Objectives:

* To develop a standard scoping methodology to evaluate the opportunities/challenges in existing school buildings to achieve an acceptable design for the elimination of on-site fossil fuel use and the application of all electric HVAC, Domestic Hot Water (DHW), food service/culinary art cooking and other types of educational program space (Science Labs, Vocational Shops, other) use of fossil fuels.
* To examine an existing building for the purpose of developing an Electric Power Budget (**EPB**) and the assessment/coordination of Architectural/Structural work impacted from the selection of electric space heating, air-conditioning, domestic hot water heating, food service cooking and the replacement of educational program use of natural gas to all electric energy.
* This Project Scope/Design Checklist is intended as a starting point to perform a thorough and complete analysis of the feasibility of implementing different HVAC & DHW equipment/system selection(s) to achieve the Project Goals & Objectives. Further development and refinement of this Checklist is expected with its beneficial use.

Electrical Scoping - Preliminary Considerations

1. Establish an Electrical Power Budget (**EPB**) for the building, including:
2. Existing electric service capacity (Ampacity, kVA, kW)
3. Existing Connected load (Ampacity, kVA, kW) including:
4. Lighting load
5. Plug load
6. Large motor loads (elevator, chiller, fire pump, large fan/pump)
7. Connected load utilization (30%, 60%, 90%, other)
8. Existing electric service capacity allocated for future space cooling equipment.
9. Based on the EPB established for the building, determine the Reserve Electric Service Capacity (RESC) available for converting space heating, Domestic Hot Water (DHW), food service/culinary art cooking and Science Lab/Vocational Arts educational program equipment to an all-electric fuel source.

1. To calculate the RESC, utilize existing electric demand (kW) history available from DCAS to check the base building peak electric load. All major HVAC, Plumbing and other electric appliance/equipment to be removed shall be deducted from the historic peak demand to determine the adjusted peak load and Reserve Electrical Service Capacity.

1. With a "best fit" preliminary selection of new electric HVAC & DHW equipment, identify the net shortfall of available electric service capacity required to undertake the electric conversion of space heating, DHW, food service/culinary art cooking and Science Lab/Vocational Arts educational program equipment.
2. Prepare a Draft Electric Utility Load Letter for the proposed scope work to meet the net shortfall in existing electric service capacity. The Load Letter should describe the required scope of work; list all new connected electric loads including largest electric motor size(s), list all existing connected electric loads to be removed, identify request for reinforcement of an existing POE or requirement for providing a new POE, identify if existing/new POE must remain operational at the same time, request determination of the available Utility service and fault current.
3. The following method for a preliminary sizing of new/supplementary building electric service may be considered:
4. Confirm Utility Supplier for the Project location (e.g., PSEG-QN, Con-Edison-BX-NY-BK-QN-SI). Confirm available Utility voltage (208 V, 460 V).
5. Calculate new/supplementary electric service load as per NEC guidelines - Limit each service switch and switchboard size to no more than 4,000 Amps, evaluate the potential growth in connected load, evaluate existing/new large motor starting method(s).
6. Obtain short circuit values from the Utility based on their distribution system model (sub-station, transformer, breakers) suitable to perform short circuit analysis calculations.
7. Review available specifications of the Utility transformer feeding the building electric service including kVA rating and % Impedance (Z) where available (pad mounted transformers when provided). Allow for an increase in available short circuit current from large building motor loads.
8. Select a standard interrupting rating (AIC, kAIC, kA) value greater than the available Utility fault Current and appropriate for the type of building service/distribution equipment used (e.g., switchboard, switchgear, main distribution panel).
9. Where affected by the primary scope of work, identify the impact on building interior/exterior lighting systems, low voltage electrical systems, including fire detection and alarm systems (including Ansul system, emergency voice/alarm communication, deluge water curtain), carbon monoxide detection and monitoring, gas leak/overpressure alarm systems, auxiliary signal systems, other.

Mechanical/Plumbing Scoping - Preliminary Considerations

1. Categorize the existing Space Heating System:
2. Central oil/gas fired boilers generating:
3. Steam
4. Hot water

Serving (all that apply):

1. Air-handling unit coils
2. Duct heating coils
3. Fan-coil units
4. Unit ventilators
5. Cast iron/fin-tube heating elements
6. Packaged oil/gas fired warm air furnace supplying air to:
7. Gymnasium/Gymatorium
8. Auditorium
9. Cafeteria/Kitchen
10. Other Public Assembly Spaces or Common areas
11. Categorize the existing domestic hot water heating system, including:
12. Tankless boiler DHW heating coil(s)
13. Boiler steam to DHW converter(s)
14. Indirect boiler steam DHW storage tank
15. Oil/gas fired DHW storage tank
16. Electric heated DHW storage tank
17. Identify opportunities to de-couple the dependence of Public Assembly Spaces and other Common areas in the building on the Central oil/gas fired boilers, including:

1. Electric Single Zone Air-source Heat Pump Air-handling/Rooftop Units equipped with Energy Recovery Wheel (ERW), electric heating coil and Demand Controlled Ventilation (DCV) control.

1. Identify opportunities to de-couple the dependence of Classroom and Administrative areas

in the building on the Central oil/gas fired boilers, including:

1. Electric Multi-zone, Air-source Heat Pump Variable Air Volume Air-handling/Rooftop Units equipped with Energy Recovery Wheel (ERW), electric heating coil and Demand Controlled Ventilation (DCV) control.
2. Electric Single Zone Air-source Heat Pump Vertical Unit Ventilator (VUV) Units equipped with Energy Recovery Wheel (ERW). Provide supplemental and/or back-up redundant electric heating (electric baseboard, integral electric coils in VUV Units) to spaces with high perimeter heating load.
3. Electric Single Zone Air-source Heat Pump Variable Refrigerant Flow (VRF) ductless/ducted Fan-coil Units coupled with electric Air-source Heat Pump Dedicated Outdoor Air System (DOAS) Air-handling Unit equipped with ERW and electric heating coil. Provide supplemental and/or back-up redundant electric heating (electric baseboard, integral electric coils in Fan-coil Units) to spaces with high perimeter heating load.
4. Where Classroom and Administrative area space heating is provided by a central building hot water heating system, consideration can be given to the application of an electric Air-source Chiller/Heater Pump to replace existing oil/gas fired boiler equipment. Electric boilers will be provided to provide supplemental and/or back up redundant heating capacity for the central system.
5. A condition assessment of existing hot water supply/return piping configuration (primary, primary/secondary pumping), space heating and ventilation equipment (air-handling units, unit ventilators, fan-coil units, cast iron/fin-tube heating elements), hot water pumps and system controls (pneumatic, electric, direct digital control-DDC) should be performed and ranked in terms of remaining useful life, design justification for continued use, replacement in kind or upgrade to more effective/efficient space terminal/central plant equipment and control.
6. Identify the opportunities to de-couple entrance vestibules, stairway, corridor spaces, toilet rooms, utility spaces and janitor closets in the building from dependence on steam/hot water heating systems, utilize electric cabinet heaters, convectors and unit heaters.
7. Where new HVAC equipment (Rooftop Unit, Condensing Unit, Air-source Chiller/Heat Pump) is located at the exterior of the building (Roof, @ grade in school yard), consideration should be given to the potential for exterior noise transmission outside to inside (affecting school program spaces, affecting neighboring properties). Sound Power Data: Lw (in the appropriate Octave Band Center Frequencies) should be obtained from the HVAC equipment manufacturer for performing a preliminary acoustical analysis.

The design of noise control measures are to be checked by an acoustic consultant.

1. Where all air heating/cooling systems (air-handling units, rooftop units) are existing or proposed as new, evaluate the extent of existing ductwork that can be abandoned, demolished or kept intact for beneficial use. Consider the age and operating condition of existing ductwork and that existing ductwork typically lacks air-tightness integrity (leakage), adequate insulation level and balancing capability. Only re-use existing ductwork where strategic value can be justified or if significant challenges present to the proper sizing, arrangement (interior, exterior) and routing (horizontal, vertical) of new ductwork through the building. Provide inspection of fire dampers and functional testing of combination fire smoke dampers (FSD) and control devices for existing duct systems that will remain in use.
2. Identify opportunities to de-couple the dependence of building domestic hot water system (DHW) on central plant oil/gas fired boiler equipment and/or the use of oil/gas fired DHW storage tank equipment, including:
3. Integrated Electric Air-source Heat Pump Storage Tank domestic hot water heater(s) equipped with an integral electric coil.
4. Central Electric Air-source Heat Pump domestic hot water heater(s) coupled with a supplemental auxiliary/back-up Electrically heated Storage Tank(s).

Fire Protection Scoping - Preliminary Considerations

1. Categorize the existing sprinkler and standpipe system(s) (including):
2. Supply of water:
3. House tank
4. Pressure tank
5. Dedicated City water fire service
6. Combined City domestic water/fire service
7. Sprinkler booster pump/Fire pump
8. Sprinkler system:
9. Limited area(s) sprinkler protection
10. Fully sprinklered building
11. Wet system (other)
12. Standpipe:
13. Wet automatic
14. Combination sprinkler/standpipe
15. Dry manual
16. Class I (other)
17. Evaluate the cost impact of primary scope of work to determine if derivative sprinkler/standpipe work is required by Code:
18. As per Section BC 901.9.4.2, if the value of alterations of a space is between 30% and 60% of the value of the existing school those portions of the school being altered shall be made to comply with the sprinkler/standpipe fire protection requirements of Section BC 901.
19. As per Section BC 901.9.4.1, if the value of alterations to a school equals or exceeds 60% of the value of the existing school, the entire school shall be made to comply with the sprinkler/standpipe fire protection requirements of Section BC 901, as if the school were hereafter erected.

Architectural/Structural Scoping - Preliminary Considerations

1. Evaluate the impact of Architectural and Structural Considerations on the "best fit" preliminary selection of new electric HVAC & DHW equipment, including:
2. Floor to slab heights (including allowance for structural beams); Width of perimeter windows and clearance above for arrangement and connection to new RTU/AHU/VUV/VRF/FC Unit ductwork.
3. Impact of new louvered openings in exterior wall and window openings.
4. Impact of duct removal or replacement on ceiling and lighting systems.
5. Impact of new duct work on the interior of PA spaces, especially Auditoriums
6. Impact of new HVAC equipment on Classroom layout (seating, occupancy).
7. Location, arrangement and size and of existing floor openings/shafts for routing new ductwork, piping and electrical conduit.
8. Roof repairs (a roof under warranty, shall be repaired by a certified contractor).
9. Impact on Kitchen exhaust System.
10. Structural load bearing capacity of existing roof construction.
11. Structural load bearing capacity of existing floor construction.

Impact of resident cinder concrete and terra cotta arch framed slabs;

1. Weldability of existing building steel and equipment dunnage.
2. Existing equipment/utility room floor space, clearance/service clearance,

floor to slab heights and available louvered wall openings.

1. Evaluate the impact of Architectural and Structural Considerations on the configuration of all new/supplementary electric service equipment, including transformers, switchboard equipment (including conduit pull space, fire pump tap, main breaker/CT/utility meter cabinet, distribution load breakers section), distribution lighting/power panels, additional incoming electrical service conduits, and other.
2. Evaluate the condition of existing windows and intake/exhaust louver openings that may require replacement or that may be considered collateral work with other interior renovation work or building envelope project work. Include a description of the existing window types and locations (double hung, projecting (outward or inward type), fixed), glazing type(s), framing materials (wood, metal), configuration (single, ganged, triple, etc.), and if there are any obscured glazing, insect screens or interior/exterior guards.
3. Inspect the condition of steel/masonry lintels over existing window/louver openings. Indicate if repair or replacement is required (include rust removal, preparation and painting of steel lintels). Identify where probes need to be done to verify the condition of the lintels and the back-up to which it is to be attached.
4. With the placement of major Mechanical/Electrical equipment at the building roof level, evaluate if the entire (or select roof) area(s) should be replaced. Consider the potential for roof warranty issues or damage to existing roofing systems if equipment supports are replaced at a later date (support curb or steel dunnage installed beyond the scope of work related to roof replacement projects). Refer to Design Requirements for roof access requirements. Addition of roof ladders or other means of access may be required.
5. Where the replacement of an entire existing roof deck or roof assembly is to be performed, provide a "Sustainable Roofing Zone" (Ref. NYC Local Laws 92 and 94 - 2019), 100 percent of which must be a solar photovoltaic electricity generating system, a green roof system, or a combination, in compliance with NYC Electrical, Fire code and NYC Zoning Resolution. FDNY access to the rooftop(s) is required by Code ( 2022 MC 304.13, FC 504.4). Existing and potentially new obstacles must be taken into account during the scoping process.
6. Evaluate the impact of Architectural and Structural Considerations on the configuration of all new/supplementary electric service equipment, including transformers, switchboard equipment (including conduit pull space, fire pump tap, main breaker/CT/utility meter cabinet, distribution load breakers section), distribution lighting/power panels, other.
7. Electric service equipment of 1,000 kVA or more (new or modified) will require the review and evaluation of allowable clearance requirements, path of egress and egress door hardware requirements that must be accounted for in the design of equipment spaces.
8. When electric service and distribution equipment are recommended for replacement, the design and arrangement of electric service equipment spaces shall provide for two means of egress when the service equipment is over 1200 amperes and board lineup is over six (6) feet.
9. Where there is a condition of non-compliance, a written justification (using allowable exceptions) must be prepared for review /approval by the New York City Department of Buildings.
10. If electric service and distribution equipment is recommended for replacement, provide for dual egress requirements where service equipment is over 1200 amperes and board lineup is over six (6) feet or justify using allowable exceptions. Non-compliance must be supported with proper documentation showing approval of the New York City Department of Buildings.
11. When the Utility company requires a transformer vault, the vault room shall be constructed of fireproof materials with minimum fire resistance separation rating of three (3) hours.
12. Major Rooftop Mechanical and Electrical equipment shall be mounted on steel dunnage with raised walkways for equipment service , concrete curbs, or prefabricated seismic/vibration isolation curbs.
13. Equipment support elements should not restrict clearance to roof systems for inspection, repair or replacement. Specify dunnage materials (painted steel, galvanized steel) and identify any requirement to protect metal surfaces (remove rust, prepare and paint, cold galvanizing).
14. The height of the steel dunnage above the finished roof surface shall be adequate to maintain and replace the roof assembly in the future. Follow the recommendations presented in "Guidelines for Roof Mounted Outdoor Air-Conditioner Installations", ARI/SMACNA June 1997.
15. Elevated roof-mounted equipment service walkways shall be metal platform, a minimum 24" wide. The length of the platform shall be sufficient to serve one or multiple equipment access panels. At locations where access panel/door swings into the platform, the width of platform shall be such that it is at least 20" in width beyond the swing of the panel/door.
16. The surface of the platform shall be non-skid with open grates. Platform shall have an OSHA compliant ladder/stair. Platform shall be located at "sill level" or such that the relative height between the platform surface and top of access panel/door is no more than 7'-0".
17. All platforms are to have a 3'-6" high railing system at all open sides. For platforms greater than four feet above adjacent roof, provide toe board along all open sides (i.e., sides that are not against the side of equipment served). Where the top of roof mounted equipment must be serviced, provide an OSHA compliant ladder for access.
18. Service walkway platforms ladder/stair structures shall be constructed to be removable to facilitate roofing and flashing during roof replacement or any other related work that requires re-roofing.
19. Curbs shall be used at duct and piping roof penetrations. For smaller equipment (exhaust fans), or if project requirements limit height of units above the roof, curb mounted equipment is to be used such that the height of the curb is 12” to 18” above the finished surface of the roof (top of paver in a protected membrane assembly). For reroofing applications, 20” minimum clearance is typically sufficient to allow reroofing as long as penetrations are reachable from the side to be flashed.