Attachment A: Measure Package Requirement Details

I. Envelope Package Requirement Details

Required Measure Installation

Projects must meet both measure installation requirements listed below.

1. Meet specified area weighted U-value target based on climate zone and building typology. The area weighted U-value is a whole building value. The target considers the U-value of all above grade exposed building envelope components such as roof, windows, exterior walls, and exposed floors (e.g. above a garage) to calculate a weighted, whole building value. The Envelope Workscope Tool will be used to confirm whether a project meets the target. The Applicant will determine the workscope to reach this target, e.g. add wall and/or roof insulation, install new windows, etc.

Building Location[1]	MF Building 1-3 Stories U-value	MF Building 4+ Stories U-value
Climate Zone 4 (A-C)	Target of ≤0.07	Target of ≤0.13
Climate Zone 5 (A-C)	Target of ≤0.06	Target of ≤0.10
Climate Zone 6 (A-B)	Target of ≤0.05	Target of ≤0.09

[1]Climate zones are based on the International Energy Conservation Code (IECC). Climate zone by NYS counties can be found in Appendix A

2. Provide code-compliant ventilation for each bathroom and kitchen OR demonstrate existing ventilation system is operational to the specifications indicated in the table below.

Existing Ventilation	Required Measure	Operational Test Out Specifications
Central Exhaust System	Clean and seal the ductwork to 5 CFM50/ register + 5 CFM50/floor leakage and provide adjustable constant airflow regulator (CAR) to provide code-compliant mechanical exhaust at each terminal.	• 25 CFM continuous ventilation for each kitchen. • 20 CFM continuous ventilation for each bathroom.
Unitized Exhaust System	• Provide code-compliant mechanical exhaust of 25 CFM continuous or 100 CFM intermittent ventilation for each kitchen. • Provide code-compliant 20 CFM continuous or 50 CFM intermittent ventilation for each bathroom.	• 25 CFM continuous or 100 CFM intermittent ventilation for each kitchen. • 20 CFM continuous or 50 CFM intermittent ventilation for each bathroom.
Naturally-ventilated Bathrooms and Kitchens	• If replacing windows, provide a unitized through-wall exhaust fan in each kitchen and bathroom to provide code-compliant mechanical ventilation. See the above “unitized exhaust system” row for CFM requirements. • If not replacing windows, no action required.	N/A

Operational Test Out Specifications

If the project chooses the operational test-out pathway for ventilation compliance, then cleaning and sealing of central systems is not required. Projects choosing this pathway must follow the below protocol.

1. Central systems – Testing must follow the latest version of the Residential Energy Services Network (RESNET) sampling protocols and must include, at a minimum, the top and bottom floors served by the riser.
2. Unitized systems – Testing must follow the latest version of the RESNET sampling protocols.
3. Testing equipment must be capable of measuring within a +/1 CFM tolerance at flow rates as low as 20 CFM (e.g., low-flow balometer, powered flow hood). Documentation of equipment to be used must be provided and approved before testing begins.
4. Notify Program staff at least two weeks prior to testing. Program staff will be in attendance when testing occurs.

Minimum Installation Standards

Projects must meet the following program minimum installation standards:

1. System and system components must be installed in accordance with manufacturer specifications and installation requirements, and in compliance with all applicable laws, regulations, codes, licensing and permit requirements including, but not limited to, the New York State Environmental Quality Review, the Statewide Uniform Fire Prevention and Building Code and State Energy Conservation Construction Code, the National Electric Code, Fire Codes, and all applicable State, city, town ordinances or permit requirements.
2. Thermal bridging at major connections must be mitigated. Major connections include slab edges, bulkheads, rim joists, and roof-to-wall connections.
3. Exterior insulation must be continuous. Metal z-girts are not allowed.
4. Provide a continuous air barrier system.
5. If installed, cavity insulation must be installed without compression or slumping (refer to grade 1 condition according latest RESNET standards).
6. If the windows are replaced, the new windows must be air sealed to the opening with either 2x backer rod and caulk sealant joints or applicable tapes.
7. New ventilation exhaust penetrations must be air sealed.
8. Ventilation exhaust must vent to the outside.
9. For ventilation, third party testing and balancing (TAB) contractors must be contracted to balance and verify flow rates meet the design rates in the plans, specifications, and project narrative. TAB contractors must use equipment that is capable of measuring within a +/1 CFM tolerance at flow rates as low as 20 CFM (e.g., low-flow balometer, powered flow hood).
10. Train owner's representative and appropriate onsite staff in the use of new equipment, including associated controls and preventative measures. Provide an owner's manual that contains, at minimum, equipment and control cut sheets, statement of system operations (including controls) and preventative measures.

Recommendation: If installing exterior insulation, extend exterior insulation to cover any exposed slab edge and extend 24" below slab on grade.

Required Deliverables: Pre-construction

Prior to construction beginning, the Applicant must submit the following documentation to confirm the workscope eligibility.

Envelope Pre-construction Deliverable	Deliverable Description
Utility Data Release Authorization Forms (DRAFs)	• Submit Owner DRAFs for all master metered and house meter accounts for each building. • Submit Resident DRAFs for at least 10% of each size (e.g. 1-bedroom, 2- bedroom, etc.) of direct metered apartments with a minimum of 7 total for each building. For buildings with 5-14 total units, submit a minimum sample of 50% of total apartments. If a project is in Consolidated Edison (Con Ed) territory, then Con Ed aggregated data files can be submitted in lieu of apartment DRAFs.
Bulk Fuel and District Steam usage, if applicable	• Submit two years of complete delivery records for oil or other bulk fuels. • Submit two years of billing records for district steam.
Workscope Tool	• Includes weighted U-value calculations • Describes the existing conditions and proposed upgrades
Ventilation Test out Results, if applicable	• Results of operational test out sampling procedure
Design Documents	Drawings, specifications, and contract documents. Documents should include how thermal bridging will be mitigated.
Photo Template	• Photos of existing envelope conditions for each unique envelope assembly. • Photos of existing ventilation system • Specific photo and sampling requirements by equipment type can be found in the photo template.
Resident Survey – Pre-construction	Collaborate with NYSERDA's survey administrator and provide resident contact information as needed to ensure that NYSERDA's survey administrator has the means to reach residents and conduct the resident experience survey.

Required Deliverables: Partial Installation

Applicants are required to notify NYSERDA when 30% of the insulation is installed, and no greater than 50% of the insulation is installed. The approved Envelope Workscope Tool will list what the trigger is for a particular project. NYSERDA will then conduct a field inspection to verify minimum installation standards are being met. When notifying NYSERDA, projects are required to submit the following deliverables.

Envelope Partial Installation Deliverable	Deliverable Description
Updated Workscope Tool	Describes installation status.

Photo Template	• Photos of current envelope installation progress. Include photos of all upgraded unique envelope assembly and fastener systems, if applicable. • Photos of ventilation system upgrade, if applicable. • Specific photo and sampling requirements by equipment type can be found in the photo template.
Cut Sheets	Cut sheets of installed products with installed model and options highlighted. Cut sheets must include the following information: • Manufacturer • Model Number • Any specific features and/or options that were installed • Relevant energy rating information

Required Deliverables: Construction Complete

NYSERDA will conduct a final field inspection upon project completion. Projects are required to notify NYSERDA when this milestone is reached and submit the following deliverables.

Envelope Construction Complete Deliverable	Deliverable Description
Updated Workscope Tool	Describes installation status.
Photo Template	• Photos of upgraded unique envelope assembly and fastener systems, if applicable. • Photos of ventilation system upgrade, if applicable. • Specific photo and sampling requirements by equipment type can be found in the photo template.
Ventilation testing and balancing (TAB) Results, if applicable	Inspection reports including TAB report and duct sealing results.
Cut Sheets	Cut sheets of installed products with installed model and options highlighted, including fastener system if applicable. Cut sheets must include the following information: • Manufacturer • Model Number • Any specific features and/or options that were installed • Relevant energy rating information
Final Invoices	Invoices for the installed measures within the workscope. Invoices must separate labor from material costs. Invoices must include the following information: • Measure description and quantity (e.g. 5,000 sq ft of 1-inch EIFS) • Labor for each measure installation (e.g. installation of EIFS, installation of roof insulation, etc.)
Owner's Manual	Owner's manual that contains, at minimum, equipment and control cut sheets, statement of system operations (including controls) and preventative measures.

Resident Survey – Construction Complete	Collaborate with NYSERDA's survey administrator and provide resident contact information as needed to ensure that NYSERDA's survey administrator has the means to reach residents and conduct the resident experience survey.
Updated DRAFs	• Submit Owner DRAFs for all new master metered and house meter accounts for each building. • Consult with NYSERDA to determine how many resident DRAFs are required.

II. Ventilation Package Requirement Details

Required Measure Installation

Projects are required to provide balanced ventilation with heat and/or energy recovery to each dwelling unit. Balanced ventilation requires providing both supply and exhaust ventilation with supply airflow within 10% of the exhaust airflow.

Minimum Installation Standards

Projects must meet the following program minimum installation standards:

1. System and system components must be installed in accordance with manufacturer specifications and installation requirements, and in compliance with all applicable laws, regulations, codes, licensing and permit requirements including, but not limited to, the New York State Environmental Quality Review, the Statewide Uniform Fire Prevention and Building Code and State Energy Conservation Construction Code, the National Electric Code, Fire Codes, and all applicable State, city, town ordinances or permit requirements.
2. Heat or energy recovery ventilator (HRV or ERV) must have minimum 77% sensible heat recovery efficiency at manufacturer rated design conditions.
3. Total fan power for the ERV at design external static pressure and design CFM must be less than 1 Watt per CFM.
4. Kitchens and bathrooms shall be continuously ventilated to a minimum of 25 CFM and 20 CFM, respectively.
5. Adjustable constant airflow regulators (CARs) are required to maintain balanced operation.
6. Seal all central ventilation duct work (e.g. aerosolized sealant product) to meet duct leakage limit of 5 CFM50 per register + 5 CFM50/floor leakage OR a maximum leakage of 10% of total design air flow for system, whichever is lower.
7. Typical 24/7 operation total supply and exhaust flows must be within +15% of required airflow at each terminal, +/- 15% of total required design flows at the system level, and within 10% of each other on a per dwelling unit basis.
8. Third party testing and balancing (TAB) contractors must be contracted by the owner (not the contractor) to balance and verify flow rates meet the design rates in the plans, specifications, and project narrative. Testing equipment used must be capable of measuring within a +/1 CFM tolerance at flow rates as low as 20 CFM (e.g., low-flow balometer, powered flow hood). Documentation of equipment used must be provided.
9. Exterior outdoor air intake louver must be at least 4 feet above grade or roof deck, at least 10 feet away from known contamination sources (dryer, garage exhaust, etc.), and no closer to the exhaust port than recommended by the manufacturer
10. Ducts between an interior HRV or ERV and the exterior must be insulated to a minimum of R-8 and covered with an airtight vapor tight material that is carefully sealed to the exterior wall.
11. Ducts between an exterior mounted HRV or ERV and the building envelope must be insulated to a minimum of R-8.
12. Frost protection should be installed for the heat exchanger core.
13. Install a minimum MERV 8 filter in the intake air duct and in the extract air duct for all ventilation systems.
14. Duct to sheetrock connection must be air sealed prior to the installation of grilles.

15. Electric resistance heating can be used to raise supply air temperature (post-core) at winter design condition by no more than 5°F.
16. Train owner's representative and appropriate onsite staff in the use of new equipment, including associated controls and preventative measures. Provide an owner's manual that contains, at minimum, equipment and control cut sheets, statement of system operations (including controls) and preventative measures.

Recommendation:

- Supply air leaving the HRV or ERV should be no colder than 62°F at winter design conditions to ensure occupant comfort.
- Makeup heat for HRV or ERV be supplied with heat pumps.
- When possible, install a minimum MERV 13 filter in the intake air duct and in the extract air duct for all ventilation systems. During design phase, consider the static pressure drop across the filter.

Required Deliverables: Pre-construction

Prior to construction beginning, the Applicant must submit the following documentation to confirm the workscope eligibility.

Ventilation Pre-construction Deliverable	Deliverable Description
Utility Data Release Authorization Forms (DRAFs)	• Submit Owner DRAFs for all master metered and house meter accounts for each building. • Submit Resident DRAFs for at least 10% of each size (e.g. 1-bedroom, 2- bedroom, etc.) of direct metered apartments with a minimum of 7 total for each building. For buildings with 5-14 total units, submit a minimum sample of 50% of total apartments. If a project is in Consolidated Edison (Con Ed) territory, then Con Ed aggregated data files can be submitted in lieu of apartment DRAFs.
Bulk Fuel and District Steam usage, if applicable	• Submit two years of complete delivery records for oil or other bulk fuels • Submit two years of billing records for district steam
Workscope Tool	Describes the existing conditions and proposed upgrades
Cut sheets	Cut sheets of proposed products should be submitted with the proposed model and options highlighted. Cut sheets must include the following information: • Manufacturer • Model Number • Any specific features and/or options that were installed • Relevant energy rating information
Design Documents	• Drawings, specifications, and contract documents. • Must include supply and exhaust air flows and commissioning requirements.

Photo Template	Photos of existing ventilation system. Specific photo and sampling requirements by equipment type can be found in the photo template.
Resident Survey – Pre-construction	Collaborate with NYSERDA's survey administrator and provide resident contact information as needed to ensure that NYSERDA's survey administrator has the means to reach residents and conduct the resident experience survey.

Required Deliverables: Partial Installation (optional stage)

Applicants have the option of requesting a partial installation inspection for an early partial construction payment. To be eligible, the project must be at least 30% complete with installation of the workscope. NYSERDA will then conduct a field inspection to verify minimum installation standards are being met. When notifying NYSERDA, projects are required to submit the following deliverables.

Ventilation Partial Installation Deliverable	Deliverable Description
Updated Workscope Tool	Describes installation status.
Photo Template	Photos including installed HRV or ERV, installed CARs, installed duct insulation, installed filters as applicable. Specific photo and sampling requirements by equipment type can be found in the photo template.
Cut Sheets	Cut sheets of installed products with installed model and options highlighted. Cut sheets must include the following information: • Manufacturer • Model Number • Any specific features and/or options that were installed • Relevant energy rating information

Required Deliverables: Construction Complete

NYSERDA will conduct a final field inspection upon project completion. Projects are required to notify NYSERDA when this milestone is reached and submit the following deliverables.

Ventilation Construction Complete Deliverable	Deliverable Description
Updated Workscope Tool	Describes installation status.
Photo Template	Photos including installed HRV or ERV, installed CARs, installed duct insulation, installed filters as applicable. Specific photo and sampling requirements by equipment type can be found in the photo template.
Equipment Testing Reports	• Pre- and post-sealing testing results of leakage for each riser, if applicable • Inspection reports including TAB report and duct sealing results
Cut Sheets	Cut sheets of installed products with installed model and options highlighted. Cut sheets must include the following information:

	• Manufacturer • Model Number • Any specific features and/or options that were installed • Relevant energy rating information
Final Invoices	Invoices for the installed measures within the workscope. Invoices must separate labor from material costs. Invoices must include the following information: • Measure description and quantity (e.g. ERV, aerosolized sealant product) • Labor for each measure installation (e.g. testing for each riser, installation of ERV, etc.)
Owner's Manual	Owner's manual that contains, at minimum, equipment and control cut sheets, statement of system operations (including controls) and preventative measures.
Resident Survey – Construction Complete	Collaborate with NYSERDA's survey administrator and provide resident contact information as needed to ensure that NYSERDA's survey administrator has the means to reach residents and conduct the resident experience survey.
Updated DRAFs	• Submit Owner DRAFs for all new master metered and house meter accounts for each building. • Consult with NYSERDA to determine how many resident DRAFs are required.

III. Heating and Cooling Package Requirement Details

Required Measure Installation

Projects are required to replace the building's current heating and cooling system with one of the following:

Technology Type	Minimum Performance Requirement[1]
Variable Refrigerant Flow (VRF)	Follow NYS Clean Heat Requirements (https://saveenergy.ny.gov/NYScleanheat/assets/pdf/NYS-Clean-Heat-Program-Manual.pdf)
Mini/multi-split Air Source Heat Pump (ASHP)	
Packaged Terminal Heat Pump (PTHP)	
Single Package Vertical Heat Pump (SPVHP)	
Low-temp hydronic with Air to Water Heat Pump (AWHP)	Follow ASHRAE 90.1-2019 Table 6.8.1-16 for Heat Pump and Heat Recovery Chiller Packages
Water-to-Water Heat Pump (WWHP)[2] and Ground Source Heat Pump	Follow Tier 3 ENERGY STAR for Ground Source Heat Pump (https://www.energystar.gov/sites/default/files/specs/private/Geothermal_Heat_Pumps_Program_Requirements%20v3.1.pdf) or ASHRAE 90.1-2019 Table 6.8.1-15 for WWHP

[1]The system must be designed and installed to meet both the full heating and cooling loads of the project.

[2]The initial heat source for water-to-water heat pumps cannot be a fluid that was previously heated by fossil fuels, unless when used for waste heat recovery from service hot water, heat-recovery chillers, or other building equipment.

Minimum Installation Standards

Projects must meet the below minimum installation standards. If the project is participating in the NYS Clean Heat program, be sure to consult and meet that program's requirements.

1. System and system components must be installed in accordance with manufacturer specifications and installation requirements, and in compliance with all applicable laws, regulations, codes, licensing and permit requirements including, but not limited to, the New York State Environmental Quality Review, the Statewide Uniform Fire Prevention and Building Code and State Energy Conservation Construction Code, the National Electric Code, Fire Codes, and all applicable State, city, town ordinances or permit requirements.
2. Based upon best practices and manufacturers installation manuals, outdoor units should be installed above the local snow line.
3. Outdoor units must be installed such that melting defrost condensate does not drip onto other outdoor units.

4. All pipe penetrations (refrigerant, electrical, etc) in the exterior wall of the building that are created as part of the installation of this measure must be thoroughly air sealed.
5. If the equipment includes integrated electric resistance, the control sequence for the electric resistance must be set to ensure the electric resistance is used for back-up only when the equipment cannot maintain adequate space temperature. The system must include a time delay allowing adequate time for equipment to bring space temperature up. Back-up electric resistance cannot be used to bring up a space to temperature.
6. Train owner's representative and appropriate onsite staff in the use of new equipment, including associated controls and preventative measures. Provide an owner's manual that contains, at minimum, equipment and control cut sheets, statement of system operations (including controls) and preventative measures.
7. Removing fossil fuel equipment is not required as part of this program. However, if combustion equipment is removed as part of the scope of work for this measure, all holes created by the removal of the combustion equipment (e.g. the bottom of the chimney) must be air sealed. Additionally, any obsolete gas supply pipes must be capped off.

Recommendation: Ensure installed equipment has connectivity capabilities to connect with an energy or building management system.

Required Deliverables: Pre-construction

Prior to construction beginning, the Applicant must submit documentation the following to confirm the workscope eligibility.

Heating and Cooling Pre-construction Deliverable	Deliverable Description
Utility Data Release Authorization Forms (DRAFs)	• Submit Owner DRAFs for all master metered and house meter accounts for each building. • Submit Resident DRAFs for at least 10% of each size (e.g. 1-bedroom, 2- bedroom, etc.) of direct metered apartments with a minimum of 7 total for each building. For buildings with 5-14 total units, submit a minimum sample of 50% of total apartments. If a project is in Consolidated Edison (Con Ed) territory, then Con Ed aggregated data files can be submitted in lieu of apartment DRAFs.
Bulk Fuel and District Steam usage, if applicable	• Submit two years of complete delivery records for oil or other bulk fuels • Submit two years of billing records for district steam
Workscope Tool	Describes the existing conditions and proposed upgrades
Cut Sheets	Cut sheets of proposed products with model and options highlighted. Cut sheets must include the following information: • Manufacturer • Model Number •Any specific features and/or options that were installed Relevant energy rating information
Design Documents	•Drawings, specifications, and contract documents. Must include load calculations and control sequence, if applicable.

	Must include heat loss/gain calculations (input and output reports)
Photo Template	Photos to show existing heating and cooling system. Specific photo and sampling requirements by equipment type can be found in the photo template.
Resident Survey – Pre-construction	Collaborate with NYSERDA's survey administrator and provide resident contact information as needed to ensure that NYSERDA's survey administrator has the means to reach residents and conduct the resident experience survey.

Required Deliverables: Partial Installation (optional stage)

Applicants have the option of requesting a partial installation inspection for an early partial construction payment. To be eligible, the project must be at least 30% complete with installation of the workscope. NYSERDA will then conduct a field inspection to verify minimum installation standards are being met. When notifying NYSERDA, projects are required to submit the following deliverables.

Heating and Cooling Partial Installation Deliverable	Deliverable Description
Updated Workscope Tool	Describes installation status.
Photo Template	Photos of installed system and system components. Specific photo and sampling requirements by equipment type can be found in the photo template.
Cut Sheets	Cut sheets of installed products with installed model and options highlighted. Cut sheets must include the following information: • Manufacturer • Model Number • Any specific features and/or options that were installed • Relevant energy rating information

Required Deliverables: Construction Complete

NYSERDA will conduct a final field inspection upon project completion. Projects are required to notify NYSERDA when this milestone is reached and submit the following deliverables.

Heating and Cooling Construction Complete Deliverable	Deliverable Description
Updated Workscope Tool	Describes installation status.
Photo Template	Photos of installed system and system components. Specific photo and sampling requirements by equipment type can be found in the photo template.
Final design specifications	Submit documentation of actual piping sizes, lengths, and calculations of actual refrigerant charge needed.

Testing	Submit documentation of pressure testing of refrigerant lines, including photos of gauges pre- and post-pressure testing, duration of pressure test, dates of testing, and ambient outdoor temperature at time of testing (beginning and end).
Checklists	• Submit completed manufacturer start-up checklists • Submit completed pre-functional and functional commissioning checklists
Cut Sheets	Cut sheets of installed products with model and options highlighted. Cut sheets must include the following information: • Manufacturer • Model Number • Any specific features and/or options that were installed • Relevant energy rating information
Final Invoices	Invoices for the installed measures within the workscope. Invoices must separate labor from material costs. Invoices must include the following information: • Measure description and quantity (e.g. 3 condensers units) • Labor for each measure installation (e.g. testing for refrigerant lines, etc.)
Owner's Manual	Owner's manual that contains, at minimum, equipment and control cut sheets, statement of system operations (including controls) and preventative measures.
Resident Survey – Construction Complete	Collaborate with NYSERDA's survey administrator and provide resident contact information as needed to ensure that NYSERDA's survey administrator has the means to reach residents and conduct the resident experience survey.
Updated DRAFs	• Submit Owner DRAFs for all new master metered and house meter accounts for each building. • Consult with NYSERDA to determine how many resident DRAFs are required.

IV. Domestic Hot Water Package Requirement Details

Required Measure Installation

Projects are required to replace their domestic hot water (DHW) systems with heat pump technology. The system requirements are based on the existing DHW system.

Existing Conditions	DHW Annual Consumption Displacement	Equipment Requirement	Performance Requirement
Unitized DHW	100%	Air-to-Water Heat Pump	Follow NYS Clean Heat Requirements (https://saveenergy.ny.gov/NYScleanheat/assets/pdf/NYS-Clean-Heat-Program-Manual.pdf); new system must be a split Heat Pump Water Heater (HPWH); integrated tank-type HPWHs not permitted
Central DHW	Minimum 30%	Air-to-Water Heat Pump	ENERGY STAR labeled or Follow ASHRAE 90.1-2019 Table 6.8.1-16 for Heat Pump and Heat Recovery Chiller Packages
		Water-to-Water Heat Pump[1]	Follow Tier 3 ENERGY STAR for GSHP (https://www.energystar.gov/sites/default/files/specs/private/Geothermal_Heat_Pumps_Program_Requirements%20v3.1.pdf) or ASHRAE 90.1-2019 Table 6.8.1-15 for WWHP

[1]The heat source for water-to-water heat pumps cannot be a fluid that was previously heated by fossil fuels, unless when used for waste heat recovery (e.g. from service hot water or heat-recovery chillers).

For central DHW systems, projects must install at least the minimum capacity from the table below. Projects can use either the per bedroom or per dwelling unit calculation method.

Building Location[1]	Minimum Installed Capacity (MBH/Bedroom)	Minimum Installed Capacity (MBH/Dwelling Unit)
Climate Zone 4 (A-C)	1.7	2.0
Climate Zone 5 (A-C)	1.8	2.2
Climate Zone 6 (A-B)	1.8	2.2

[1]Climate zones are based on the International Energy Conservation Code (IECC). Climate zone by NYS counties can be found in Appendix A.

Minimum Installation Standards

Projects must meet the below minimum installation standards. If the project is participating in the NYS Clean Heat program, be sure to consult and meet that program's requirements.

1. System and system components must be installed in accordance with manufacturer specifications and installation requirements, and in compliance with all applicable laws, regulations, codes,

licensing and permit requirements including, but not limited to, the New York State Environmental Quality Review, the Statewide Uniform Fire Prevention and Building Code and State Energy Conservation Construction Code, the National Electric Code, Fire Codes, and all applicable State, city, town ordinances or permit requirements.

2. Based upon best practices and manufacturers installation manuals, outdoor units should be installed above the local snow line.
3. All pipe penetrations (refrigerant, electrical, etc) in the exterior wall of the building that are created as part of the installation of this measure must be thoroughly air sealed.
4. Control system must be set-up such that the heat pump system operates nights and weekends, at minimum.
5. Train owner's representative and appropriate onsite staff in the use of new equipment, including associated controls and preventative measures. Provide an owner's manual that contains, at minimum, equipment and control cut sheets, statement of system operations (including controls) and preventative measures.
6. Removing fossil fuel equipment is not required as part of this program. However, if combustion equipment is removed as part of the scope of work for this measure, all holes created by the removal of the combustion equipment (e.g. the bottom of the chimney) must be air sealed. Additionally, any obsolete gas supply pipes must be capped off.

Recommendation: Ensure installed equipment has connectivity capabilities to connect with an energy or building management system.

Required Deliverables: Pre-construction

Prior to construction beginning, the Applicant must submit documentation the following to confirm the workscope eligibility.

DHW Pre-construction Deliverable	Deliverable Description
Utility Data Release Authorization Forms (DRAFs)	• Submit Owner DRAFs for all master metered and house meter accounts for each building. • Submit Resident DRAFs for at least 10% of each size (e.g. 1-bedroom, 2- bedroom, etc.) of direct metered apartments with a minimum of 7 total for each building. For buildings with 5-14 total units, submit a minimum sample of 50% of total apartments. If a project is in Consolidated Edison (Con Ed) territory, then Con Ed aggregated data files can be submitted in lieu of apartment DRAFs.
Bulk Fuel and District Steam usage, if applicable	• Submit two years of complete delivery records for oil or other bulk fuels • Submit two years of billing records for district steam
Workscope Tool	Describes the existing conditions and proposed upgrades, including a description of the thermal loads and thermal storage
Cut Sheets	Cut sheets of proposed products with proposed model and options highlighted. Cut sheets must include the following information:

	• Manufacturer • Model Number • Any specific features and/or options that are proposed • Relevant energy rating information
Design Documents	Drawings, specifications, and contract documents Calculations showing how the proposed system will meet 30% of the DHW load, including the control strategy for the overall DHW system.
Photo Template	Photos of existing domestic hot water system. Specific photo and sampling requirements by equipment type can be found in the photo template.
Resident Survey – Pre-construction	Collaborate with NYSERDA's survey administrator and provide resident contact information as needed to ensure that NYSERDA's survey administrator has the means to reach residents and conduct the resident experience survey.

Required Deliverables: Partial Installation (optional stage)

Applicants have the option of requesting a partial installation inspection for an early partial construction payment. To be eligible, the project must be at least 30% complete with installation of the workscope. NYSERDA will then conduct a field inspection to verify minimum installation standards are being met. When notifying NYSERDA, projects are required to submit the following deliverables.

Domestic Hot Water Partial Installation Deliverable	Deliverable Description
Updated Workscope Tool	Describes installation status.
Photo Template	Photos of installed system and system components. Specific photo and sampling requirements by equipment type can be found in the photo template.
Cut Sheets	Cut sheets of installed products with installed model and options highlighted. Cut sheets must include the following information: • Manufacturer • Model Number • Any specific features and/or options that were installed • Relevant energy rating information

Required Deliverables: Construction Complete

NYSERDA will conduct a final field inspection upon project completion. Projects are required to notify NYSERDA when this milestone is reached and submit the following deliverables.

Domestic Hot Water Construction Complete Deliverable	Deliverable Description
Updated Workscope Tool	Describes installation status.

Photo Template	• Photos of installed system and system components. Specific photo and sampling requirements by equipment type can be found in the photo template.
Final design specifications	• If applicable, submit documentation of actual piping sizes, lengths, and calculations of actual refrigerant charge needed. • Submit documentation of controls set-up for central systems.
Testing	If applicable, submit documentation of pressure testing of refrigerant lines, including photos of gauges pre- and post-pressure testing, duration of pressure test, dates of testing, and ambient outdoor temperature at time of testing.
Checklists	• Submit completed manufacturer start-up checklists • Submit completed pre-functional and functional commissioning checklists
Cut Sheets	Cut sheets of installed products with installed model and options highlighted. Cut sheets must include the following information: • Manufacturer • Model Number • Any specific features and/or options that were installed • Relevant energy rating information
Final Invoices	Invoices for the installed measures within the workscope. Invoices must separate labor from material costs. Invoices must include the following information: • Measure description and quantity (e.g. 3 condensers units) • Labor for each measure installation (e.g. testing for refrigerant lines, etc.)
Owner's Manual	Owner's manual that contains, at minimum, equipment and control cut sheets, statement of system operations (including controls) and preventative measures.
Resident Survey – Construction Complete	Collaborate with NYSERDA's survey administrator and provide resident contact information as needed to ensure that NYSERDA's survey administrator has the means to reach residents and conduct the resident experience survey.
Updated DRAFs	• Submit Owner DRAFs for all new master metered and house meter accounts for each building. • Consult with NYSERDA to determine how many resident DRAFs are required.

V. Optional Recommended Measures Details

The following are the measure requirements for the optional recommended measures. Projects can choose to install the optional measures in addition to a primary package for an additional incentive. Please refer to Program Opportunity Notice (PON) documentation for further details.

1.1 Air Sealing

Required Measure Installation

Projects must evaluate and install all applicable air sealing (including caulking, weatherstripping, thermal barriers) of repeatable penetrations. This includes the following building areas:

1. Tops of shafts/bulkheads
2. Exterior doors
3. Air conditioner sleeves
4. Windows
5. Floor of attic or ceiling of top floor penetrations (attic door, hatch, electrical, piping, ventilation, etc.)
6. Plumbing and electrical penetrations in the apartments
7. Penetrations and openings between all mechanical equipment rooms, including the boiler room, and the conditioned space
8. Basement perimeter
9. Fire sprinkler penetrations

Minimum Installation Standards

Projects must meet the below minimum installation standards.

1. System and system components must be installed in accordance with manufacturer specifications and installation requirements, and in compliance with all applicable laws, regulations, codes, licensing and permit requirements including, but not limited to, the New York State Environmental Quality Review, the Statewide Uniform Fire Prevention and Building Code and State Energy Conservation Construction Code, the National Electric Code, Fire Codes, and all applicable State, city, town ordinances or permit requirements.
2. For weather stripping of windows or doors, due diligence should include confirming that all latches, hinges, and self-closing mechanisms operate smoothly and properly, and confirming that weather stripping is mechanically fastened.
3. Door weather stripping shall be mechanically fastened, foam-filled tubular gasket vinyl weather stripping along all sides and tops of all doors.
4. Large openings that cannot be sealed with spray foam should be sealed with another appropriate air sealing strategy such as rigid foamboard or caulk.
5. Attics shall be thoroughly checked for air leakage locations by moving existing insulation as needed. Once air sealing has been completed, insulation shall be replaced to provide continuous coverage of an even depth throughout the attic.

Required Deliverables: Pre-construction

Prior to construction beginning, the Applicant must submit the following documentation, in conjunction with the primary package (e.g. Envelope, Ventilation or Heating and Cooling) documentation to confirm the workscope eligibility.

Air Sealing Pre-construction Deliverable	Deliverable Description
Workscope Tool	Describes the existing conditions and installation workscope. Includes why any measures were not recommended or deemed not applicable
Photo Template	Photos of existing condition of all existing repeatable penetrations. Specific photo and sampling requirements by equipment type can be found in the photo template.

Required Deliverables: Construction Complete

NYSERDA will conduct a final field inspection upon project completion. Projects are required to notify NYSERDA when this milestone is reached and submit the below deliverables. Deliverables and inspections should be submitted and conducted in conjunction with the primary package (e.g. Envelope, Ventilation, or Heating and Cooling) documentation and inspection.

Air Sealing Construction Complete Deliverable	Deliverable Description
Updated Workscope Tool	Describes installation status.
Cut Sheets	Cut sheets of installed products with installed model and options highlighted. Cut sheets must include the following information: • Manufacturer • Model Number • Any specific features and/or options that were installed • Relevant energy rating information
Photo Template	Photos of installed components. Specific photo and sampling requirements by equipment type can be found in the photo template.

1.2 Steam Heating System Upgrades

Required Measure Installation

Projects must evaluate and install all applicable steam heating system upgrades including:

1. Energy Management System (EMS)
2. Radiant heat barriers (for enclosed heaters)
3. Thermostatic radiator values (TRVs) or other thermostatic controls on every radiator or fan coil unit
4. Inlet orifice plates on all radiators
5. Master venting on all mains and risers

6. Functional steam traps (for those remaining in service), including all traps in the basement and boiler room
7. Burner clean and tune

Minimum Installation Standards

Projects must meet the below minimum installation standards.

1. System and system components must be installed in accordance with manufacturer specifications and installation requirements, and in compliance with all applicable laws, regulations, codes, licensing and permit requirements including, but not limited to, the New York State Environmental Quality Review, the Statewide Uniform Fire Prevention and Building Code and State Energy Conservation Construction Code, the National Electric Code, Fire Codes, and all applicable State, city, town ordinances or permit requirements.
2. Energy Management Systems must meet the following requirements:
    a. The EMS must control the boiler or steam valve based on data from multiple apartment sensors. Temperature sensors must be installed in at least 25% of apartments and on a variety of floors, and there must be a sensor in the apartment at the end of each steam line.
    b. In addition to the sensors in the apartments, the EMS must have sensors for the following temperatures: boiler exhaust, DHW supply (only for buildings where DHW is supplied by the heating boiler), outdoor air, and condensate.
    c. The EMS must allow multiple boiler systems to have staging capability.
    d. The EMS must allow remote access or web-based monitoring.
    e. If the building has an existing EMS, the entire system must be retro-commissioned, and it must be retrofit to meet the standards above.
3. Orifice plates must meet the following:
    a. Orifice plates are not required in 1-pipe steam systems.
    b. If orifice plates are sized to reduce the output of the terminal unit, the output of the unit must not be less than 100% of the heat load of the room it serves.
4. Air vents must meet the following:
    a. Air vents must be installed in the vertical direction and at least 15" away from any elbows.
    b. Air vents should be sized and installed at the ends of 100% of the steam supply mains and risers.
5. Remote temperature sensing TRVs must be installed on any enclosed radiators.
6. TRVs and orifice plates must be installed on at least 75% of apartment terminal units and 100% of common area terminal units.
7. Train owner's representative and appropriate onsite staff in the use of new equipment, including associated controls and preventative measures. Provide an owner's manual that contains, at minimum, equipment and control cut sheets, statement of system operations (including controls) and preventative measures.

Required Deliverables: Pre-construction

Prior to construction beginning, the Applicant must submit the following documentation, in conjunction with the Envelope package documentation to confirm the workscope eligibility.

Steam Heating Pre-construction Deliverable	Deliverable Description
Workscope Tool	Describes the existing conditions and proposed workscope.
Photo Template	Photos of existing steam system components. Specific photo and sampling requirements by equipment type can be found in the photo template.

Required Deliverables: Construction Complete

NYSERDA will conduct a final field inspection upon project completion. Projects are required to notify NYSERDA when this milestone is reached and submit the below deliverables. Deliverables and inspections should be submitted and conducted in conjunction with the Envelope package documentation and inspection.

Steam Heating Construction Complete Deliverable	Deliverable Description
Updated Workscope Tool	Describes installation status.
Photo Template	Photos of installed system and system components. Specific photo and sampling requirements by equipment type can be found in the photo template.
Testing	Submit pre- and post-tune-up steady state efficiency (SSE) test results
Cut Sheets	Cut sheets of installed products with model and options highlighted. Cut sheets must include the following information: • Manufacturer • Model Number • Any specific features and/or options that were installed • Relevant energy rating information
EMS Schematic	Shows where all apartment and boiler room sensors were installed
Installation Log	Complete record of where orifice plates were installed and what size hole was used (by apartment and room) Complete record of where TRVs or apartment-level thermostats were installed (by apartment and room) Complete record of where Radiant Heat Barriers were installed (by apartment and room)
Steam System Schematic	Shows the following: A layout sketch of the steam supply mains in the basement, including mark-offs for the new air vents to be installed A diagram of all steam risers, including pipe sizes, and current air vent sizes A sketch of near-boiler piping, including pipe sizes, steam traps, and air vents
Terminal Unit Survey	Must include the dimensions of the following: 75% or more of top floor terminal units

	Terminal units in one apartment from each line on floors other than the top floor and first floor 100% of first floor terminal units 100% of common area terminal units
Heat Load vs Terminal Unit Output Calculations	Shows the calculation of heat loss for a minimum sample of one unit in each line. Shows the calculation of output of the terminal units in sampled apartments.
Owner's Manual	Owner's manual that contains, at minimum, equipment and control cut sheets, statement of system operations (including controls) and preventative measures.

1.3 Induction Stoves

Required Measure Installation

Projects must replace all existing gas stoves with comparably sized induction stoves.

Minimum Installation Standards

Projects must meet the below minimum installation standards.

1. System and system components must be installed in accordance with manufacturer specifications and installation requirements, and in compliance with all applicable laws, regulations, codes, licensing and permit requirements including, but not limited to, the New York State Environmental Quality Review, the Statewide Uniform Fire Prevention and Building Code and State Energy Conservation Construction Code, the National Electric Code, Fire Codes, and all applicable State, city, town ordinances or permit requirements.

Required Deliverables: Pre-construction

Prior to construction beginning, the Applicant must submit the following documentation, in conjunction with the Heating and Cooling package to confirm the workscope eligibility.

Induction Stove Pre-construction Deliverable	Deliverable Description
Workscope Tool	Describes the existing conditions and proposed workscope.
Photo Template	Photos of existing stoves. Specific photo and sampling requirements by equipment type can be found in the photo template.

Required Deliverables: Construction Complete

NYSERDA will conduct a final field inspection upon project completion. Projects are required to notify NYSERDA when this milestone is reached and submit the below deliverables. Deliverables and inspections should be submitted and conducted in conjunction with the Heating and Cooling package documentation and inspection.

Induction Stove Construction Complete Deliverable	Deliverable Description
Updated Workscope Tool	Describes installation status.
Photo Template	Photos of installed components. Specific photo and sampling requirements by equipment type can be found in the photo template.
Cut Sheets	Cut sheets of installed products with model and options highlighted. Cut sheets must include the following information: • Manufacturer • Model Number • Any specific features and/or options that were installed • Relevant energy rating information

Appendix A – Climate Zones by New York State County

Climates zones are determined by county, based on the International Energy Conservation Code (IECC).

County	Climate Zone
Albany	5A
Allegany	6A
Bronx	4A
Broome	6A
Cattaraugus	6A
Cayuga	5A
Chautauqua	5A
Chemung	5A
Chenango	6A
Clinton	6A
Columbia	5A
Cortland	5A
Delaware	6A
Dutchess	5A
Erie	5A
Essex	6A
Franklin	6A
Fulton	6A
Genesee	5A
Greene	5A
Hamilton	6A
Herkimer	6A
Jefferson	6A
Kings	4A
Lewis	6A
Livingston	5A
Madison	6A
Monroe	5A
Montgomery	6A
Nassau	4A
New York	4A

County	Climate Zone
Niagara	5A
Oneida	6A
Onondaga	5A
Ontario	5A
Orange	5A
Orleans	5A
Oswego	5A
Otsego	6A
Putnam	5A
Queens	4A
Rensselaer	5A
Richmond	4A
Rockland	5A
Saratoga	5A
Schenectady	5A
Schoharie	6A
Schuyler	6A
Seneca	5A
St. Lawrence	6A
Steuben	6A
Suffolk	4A
Sullivan	6A
Tioga	5A
Tompkins	6A
Ulster	6A
Warren	6A
Washington	5A
Wayne	5A
Westchester	4A
Wyoming	6A
Yates	5A

Appendix B – On-Site Generation Data Requirements

Data submittal requirements for solar photovoltaics and combined heat and power (CHP) systems.

1.4 On-Site Solar PV

Projects with on-site, behind-the-meter solar photovoltaic system during the pre-construction and/or construction complete, are required to submit the following additional site data:

1.4..1.1 Solar PV system monitoring

The following daily values from the solar PV monitoring system shall be made available to NYSERDA:

1. Total electricity produced per day by the installed solar PV system, in kWh.
2. The date of production for each daily kWh value.

If a PV solar system has a functioning internet connection that uploads daily solar production values in kWh to an internet-based monitoring system, the Applicant and Consultant shall assure that NYSERDA is provided with log-in access to obtain system production values during the pre-construction and/or construction complete period.

1.4..1.2 Utility data associated with solar PV systems

A signed Data Release Authorization Form (DRAF) for the electric utility meter is required so NYSERDA can obtain electricity consumption data recorded by the utility meter (in kWh), as well as the data for excess on-site solar electricity generation that is exported to the utility grid (in kWh).

If NYSERDA is unable to independently obtain kWh values for both consumption and export of electricity, the Participant and Provider shall ensure NYSERDA is provided with copies of the monthly billing invoices from any utility meter that is connected to on-site, behind-the-meter generation solar, for all months during the monitoring period.

The kWh value for consumption and export can be reported as two separate values, or as a single net sum of both values (in kWh). All kWh data must be clearly labeled as being either consumption-only, export-only, or the net sum of consumption and export.

The following values from the utility company shall be made available to NYSERDA, for each billing cycle during the monitoring period:

1. Account number
2. Service address
3. Billing period start date
4. Billing period end date (i.e., the meter reading date)
5. Type of meter reading (i.e., actual, estimated)
6. Net sum value, in kWh, of the total consumption and export of electricity during the billing period, or
    - Total consumption, in kWh, during the billing period
    - Total exported generation, in kWh, during the billing period

1.5 Combined Heat and Power (CHP) Systems

Projects with a CHP system during the baseline and/or performance period are required to submit the following additional daily values from the installed CHP monitoring system:

1. Total electricity produced per day by the installed CHP system, in kWh.
2. Total useful heat recovery from the CHP system, per day, that was measured as being delivered to heating or DHW systems serving the multifamily facility; reported in kBtu.
3. Total unused heat recovery from the CHP system, per day; reported in kBtu. This is recovered heat that was measured as being unused by the multifamily facility and rejected to the atmosphere through dump radiators.
4. Total input fuel used by the CHP system, per day; measured in either cubic feet, CCF, Therms or kBtu (Site Energy values). Specify the unit of measure used.
5. The date of measurement for each of the values listed.

Quantification of parasitic loads is optional but highly recommended. If parasitic loads are not measured, then these parasitic loads will necessarily be included in the overall measurement of whole-building energy consumption during the performance period and will, therefore, reduce the measured percent site energy savings achieved.

Please refer to NYSERDA's *Monitoring and Data Collection Standard for Distributed Energy Resource (DER) Systems* (January 2020) for best practices on measuring the CHP system data required by the Program, including parasitic loads.