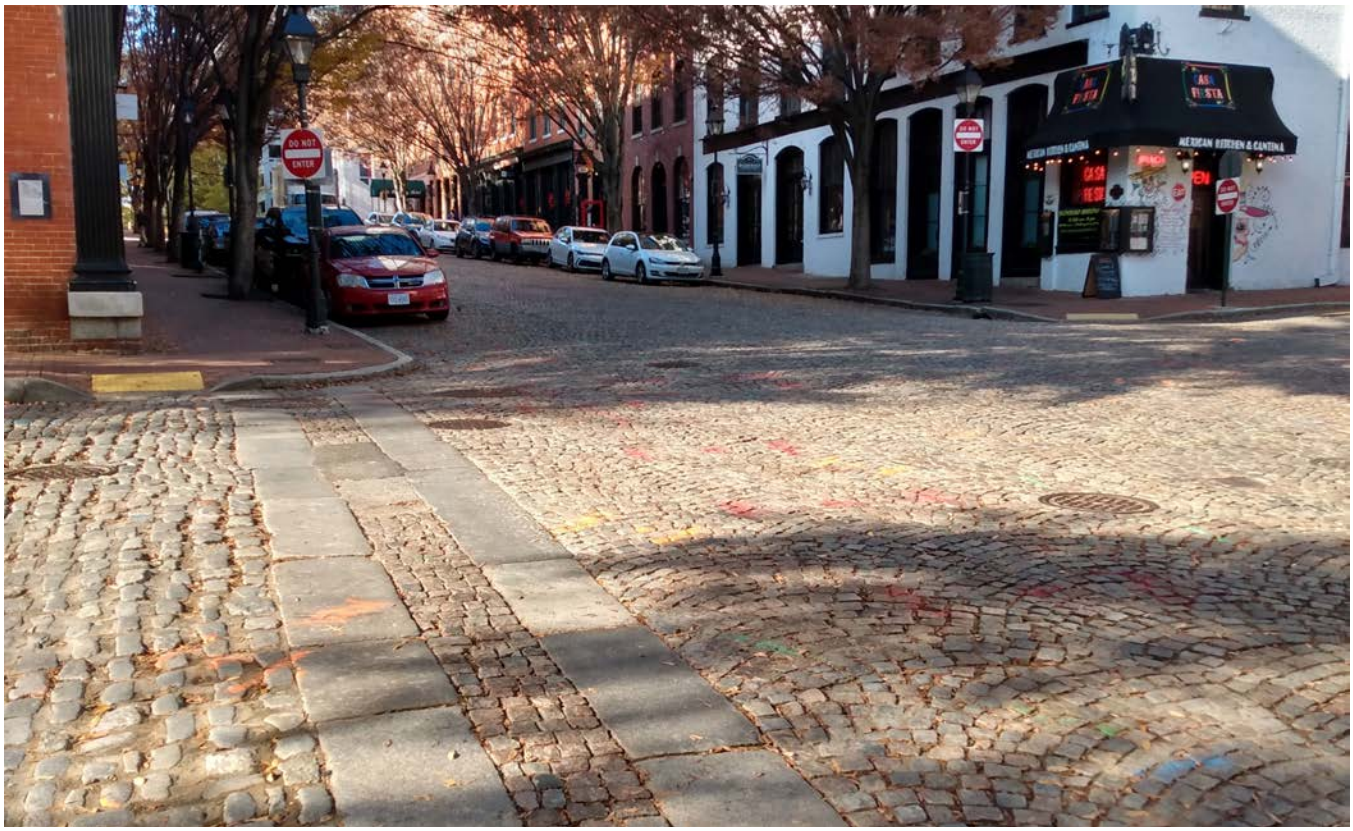
Local sustainability measures affect regional and remote resilience. The choice of materials affects the winter habitat of migratory birds, the water quality of local streams, regional pollution, the rate of consumption of natural resources, localized flooding, and flooding downstream. The choice of materials can preserve cultural and historic resources and can also grow the local economy.

Priorities:

- Use a minimum of 60% of planting materials and 40% of hardscape building materials or products based on cost that are regionally extracted, harvested, recovered, or manufactured within a 500-mile radius of the city of Richmond.
- Use recycled content materials. Site furnishings shall be fabricated of 50% or more recycled material.
- Wood products shall be Forest Stewardship Council (FSC) certified as harvested from sustainably managed forests of non-threatened species. Do not use wood on the "Red List."
- Erosion control fabric shall be biodegradable rather than photodegradable.

Recommendations:

- Maintain and restore historic paving.
- Reduce impervious surfaces. Install porous pavers.
- Design for disassembly.
- Avoid materials that contribute pollutants to stormwater, including galvanized railings and posts. Avoid treated lumber except where necessary.
- Practice sustainable consumption and building practices. Practice zero-waste behaviors in design and construction.



Historic paving materials

5.6.7 Operations and Maintenance

Sites that are designed for resilience but not maintained with sustainable methods lose resilience. Operations and maintenance activities directly affect resilience and the longevity and success of hardscape and planting design. The health, safety, and welfare of O&M personnel, the public, and natural resources are of paramount importance.

Priorities:

- Reuse or recycle construction and demolition materials.
- Do not mound mulch against woody stems or tree trunks.
- In riparian areas, establish a buffer zone banning pesticides and fertilizers.
- Provide maintenance access for all equipment and facilities.
- Remove invasive species.
- In natural areas, do not remove native plant species that are beneficial to pollinators and other wildlife or treat them as weeds.
- Mow turf grass areas only as necessary for safety and intended purpose.
- Time maintenance activities to prevent weeds from forming seedheads, but at the same time, avoid interfering with nesting grassland birds.

Recommendations:

- Salvage and reuse materials.
- Mow or bush hog native meadow areas only as necessary to prevent weeds and woodies. Maintain turf grass at a 3-inch height and mulch in place, except where grass trimmings would clog drainage systems. Along trails, limit mowing activities in general to a 3- to 6-foot-wide strip on each side except where it is necessary to maintain such things as sight lines, and signage.
- Provide leaf and brush dump areas for on-site composting and mulching, and for habitat.
- Restrict the use of chemical agents for plant growth and pest management (such as fertilizers, pesticides, herbicides, and insecticides). Implement mechanical, manual, organic, and IPM methods first.
- Provide the Owner with a maintenance plan or manual that includes short- and long-term actions, a timetable for inspection and monitoring activities, a list of required skills/knowledge and tasks, resources for pilot projects, information on native plants at various stages of growth, strategies for IPM and other methods to avoid the use of chemicals, eradication of invasives, and spot treatments.
- Engage green jobs training participants and community volunteers.

Maintain plants for year-round interest

5.6.8 Commissioning and Reporting

Resilient site designs should plan for monitoring and reporting to improve efficiency, longevity, and coordination. Data on deletions, additions, and improvements are essential for mapmaking, budgeting, and maintenance.

Priorities:

- Early in the project, develop a list of site-related systems for commissioning. Include measurement, performance verification, and staff education of complex site systems (drainage systems and structures, green roofs, lighting, water harvesting and storage, weather stations, and other systems).
- Report to Parks, Recreation, and Community Facilities (PRCF) if the project is within a 10-minute walk of a park.
- Report the quantity and species of trees removed and added to DPW's Urban Forestry Division for the Interactive Tree Map.

Trees and proximity of projects to parks are helpful inventory data

5.7 Architecture

Buildings that are designed with **architectural integrity** - combining both visual appeal and durable construction - contirbute significantly to long-term sustainability. Architectural integrity ensures that buildings are built not only to last physically but also to be appreciated, preserved, and adapted over time. This extends their lifespan, reduces the environmental and economic costs associated with demolition and reconstruction, and contributes to the city's sustainable development efforts. Thoughtful, enduring design is a powerful tool in creating a built environment that is ecologically responsible, economically viable, and culturally meaningful.

5.7.1 Wellness

The City of Richmond values the wellness of building occupants and encourages wellness to be considered during the design process.

Priorities:

- Complete a Fitwel certification checklist as part of the design process for interior spaces. This is applicable for all regularly occupied building spaces for new construction projects greater than 20,000 SF.
- Include lactation/wellness rooms with sinks, comfortable seating, dimmable lighting, lockable doors, refrigeration, and electric outlet access.
- Provide daylight in appropriate spaces through direct or indirect lighting from windows and skylights.
- To promote physical activity and waste reduction, all trash cans should be placed in a centralized location accompanied by recycling bins.
- To reduce waste and visual clutter, no desk phones should be provided. City issued cell phones should be used instead.

Recommendations:

- Include entryway systems (10 feet in length or greater) at main entrances.
- Provide sit-to-stand desks for a variety of desk working positions.
- For projects that have a second story, design stairs that occur before elevator access. Include stimulants in the stairwells such as music, lighting, art, views to engage occupants and encourage stair usage. When appropriate, design open monumental stairs to encourage stair use. Place signage at elevators encouraging the use of stairs.
- Integrate natural vegetation within and on the structure through green living walls, vertical gardens, and green roofs.
- Provide free filtered water.
- Provide noise-reduction glazing next to busy roadways, airports, and noise-generating facilities.
- Provide art by City of Richmond natives or current residents that is integrated within the architecture or defined locations that are designed to showcase changeable pieces.

5.7.2 Environmental, Social and Governance

Design for all includes designing for all people regardless of the group or disability. All projects shall consider environmental, social and governance issues during the design process.

Priorities:

- Provide full accessibility to accommodate those with low or no vision, hearing impairment, and mobility challenges, including people who use wheelchairs, scooters, and strollers. A minimum of one gender neutral/family restroom shall be provided per floor.
- Provide a baby changing station in public access family restrooms or in both men's and women's restrooms.

Recommendations:

- For buildings providing community services, consider restrooms accessible from the exterior of the facility to allow those in need access to clean restrooms with dignity.
- Provide a baby changing station in staff-only accessible restrooms or in both men's and women's restrooms.
- Provide multilingual signs where the community served is bilingual.
- Provide wayfinding signage that can be understood quickly. Consider pictograms as well as text.
- For smaller facilities requiring only single occupant restrooms, consider not providing urinals to allow flexibility of use by all genders.
- Where space is limited in renovation projects, water closets in lieu of urinals may be used.

Pictograms provide easy wayfinding

5.7.3 Material Selection

The materials selected during design and construction can play a significant role in the resilience, durability, and sustainability of the project.

Priorities:

- Select sustainably sourced materials with the highest durability and resilience allowed by the project budget.
- Design and select roofing materials and colors to minimize the heat island effect and improve energy efficiency.
- Divert 75% construction waste from landfills to recycling facilities.
- Use only low and no Volatile Organic Compound (VOC) materials inside the building envelope. Use only low and no VOC materials for building perimeter/exterior surfaces for buildings of increased sensitivity, such as schools and other facilities serving children, and healthcare facilities.
- Consider bird-safe building design, incorporate brid-safe screenings and other deterents, and provide bird safe glass when these elements are not viable, as well as at high vulnerability sites such as adjacent to or within natural landscapes.
- Do not use any materials derived from the Red List.

Recommendations:

- Consider locally manufactured materials produced within 100 miles for the greatest impact on regional economies.
- Avoid materials that contribute pollutants to stormwater, including copper and zinc cladding, galvanized posts, and treated lumber.
- Use materials with recycled content. Add recycled content to concrete admixes and steel.
- Consider manufactured materials from Richmond-based Disadvantaged Business Enterprises (DBEs) and Emerging Small Businesses (ESBs).

5.7.4 Flood Proofing/Resilience

Projects in flood-prone locations shall be designed to be protected from flooding through wet or dry flood-proofing methods

Priorities:

- Locate equipment required for emergency usage a minimum of 24 inches above base flood elevation.
- In areas that are likely to flood, use covered parking with minimal finishes or finishes that can withstand the effects of flooding.
- Dry flood-proof building entrances and windows that are susceptible to floodwaters.

Recommendations:

- Elevations of first floors and mechanical equipment should be at least 1 foot above the base flood elevation for projects located within the floodplain. Consider higher freeboard of up to 3 feet for critical facilities.
- Place costly equipment on higher levels above the base flood elevation.

5.7.5 Massing

Engage the streetscape through selective massing of street elements. Maintain pedestrian scale on the street level and entry. Massing shall integrate with and respect historic and neighborhood settings. On the ground level, provide active uses related to the surrounding context.

Priorities:

- Avoid monolithic blank walls facing public ways. Incorporate windows, change of materials, change of planes, and/or other architectural design strategies to mitigate large, single mass expanses.
- Avoid garage and delivery entrances on main streets.
- Design and orient building massing to increase airflow and to reduce and optimize energy use.
- Modulate massing to complement the context by adding visual interest and spatial experience.
- Design and orient building massing to increase access to natural light.
- Provide sheltered entries.

Engaging streetscape with covered entry - Children's Museum of Richmond

5.7.6 Emergency Shelters

Consider building emergency shelter requirements into neighborhood projects to provide emergency shelters as safe havens for City of Richmond residents during and after weather-related or human-caused crises.

Recommendations:

- Provide emergency shelters in appropriate projects, such as school, library, and community center projects, to provide safe havens for local and neighboring residents.
- Provide access to a kitchen and restrooms with showers in or adjacent to the shelter space.

5.7.7 Repurposing Existing Structures

Repurposing existing structures capitalizes on the embodied carbon already stored in the existing building stock in Richmond. Reusing existing structures also maintains existing neighborhood character and City history. Building reuse and repurposing should always be a priority.

Priorities:

- Maintain culturally, historically, and architecturally significant buildings, sites, structures, neighborhoods, cemeteries, and landscapes that contribute to the City of Richmond's authenticity. Refer to *Richmond 300: A Guide for Growth* (City of Richmond, 2020) and *Old & Historic Districts of Richmond, Virginia* (City of Richmond, 2017).
- Culturally, historically, and architecturally significant buildings, sites, structures, cemeteries, and landscapes that are listed or qualify for listing in the National Park Service National Register of Historic Places shall follow *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring and Reconstructing Historic Buildings* (NPS, 2017). Refer also to the Virginia Department of Historic Resources.
- Evaluate existing structures and buildings to determine their suitability for reuse or repurposed use, including outdoor and public spaces such as creating appropriately sized space for nonpermenate fixtures (i.e., tables and chairs)..

5.7.8 Design for Adaptability

Over time, occupant groups expand, contract, and reorganize, and new groups move into existing spaces. Accommodating these changes requires initial planning strategies that can mitigate lost time and cost impacts.

Recommendations:

- Use a common core of conference rooms, break rooms, copy rooms, lactation/wellness rooms, and similar functions to be shared by multiple departments to minimize footprint and maximize utilization.
- Plan the common core such that the rooms may remain reasonably intact when adjacent offices and workstations need to be redesigned and reconstructed.
- Design the exterior window placement to allow a variety of interior space divisions.

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Appendix A:
List of Material Specifications

Best sustainable practice | Energy savings | Durability and longevity, lower maintenance | Reducing carbon

Division 1 – General Requirements
Substitutions must adhere to sustainability standards
Include O&M personnel in review of mockups.
Reuse or recycle construction and demolition materials.
At a minimum, achieve the LEED Silver including LEED prerequisites, and other LEED credits mandated by the City of Richmond.
Division 2 – Existing Conditions
Salvage and return to manufacturer's take-back programs carpet, acoustical ceiling tile, and systems furniture indicated to be demolished.
Division 3 - Concrete
Specify 40% fly ash or other recycled replacement content as supplemental cementitious material in cement admixes. Fly ash shall not be generated from municipal waste incinerators. Fly ash from coal fired power plant wastes shall not have mercury greater than 5.5 parts per billion.
Specify recycled concrete as aggregate.
Division 4 - Masonry
Specify ultra-low carbon concrete masonry units (CMU) (reducing cement content and increasing sequestration)
Specify take-back of unused construction materials and packaging for masonry units. Reclaimed materials shall not be deposited in landfill or incinerated
Division 5 - Metals
Steel manufactured by the basic oxygen furnace (BOF) process shall contain 25-30 percent total recovered materials.
Steel manufactured by the electric arc furnace (EAF) process shall contain a total of 100 percent recovered steel.
Division 6 - Wood, Plastics, and Composites
All wood products to be certified by the Forest Stewardship Council.
Do not use wood from species on the Red List.
Do not use tropical wood.
Where required by location, wood products shall be treated with waterborne wood preservatives listed in Section 4 of AWPA Standards U1, excluding those which contain arsenic and/or chromium.
Lumber fabricated from old growth timber is not permitted
Engineered wood products shall not contain added urea formaldehyde.

Best sustainable practice | Energy savings | Durability and longevity, lower maintenance | Reducing carbon

	Sheathing shall contain biobased material: a. Provide a minimum of 55% biobased content in engineered interior panels products designed specifically for interior applications and providing a surface that is impact-, scratch-, and wear resistant and that does not absorb or retain moisture. b. Provide a minimum of 89% biobased content in engineered products designed for use in interior panel structural construction applications, including cabinetry, casework, paneling, and decorative panels. c. Provide a minimum of 94% biobased content in engineered wall panel products designed for use in structural walls, curtain walls, floors and flat roofs in commercial buildings.
	Exterior dimensional lumber used for wood fascia, trim, trellis, fence, lattice and miscellaneous millwork shall be of rot resistant species
	Specify take-back of unused construction materials and packaging for plastic lumber. Reclaimed materials shall not be deposited in landfill or incinerated.
Division 7 – Thermal and Moisture Protection	
	Spray foam insulation must not use hydrofluorocarbons (HFCs) for blowing agent.
	Do not use asphalt or glass fiber shingle roofing.
	Sealants containing aromatic solvents, fibrous talc, formaldehyde, halogenated solvents, mercury, lead, cadmium, chromium and their compounds, are not permitted.
	Specify take-back of unused construction materials and packaging for membrane roofing components, and paints. Reclaimed materials shall not be deposited in landfill or incinerated.
Division 8 - Openings	
	Limit use of aluminum windows and curtain walls to buildings greater than two stories.
	Do not use anodized aluminum for exterior windows, storefronts, and curtain wall (lasts 10-20 years vs 30 yrs for fluoropolymer (Kynar).
	Wood windows to be Energy Star Rated
	Use Low E Glazing
	Do not use single pane exterior glazing
	Provide glazed windows rated for not less than 30 Sound Transmission Class (STC)
	Do not use cylindrical lockset (use mortise locksets)
	All hardware to be BHMA Grade 1 rated for commercial use
	Do not use hollow core doors
	Pre-mixed joint treatment compounds shall be free of antifreeze, vinyl adhesives, preservatives, biocides and other slow releasing compounds

Best sustainable practice | Energy savings | Durability and longevity, lower maintenance | Reducing carbon

Division 9 - Finishes
Specify take-back of unused construction materials and packaging for carpet and paints. Reclaimed materials shall not be deposited in landfill or incinerated.
Specify carpet and acoustical ceiling panels with manufacturer's take-back programs at end of the material's life cycle.
Specify carpet tile rather than broadloom
Vinyl flooring products must be no-wax type
Use engineered wood flooring rather than traditional full depth wood flooring
Use only low and no VOC materials.
Prepared grouts shall be cement based, petroleum-free and plastic-free.
Provide acoustical panels with coating or panel based anti-microbial treatment to inhibit growth of mold and mildew.
Flame retardant additives shall be free of pentabromodiphenyl ether (pentaBDE).
Polyethylene wallcovering shall be vinyl–free, chlorine–free, plasticizer-free.
Division 10 - Specialties
Do not use powder coated steel toilet partitions
Do not use paper towels in restrooms (use air dryers) (Then please add a way to open the door without using your hands.)
Division 11 - Equipment
All residential appliances to be Energy Star Rated or equivalent (washers/ dishwashers/ refrigerators)
Division 12 - Furnishings
Specify workstations with manufacturer's take-back programs at end of the material's life cycle.
Provide business and institutional furniture compliant with (Business and Institutional Furniture Manufacturers Association) BIFMA e3 level 2
Division 14 – Conveying Equipment
Provide minimum 44% biobased content hydraulic fluids formulated for use in stationary hydraulic equipment systems that have various mechanical parts, such as cylinders, pumps, valves, pistons, and gears, that are used for the transmission of power and also for lubrication and/or wear, rust, and oxidation protection.
Provide energy efficient motors for elevators and lifts as demonstrated under FEMPMotorMaster.

Best sustainable practice | Energy savings | Durability and longevity, lower maintenance | Reducing carbon

Division 22 – Plumbing
All fuel fired domestic water heaters shall be at least 90% efficient.
Sensor operated flush valves shall be hardwired.
Sensor operated faucets shall be hardwired.
Division 23 – Heating, Ventilating, and Air Conditioning
All heating hot water boilers shall be at least 90% efficient.
All motors shall be direct drive, electronically commutated (EC) / variable-frequency type.
For DX systems, design shall not include any refrigerants to be phased-out in the next 5 years.
Recommend non-metallic piping installation (e.g. polypropylene) for building systems to increase piping longevity and reduce carbon footprint of system.
For existing building renovations, any existing piping of lead construction shall be demolished. New piping must be provided as replacement if system is to remain.
Division 26 - Electrical
All exterior lights to be LED and/or solar. Metal-halide, high-pressure sodium, fluorescent, halogen, incandescent, and other bulbs are not to be used. Adhere to International Dark-Sky Association standards.
Division 31 – Earthwork
Do not remove Heritage Trees 100 inches in circumference or greater. Replace healthy trees with a native tree.
Division 32 – Exterior Improvements
If irrigation is used, install climate-based irrigation controllers.
Plant regionally appropriate turf grasses. Use regional native plants for not less than 80 percent of total plants. A minimum of 60 percent of planting materials based on cost must be from within a 500- mile radius of the City of Richmond.
A minimum of 40 percent of hardscape materials based on cost must be from within a 500- mile radius of the City of Richmond.
Site furnishings must be fabricated of 50 percent or more recycled materials.
Erosion control fabric must be bio-degradable rather than photo-degradable.
Do not use peat moss.
Imported topsoil must be sustainably sourced, commercial topsoil. Do not use topsoil harvested from agricultural lands.