

Norfolk's Resilience Quotient: More Detail

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Resilience Quotient: More Details

- Applicability: Requirements apply to all development, unless exempted. Exemptions include:
 - Development/redevelopment that achieves LEED gold status or equivalent
 - Renovation/rehab of buildings built before Ordinance adoption if renovation cost is less than 50% of appraised value prior to renovation
 - Expansion of building built before Ordinance adoption if expansion is less than 50% of gross floor area or building
 - Certain historic or architecturally significant buildings

Resilience Quotient: More Details

- Procedure. For all developments except single-family there are two options:
 - Site plan review and additional requirements addressing flooding/risk; or
 - The Resilience Quotient points system
- General site plan standards relevant to resiliency requires:
 - Reducing flood risk
 - Managing storm water
 - Promoting energy resilience and alternative energy
 - Conserving water resources and protect water quality
 - Supporting multiple modes of mobility (including walkability/bikeability)
 - Developing in a way that promotes healthy and safe environments
 - Providing inclusionary dwelling units within mixed-income residential or mixed-use developments

Resilience Quotient: More Details

- **Single-Family.** (up to two units) –must go through site plan or comply with the following:
 - **Risk reduction-** lowest habitable floor and significant electrical and mechanical equipment elevated min. 16 inches above highest adjacent grade, unless greater elevation required by FPCH-O
 - **Storm water management-** 100% of roof drainage intercepted and detained on-site within system providing min. of 200 gallons of total storage capacity
 - **Energy resilience** – Electrical systems designed with pre-installed wiring and connections to allow use of generator during electrical outages and/or connection of solar, wind, or other locally generated electricity

Resilience Quotient: More Details

- **Multiple Dwelling Development** (three single-family units or more, other residential units, and residential part of mixed-use)
 - Option 1:
 - Site plan review (comply)
 - Elevate lowest habitable floor and significant electric/mechanical equipment min. 6 inches above highest adjacent grade (unless FPCH-O requires more)
 - Capture 100% of on site-drainage from impervious surfaces, with sufficient storage to keep first 1.25 inches of rainwater from individual event on site, unless regional storm water system available to accept discharge
 - Option 2: comply with resilience point system (and site plan). Total points and points for each component based on size of the development:
 - 1-5 units: 4 points, and min. 1 point from each component
 - 6-29 units: 5 points, and min. of 1.5 points from each component
 - 30-89 units: 6 points, and min. of 2 points per component
 - 90-199 units: 8 points total, min. 2 points per component
 - 200 or more units: 10 points, and min. of 2 points per component

- **Multiple Dwelling Unit Point System (cont.)**

TABLE 5.12.6: RESILIENT POINT SYSTEM FOR RESIDENTIAL DEVELOPMENT	
Resilient Development Activity	Points Earned
Component 1: Risk Reduction	
Construct building to meet 110-mile wind load design requirements of the VUSBC	2.00
Elevate the ground story finished floor and all significant electrical and mechanical equipment no less than 3 feet above highest adjacent grade	1.00, plus 0.50 per ft. above 3 ft.
Construct an impact-resistant (hail, tree damage) roof	0.50
Install impact (hurricane or wind) resistant windows	0.50
Install operable storm shutters	0.50
Establish operating procedures for how the project will handle loss of off-site or grid power, transition to a backup source of power, and transition back to normal operation	0.50

TABLE 5.12.6: RESILIENT POINT SYSTEM FOR RESIDENTIAL DEVELOPMENT	
Resilient Development Activity	Points Earned
Component 2: Stormwater Management	
Install a “green roof” on at least 50 percent of the total roof area (25 percent for renovated buildings) and only plant materials permitted in Section 5.2, Landscaping Standards	2.00
Install a “green roof” on at least 25 percent of the total roof area and only plant materials permitted in Section 5.2, Landscaping Standards	1.00
Provide rain gardens, street-side swales, soil and turf management or other appropriate storm water infiltration system(s) to capture and infiltrate a minimum of 25 percent of site-generated stormwater	1.00
Use pervious or grass paving systems on at least 50% of parking lot and driveway area in the development	1.00
Provide a fenced, centrally-located community garden space (which may be located as a rooftop garden) for residents and for urban gardening purposes at a ratio of 50 square feet per residential dwelling unit	1.00
Retain at least 20 percent of existing pre-development natural, non-exotic vegetation	0.75
Provide a percentage of open space greater than that required in Table 5.5.4(A), Required Open Space Set-Asides	0.50 per additional 5% preserved
For new tree plantings, enhance tree pits with specially engineered soils and native plants to absorb and filter runoff	0.25
Preserve large, non-exotic trees on site (large tree defined as 20 feet or greater in height and 24 inches or greater DBH)	0.10 per tree preserved

• Multiple Dwelling Unit Point System (cont.)

TABLE 5.12.6: RESILIENT POINT SYSTEM FOR RESIDENTIAL DEVELOPMENT	
Resilient Development Activity	Points Earned
Component 3: Energy Resilience	
Generate no less than 75% of the electricity expected to be used by the development from on-site solar and/or wind energy sources	3.00
Generate no less than 50% of the electricity expected to be used by the development from on-site solar and/or wind energy sources	2.00
Install a “cool roof” on at least 50 percent of the total roof area of the development	1.50
Generate no less than 25% of the electricity expected to be used by the development from on-site solar and/or wind energy sources	1.00
Generate no less than 25% of the electricity needed expected to be used by the development from on-site solar and/or wind energy sources	1.00
Generate no less than 25% of the electricity needed expected to be used by the development from on-site solar and/or wind energy sources	1.00
Install a geothermal energy heating & cooling system serving all residential units and common areas	1.00
Install a conditioned crawlspace under each primary structure	1.00
Install “green walls” on a minimum of 50 percent of the primary building’s walls	1.00
Adopt an energy efficient site lighting budget (based on the International Dark Sky Association’s designations for allowable lumens per square foot of specified use or type of hardscape)	1.00
Equip the project with at least one alternative, independent source of electricity supply so that the project is capable of fully operating if a primary source of power experiences interruption	1.00
Pre-wire all dwelling units to accept power provided by on-site solar panels and/or wind turbines	1.00
Install a 20+ SEER HVAC system in each dwelling unit	1.00
Re-use or repurpose an historic building that is listed on a national, state, or local register, or at least 75% (based on surface area) of existing historic structures	1.00

TABLE 5.12.6: RESILIENT POINT SYSTEM FOR RESIDENTIAL DEVELOPMENT	
Resilient Development Activity	Points Earned
Install a “cool roof” on at least 25 percent of the total roof area of the development	0.75
Install a 16-19 SEER HVAC system in each dwelling unit	0.50
Install multi-room mini-split heating and cooling systems in each dwelling unit	0.50
Install a solar or tank-less water heating system in each dwelling unit	0.50
Install no fewer than 2 operable windows on no fewer than two exterior walls in each dwelling unit	0.50
Install a generator for power generation to keep critical functions (refrigerator, freezer, basic lighting, healthcare appliances, etc.) working in the event of power failure	0.50
Provide shade, open-grid pervious pavement, or solar-reflective paving on 50% of total area of roads, sidewalks, and parking areas in the development	0.50
Provide electric vehicle (EV) level 3 charging stations, located in a parking structure or off-street parking lot, that are made available for use by residents	0.50 for every two stations
Plant vegetation so that 50% of the eastern and western building facades are shaded at noontime on the summer solstice within 10 years of planting	0.50
Use vegetation or vegetated structures to shade each dwelling’s HVAC unit	0.25
Automatically turn off all outdoor signage and lighting between the hours of 10:00 p.m. and 7:00 a.m. except for security lighting	0.25
Provide a minimum of five percent of required automobile parking spaces that are signed and reserved for hybrid/electric/low energy vehicles in preferred locations near primary building entrances	0.25
Provide electric vehicle (EV) level 2 charging stations, located in a parking structure or off-street parking lot, that are made available for use by residents	0.25 for every two stations
Re-use or repurpose an existing non-historic building, or at least 75% (based on surface area) of existing structures	0.25
Install highly-reflective blinds/shades to reduce solar gain	0.25

Resilience Quotient Example



The Tern Conceptual Master Plan

Norfolk, Virginia
May 2, 2018

SITE DATA:

Total Site Area: **+/-7.2 a.c.**
Proposed Zoning: **PD**

Units Provided: 96 Units

4 Story Townhomes (20'x47'): 22 Units

3 Story Townhomes (21'x34'): 49 Units

Carriage Homes (26'x26'): 25 Units



Points Breakdown

Total Project (96 townhomes, 30,000 sf retail)	8.0 points
Component 1	3.0
Construct to 110-mile wind	2.0
Elevate the ground story first floor elevation	1.0
Component 2	3.0
Treat 25% of site generated runoff	1.0
Treat an additional 25% of site generated runoff	1.0
Provide fenced community space	1.0
Component 3	2.0
Equip each unit with a generator hookup	1.0
Provide 2 operable windows on 2 exterior walls	0.5
Re-use existing non-historic retail building	0.25
Install tankless water heating system (in 1/2 units)	0.25 (1/2)

Resilience Quotient: More Details

- **Non-residential Development** (non-residential and non-residential part of mixed-use)
 - **Option 1:**
 - Site plan review (comply)
 - Ensure lowest habitable floor and significant electric/mechanical equipment elevated 8 inches above highest adjacent grade, unless FPCH-O requires greater elevation
 - 100% on-site drainage from impervious surfaces captured/retained on site (with sufficient storage for first 1.25 inches of rainwater from individual event on site, unless regional storm water system available to accept discharge)
 - **Option 2:** comply with resilience point system (and comply with site plan). Total points and points in each component based on development size:
 - Less than 10,000 sf: 3 points, and min. 1 point from each component
 - 10,000-25,000 sf: 4 points, and min. of 1.5 points from each component
 - 25,000-50,000 sf: 6 points, and min. of 1.5 points per component
 - Above 50,000 sf: 10 points, and min. of 2 points per component

- Nonresidential Point System

TABLE 5.12.7: RESILIENT POINT SYSTEM FOR NON-RESIDENTIAL DEVELOPMENT	
Resilient Development Activity	Points Earned
Component 1: Risk Reduction	
Construct building to meet 110-mile wind load design requirements of the VUSBC	2.00
Equip the project with at least one alternative, independent source of electricity supply so that the project is fully capable of operating if a primary source of power experiences an interruption	1.50
If the project involves a critical facility that is intended to remain operational in the event of a flood, or whose function is critical for post-flood recovery, design the facility to be protected and operable at the water levels represented by a 0.2% annual chance (500-year) flood	1.00
Elevate the ground story finished floor and all significant electrical and mechanical equipment no less than 3 feet above highest adjacent grade or to an elevation of 11 (NAVD '88)	1.00, plus 0.50 per ft. above 3 ft.
Install a generator for power generation in the event of power failure sufficient to keep critical operations functional	0.50
Establish operating procedures for how the project will handle loss of off-site or grid power, transition to a backup source of power, and transition back to normal operation	0.50

TABLE 5.12.7: RESILIENT POINT SYSTEM FOR NON-RESIDENTIAL DEVELOPMENT	
Resilient Development Activity	Points Earned
Component 2: Stormwater Management	
Install a “green roof” on at least 50 percent of the total roof area (25 percent for renovated buildings) and only plant materials permitted in Section 5.2, Landscaping Standards	2.00
Install a “green roof” on at least 25 percent of the total roof area and only plant materials permitted in Section 5.2, Landscaping Standards	1.00
Provide rain gardens, street-side swales, turf and soil management or other appropriate storm water infiltration system(s) to capture and infiltrate a minimum of 25 percent of site generated stormwater	1.00
Use pervious pavement on at least 50% of parking lot and driveway area in development	1.00
Retain at least 20 percent of existing pre-development natural, non-exotic vegetation	0.75
Provide a percentage of open space greater than that required in Table 5.5.4.A: Required Open Space Set-Asides	0.50 per additional 5% preserved
For new tree plantings, enhance tree pits with specially engineered soils and native plants to absorb and filter runoff	0.25
Preserve large, non-exotic trees on site (large tree defined as 20 feet or greater in height and 24 inches or greater DBH)	0.10 per tree preserved

- Nonresidential Point System

TABLE 5.12.7: RESILIENT POINT SYSTEM FOR NON-RESIDENTIAL DEVELOPMENT	
Resilient Development Activity	Points Earned
Component 3: Energy Resilience	
Generate no less than 75% of the electricity expected to be used by the development from solar and/or wind energy sources	3.00
Generate no less than 50% of the electricity expected to be used by the development from solar and/or wind energy sources	2.00
Install a “cool roof” on at least 50 percent of the total roof area of the development	1.50
Generate no less than 25% of the electricity expected to be used by the development from solar and/or wind energy sources	1.00
Install a geothermal heating and cooling system serving all parts of the project	1.00
Install a conditioned crawlspace under each primary structure	1.00
Install “green walls” on a minimum of 50 percent of the primary building’s walls	1.00
Install 20+ SEER HVAC systems throughout the project	1.00
Re-use or repurpose an historic building that is listed on a national, state, or local register, or at least 75% (based on surface area) of existing historic structures	1.00
Preserve or provide trees on the site which will within 10 years growing time will provide tree canopy over no less than 50% of the total site	1.00
Install a “cool roof” on at least 25 percent of the total roof area of the development	0.75
Install 16-19 SEER HVAC systems throughout the project	0.50
Install mini-split heating and cooling systems throughout the project	0.50
Install solar or tank-less water heating systems throughout	0.50
Provide shade, open-grid pervious pavement, or solar-reflective paving on 50% of total area of roads, sidewalks, and parking areas in the development	0.50

TABLE 5.12.7: RESILIENT POINT SYSTEM FOR NON-RESIDENTIAL DEVELOPMENT	
Resilient Development Activity	Points Earned
Provide electric vehicle (EV) level 3 charging stations, located in a parking structure or off-street parking lot, that are made available for use by users of the project	0.50 for every two stations
Plant vegetation so that 50% of the eastern and western building facades are shaded at noontime on the summer solstice within 10 years of planting	0.50
Orient buildings within 20 percent of east-west axis for maximum solar exposure	0.50
Provide operable windows on at least 2 façades on each floor which provide flow-through ventilation	0.25
Use vegetation or vegetated structures to shade HVAC units	0.25
Automatically turn off all outdoor signage and lighting between the hours of 10:00 p.m. and 7:00 a.m. except for security lighting	0.25
Provide a minimum of five percent of required automobile parking spaces that are signed and reserved for carpools, hybrid, electric, and low energy vehicles in preferred locations near primary building entrances	0.25
Provide electric vehicle (EV) level 2 charging stations, located in a parking structure or off-street parking lot, that are made available for use by users of the project	0.25 for every two stations
Re-use or repurpose an existing non-historic building, or at least 75% (based on surface area) of existing structures	0.25
Install highly-reflective blinds/shades to reduce solar gain	0.25
Provide skylights in an amount necessary to ensure natural lighting is provided to at least 25 percent of the habitable rooms in the structure	0.25, plus



Resilience Quotient: More Details

- Zoning Administrator authorized to:
 - Approve minor deviations to compliance with resilience point system; or
 - Review proposed alternative Resilient Development Activities that achieve the same resilience goals to an equal or greater extent

Coastal Resilience Overlay (CRO)

- Areas subject to greater flood risk
- CRO district co-terminus with Floodplain/Coastal Hazard Overlay District
- Standards
 - Ground floor height:
 - Finished floor elevation for single-family/MF at least 3 ft. above highest grade, unless higher elevation required in FPCH-O
 - Electrical and mechanical systems elevated an additional one foot
 - Landscaping- required to consist exclusively of salt tolerant/native species
 - Open space – cannot be decreased and must consist of pervious surfaces capable of infiltrating storm water
 - Limitations on parking to reduce flooding and run-off

Coastal Resilience Overlay (CRO)

- Standards (cont.)

- Resilience Quotient -- increase in min. resilience requirements:
 - Multiple dwelling units -- additional 0.5 points for Component 1, Risk Reduction, and additional 0.5 points for Component 2, Storm water Management
 - Nonresidential development -- additional 0.5 points for Component 1, Risk Reduction, and additional 0.5 points for Component 2, Storm water Management

Upland Resilience Overlay (URO)

- Area of reduced risk of flooding
- Resilience Quotient Credits
 - Four points credited for any development right in CRO district extinguished by direct purchase or easement
 - Extinguishment -- reduction of one development unit or placing land in passive open space/conservation use, in perpetuity
 - Easement grants rights to City to make improvements to lot for water retention or flood protection
 - Land must be held by conservation organization, land trust, etc.



QUESTIONS COMMENTS