

01 05 10.01 Roofscape Design Guide

Part 1 - General

A. Purpose

1. Roofscapes are a component of the full building design reviewed by the Project Design Review Board (PDRB). This guide seeks to ensure that roofscapes and related architectural elements are nicely designed, well thought out and appropriate to the context. It seeks to minimize rooftop clutter by merging infrastructure, programmatic needs and safety with good design. Finally, it seeks to ensure that water, snow and ice are managed to minimize negative impact to the building and its immediate surroundings.
 - a. Building rooftops/roofscapes are as essential to successful building design as the landscape, massing/geometry, exterior wall and window materials and special architectural features that we typically think of when we experience attractive buildings and campuses.
 - b. Building rooftops are often visible from long distances such as from highly used pedestrian and vehicular corridors, or from the interior of adjacent buildings and public spaces. For at least 6 months of the year when deciduous trees do not have any foliage, rooftops are often fully exposed to view.
 - c. Building rooftops can be desirable locations to accommodate the infrastructure necessary for successful operation of the building and/or the campus, either as part of initial construction or subsequent renovations. Examples of the infrastructure include cellular antennae, satellite dishes, HVAC equipment, safety railings including stairs and ladders, and research equipment.
 - d. Building rooftops can also be desirable programmatic opportunities either as public spaces for occupancy or for research. Examples include rooftop terraces, observatories, special research projects.

B. Application

1. This guide applies to all new construction, renovations, maintenance/repair and equipment replacement projects that have potential impact to the roof.

C. Definitions

1. Equipment - examples include generators, transformers, air handlers, cooling towers and condensers.
2. Maintenance/repairs - replacement of materials, systems and equipment.
3. New construction - new buildings or additions to existing buildings.
4. Renovations - reconfiguration of existing spaces and systems, including new equipment.
5. University Architect (UA) – The University Architect as belonging to OPP’s Planning Design and Properties unit, or a member of the UA’s staff.

D. Related Requirements: this guide endeavors to avoid duplication of content covered more thoroughly by other related standards. Links to some are below.

1. Office of Physical Plant (OPP) Design and Construction Standards:
<https://wikispaces.psu.edu/display/OPPDCS/Design+and+Construction+Standards>
 - a. 01 05 00 General Project Requirements: Includes 01 05 01 Site Requirements and 01 05 05.01 Planning for Engineered Building Systems.
 - b. 01 35 20 .02 Roof Fall Protection and Prevention: Includes but is not limited to fall protection is applicability, parapets at flat roofs for new construction, location of new rooftop equipment, and roof access.

01 05 10.01 Roofscape Design Guide

- c. 01 81 13 .03 LEED Certification Requirements: Includes investigation of solar feasibility.
- d. Division 7 - Moisture Protection
2. PSU Environmental Health and Safety: <https://ehs.psu.edu/>
3. Zoning
 - a. The University Planned District (UPD) is designed to promote the careful planning and orderly development of the University campus, consistent with the community development goals adjacent municipalities. The campus is divided into UPD subdistricts and has individual standards and requirements for each subdistrict in the areas of:
 - Maximum permitted density, based upon the FAR specified for the subdistrict.
 - Maximum impervious coverage.
 - Maximum building height.
 - Perimeter setback, where the subdistrict includes a district boundary.
 - Landscaping and buffering within the perimeter setback.
 - Open space requirements for the subdistrict.
 - Permitted uses.
 - b. While some requirements are district-wide and not imposed on individual development projects, there are site-specific standards and requirements that need to be adhered to such as building height, building setbacks, rooftop mechanical equipment/penthouses design and sound attenuation barriers. Project should consult university planner for definitions and applicability of the UPD.
 - c. Links:
 - State College Borough: <https://ecode360.com/32909719>
 - College Township: <https://www.ecode360.com/CO1052>
 - Patton Township: <https://ecode360.com/PA1476>
 - Ferguson Township did not adopt the UPD so University projects will need to reference the Ferguson Township Zoning Map and Ordinance:
 - 1) https://www.twp.ferguson.pa.us/sites/g/files/vyhli576/f/uploads/2019_zoning_map_with_sourcewater.pdf
 - 2) https://www.twp.ferguson.pa.us/sites/g/files/vyhli576/f/news/2019_11_18_ch27zoning_fergusontownship_jlw.pdf

Part 2 - Execution

A. Design

1. Preparation

- a. Design decisions (massing, materials, colors, access, equipment locations etc.) for roofscape and related architectural elements shall be in consultation with the University Architect.
- b. For new construction, schedule periodic design and construction meetings with the University Architect specifically to address the roofscape. Items to discuss include identification of significant building view corridors and associated design response, use of roof tops to meet programmatic needs, proposed roof top equipment, roof access (including canopies) and proposed changes to the rooftop during construction.

01 05 10.01 Roofscape Design Guide

- c. For renovations, maintenance and repairs, discuss the potential or known impact of work to the roofscape and exterior envelope with the University Architect at project inception and account for the associated architectural response in the project budget. Examples of impacts to the roofscape (and envelope) include but are not limited to: new or replaced equipment that could become visible (HVAC units, louvers etc); new equipment access stairs and ladders (and associated railings) that could become visible; addition of fall protection measures (railings or lifelines) required by the planned work (such as is required for roof replacement work), modifications to the drainage system that could affect the building envelope or its surroundings and potential for interior space to be affected by the work.
 - d. Schedule initial meeting with the University Architect as early as possible specifically to discuss the potential for the project to have a visual impact on the roofscape and resulting cost implications.
 - 1) Consider relocation of equipment to interior locations or to be serviceable from the interior. Refer to PSU Standard 010505.01 Planning for Engineered Building Systems and consult with Space Planning & Management for use of interior spaces. Depending on project scope, doing so may eliminate the trigger for related fall protection as well as the associated visual impact.
 - 2) System renewal projects, where no architect is involved, need to consult with University Architect early to confirm no architect is needed on the project.
 - e. Review Design and Construction Standard 01 35 20 .02 Roof Fall Protection and Prevention for additional requirements related to roof access, parapets.
2. General Requirements
- a. Equipment location: To the greatest extent possible, mechanical equipment shall be located indoors to maximize useful service life, for safety and ease of maintenance staff, particularly during adverse weather conditions.
 - 1) Exceptions: Renovations to existing facilities in which it is otherwise not practical or feasible to provide adequate indoor mechanical space.
 - 2) Location in order of preference subject to project specifics:
 - a) Within the building – mechanical rooms, basements and penthouses are typical locations.
 - b) At grade: Discreet locations on sites that can accommodate it. Concealment required by PSU Standard 010501.02. Location should consider negative impact of noise.
 - c) Rooftop: Semi-enclosed behind screen walls or other rooftop location where equipment would not be visible.
 - 3) Some equipment that cannot be concealed, such as exhaust stacks, strobic fans and observatories, shall be strategically incorporated into the design of the roofscape and building as a whole, in coordination with program, equipment performance, maintenance and safety needs.
 - c. Green roofs: Roofs that incorporate plantings are considered servicable. Justification will be based on comparison of benefits to risks and cost of

01 05 10.01 Roofscape Design Guide

ownership. Coordinate maintenance and access requirements with fall protection standards.

- d. Materials shall be appropriate to context of building and surroundings and easily maintained. No field painting is preferred. Identify warranty on factory-painted components.
- e. Occupied roofs: Portions of roofs can be considered for occupancy provided there is programming justification. Building code requirements, including but not limited to access, egress and life safety, are the same as for stories. Occupied roofs should be posted for maximum number of occupants.
- f. Penthouses shall be incorporated into the design of the building and sized to accommodate all anticipated rooftop equipment. Consideration shall be given to massing, materials, rooftop access and future equipment. Penthouses should be clad in a material that is comparable to the building to which it belongs.
- g. Roof access: Preference is to provide access to roofs from the interior of the building. Exterior roof ladders are not permitted for new construction. Coordinate interior locations with Space Planning & Management.
 - 1) Small roofs and changes in roof elevation over 19 inches. Review with University Architect before incorporating into the design since these items require roof access via step-over platforms, railings and ladders.
- h. Water Management: Horizontal and low slope architectural elements and sloped roofs can be effective and attractive roofscape or building façade elements, but require different considerations for water management versus low slope roofs with traditional internal roof drains. For the purposes of this guide, sloped roofs are 4:12 or greater. Consider the following:
 - 1) Drainage from horizontal elements and sloped roofs shall be carefully evaluated to consider safe access, effective management of water, snow and ice, and the appearance and maintenance of the drainage/capture system, landscape and walkways.
 - a) External gutters (gutters that are located at the drip edge), when approved, shall be easily accessible for maintenance from the ground via a lift or from the roof. Gutters and leaders shall withstand the damaging effects of snow and ice. Water exiting the leaders should be coordinated with storm water infrastructure, landscape plantings and walking paths.
 - b) Internal gutters (gutters integral to the roof and set in from the drip edge and fed to an interior stormwater system) shall be easily accessible for maintenance from the ground via a lift or from the roof.
 - c) Shedding water directly to a surface below the roof edge, when approved, should be coordinated with storm water infrastructure, landscape plantings and walking paths. When shedding onto another roof, consider impact from snow and ice, as well as sound attenuation for spaces below. Water shall be prevented from splashing onto wall surfaces and walkways.
 - d) Ice and snow management. Avoid new sloped roofs adjacent to walkways and other paved surfaces and avoid locating walkways or other paved surfaces near the driplines of sloped roofs. Provide a

01 05 10.01 Roofscape Design Guide

- purposely designed snow guard system specific to the roof type to impede sliding snow as well as thin layers of ice.
- e) To the greatest extent possible, the consumption of energy for snow melt cables and heat trace is to be avoided.
- 2) Avoid any equipment in the field of the roof, including a configuration that blocks access to adjacent roof areas or equipment.
 - 3) Careful consideration should be given to including anchor points due to visual concerns, even at discreet locations, since anchor points require annual inspection and temporary fall protection measures may be able to be utilized.
 - i. Solar installations: Review the feasibility of readiness for solar installations on the roof, including visual impact and infrastructure. Depending on the configuration of the roof, structural design shall accommodate future solar panel installation.
3. Miscellaneous Roof Elements:
- a. Canopies: Water management is preferred with drainage to interior storm water system. Avoid visible fall protection anchor points.
 - b. Copings shall have continuous flashing beneath to mitigate moisture at coping seams.
 - c. Cornices, horizontal shading devices and shelves shall be designed to prevent shedding of rain and melting snow toward the exterior. Preference is for safe access from the roof. Alternatively, consider providing safe access from the ground via lifts.
 - d. Guardrails
 - 1) Should not be visible or have a visual impact on the roofscape of existing buildings. Consider angled designs as a means of achieving this requirement.
 - 2) When having no visual impact is unavoidable, guardrails should be designed to have minimal visual impact. Examples include guardrails constructed primarily of aluminum angles and flat bar stock. Utilitarian guardrails, such as two-pipe guardrails, are not a preferred means of meeting this requirement. *Review with University Architect before proceeding with this option.*
 - e. Parapets: As a typical condition, guardrail-height parapets at flat roofs are preferred, including penthouse roofs. Consult with the University Architect for special architectural conditions that might warrant an exception to this requirement. Parapets, aside from the safety benefit, can serve to conceal proposed and future equipment installations as well as roof access elements.
 - f. Roof Drain locations should be determined based on the best performance of the roof drainage system and at least 15 feet from roof edges.
 - g. Screen Walls: Shall be coordinated with the architecture of the building. Screen wall locations should not inhibit access to adjacent roof areas. Review materials and opacity with the University Architect.



Figure 1 - Guardrail angled inward

01 05 10.01 Roofscape Design Guide

B. Deliverables

1. New Construction (new buildings and additions):
 - a. Renderings: Renderings presented to PSU leadership (Trustees, VPs, Directors etc) shall include a reasonable depiction of the roofscape and associated equipment.
 - b. Provide massing diagrams simulating views from prominent locations such as streets and walkways, including elevated locations as applicable. As the design develops, so should the detail of the diagrams to show expected roof components. Purpose is to visually demonstrate to the Owner what to realistically expect.
2. Renovations, Maintenance and Repairs (new and replacement equipment):
 - a. After consultation, the University Architect may request photo simulations of actual conditions indicating proposed roof top profile and/or new equipment. These can be sketch overlays or mark-ups of photographs. Additionally, in-person site visits may adequately convey intent.
3. This guide shall serve as agenda for meetings to discuss the roofscape and as an informal checklist for review at completion of each design phase.

End of Document