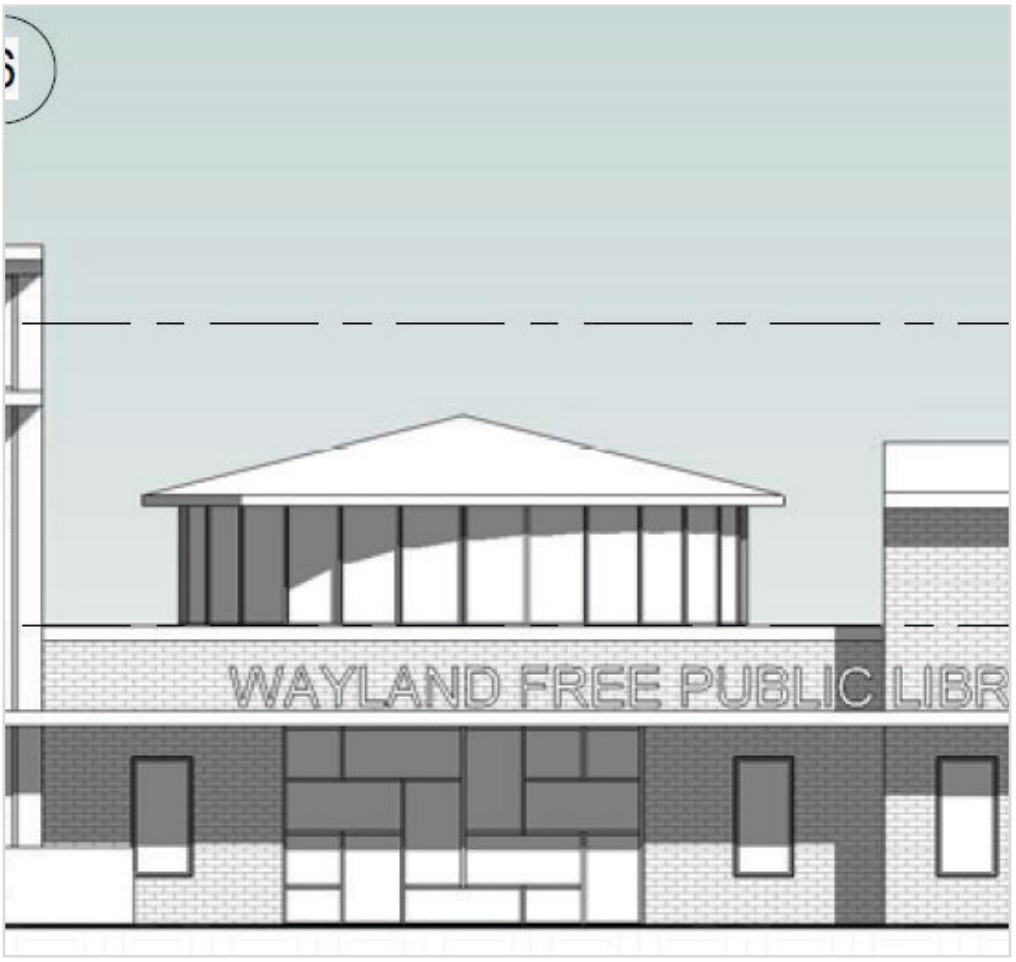
Mechanical, Electrical, Fire Protection Design Narrative

September 16, 2016

Submitted to:

Town of Wayland
41 Cochituate Road
Wayland, MA 01778



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Mechanical | Electrical | Plumbing | Fire Protection | Lighting

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Fire Protection

Included in the scope of this building project will be the installation of a new, complete system of a water based fire suppression sprinkler system in accordance with NFPA 13 Standard for the Installation of Sprinkler Systems. The NFPA Occupancy Hazard Classification for the building will be primarily Light Hazard for the purpose of establishing sprinkler discharge density and allowable maximum square foot coverage per sprinkler head. Mechanical rooms, electrical rooms and storage areas will be classified as Ordinary Hazard Group 1.

A new 6 inch fire sprinkler water service (independent of domestic water) will be brought into the building from municipal water mains in a lower level mechanical space. A double check valve backflow preventer device required by D.E.P. 310 CMR 22.22 will be provided at the water entrance to protect the public water supply. The supply piping will then have installed a wet alarm check valve to supply the piping to sprinkler heads in all occupied spaces within the building.

Due to the height of the building not exceeding code thresholds the installation of a standpipe system for fire hose connection valves in the egress stairways will not be required. Due to the lack of excessive height of the building, and the lack of pressure requirements for standpipe systems it is not anticipated that a fire booster pump will be required for this system. Fire hydrant flow tests in the vicinity of the structure will need to be performed to confirm this.

A fire department connection allowing the fire department to selectively pump into and pressurize the building fire protection piping will be installed somewhere in the front of the building to be visible to the responding fire department personnel, and by code will need to be within 100 feet of a municipal fire hydrant.

Plumbing

This project will include the provision of multiple new toilet room facilities and miscellaneous plumbing fixtures. The location of these rooms and the total number of new plumbing fixtures will be based on the expected number of occupants of the building and the requirements of Section 10.10 of the Mass. Plumbing Code.

A new domestic water service will be brought into the building from a connection to municipal water mains. The required size of the service will be calculated when number and style of new plumbing fixtures has been determined (e.g., flushometer valve style waterclosets often require larger water service piping than residential style floor-mounted tank type waterclosets), but it is anticipated that a minimum service size of 3 inches will be required.

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Domestic hot water will be from a new gas-fired high-efficiency condensing type domestic water heater appropriately sized for the anticipated use. HW distribution piping will be provided with a pumped recirculation system to provide HW temperature maintenance within the piping to ensure rapid delivery of HW at the fixtures. Public lavatory discharge temperature of HW will be limited to 110 degrees F with the provision of individual tempering valves at each lavatory.

A new natural gas service will be brought to the building with an external gas meter/regulator set and with new properly sized piping to all gas utilization equipment (space heating and domestic water heating primarily).

New sanitary drainage piping, sanitary vent piping, and hot and cold domestic water piping will be installed from the locations of the new toilet rooms and other miscellaneous plumbing fixtures, generally within new pipe chases and within walls or above ceilings, to source piping in the lower level piping in the basement mechanical spaces. New plumbing fixtures will meet all new codes for energy and water conservation and accessibility. Sanitary piping will ultimately discharge to a pumping system to convey sanitary waste flows to an on-site septic system. It is yet to be determined if the pumping system will be a sewer ejector system within the building or an external lift station. Roof drainage from the building will be piped to outside the building for connection to a site storm water drainage system.

Mechanical

The Wayland Free Public Library will be a new structure located on a different site from the existing library. New mechanical systems will be designed to provide a fully conditioned and ventilated building that meets current codes including mechanical codes and the stretch energy code that has been adopted by the Town of Wayland. Our goal is to provide energy efficient equipment that can be strategically located while considering maintenance, operability (simplicity), sound levels, and budget. Our approach will be to provide centralized equipment to limit operation, maintenance, and noise to central locations that can be designed specifically for mechanical equipment.

Heating

The building will be provided with a new centralized natural gas-fired condensing boiler plant to serve the entire building. The plant will be located in the mechanical basement level and will include new pumps with VFDs, combustion air, boiler exhaust, piping, instrumentation, controls, equipment supports and pads, etc, Efficiency cannot only be determined by the various components alone but must also be designed as a system. To obtain the highest efficiencies, the heating hot water system will be provided as a lower temperature system with a high temperature difference between the supply and return.

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This approach allows for smaller pumps, smaller pipe, and higher efficiency at the boilers. Careful selection of the heating hot water coils and/or baseboard is of particular concern.

It is anticipated that the building will be provided heat via air handlers with hot water heating coils with hot water terminal coils at the variable air volume (VAV) boxes and/or four pipe fan coil units. The system or combination of systems that best fit within the building envelope while providing proper zoning and adequate ventilation air will be provided. In some locations, additional baseboard or cabinet/unit heaters may be required.

Cooling

In this approach, an air cooled chiller will be located exterior to the building, at grade. Additional shielding of the equipment may be required for aesthetics and/or noise control. New chilled water distribution pumps with VFD's will be located in the basement mechanical with the new boiler plant. The new chilled water system will be designed to allow for draining of the chiller and outdoor piping, however, we recommend heat tracing all the piping and providing freeze control from the factory in case the chiller is not drained.

Chilled water pipe will be routed to air handlers or four pipe fan coils located inside the building. These spaces need to be heated and easily accessible to maintenance personnel.

Ventilation Air

The new library is considered a high occupancy area, however occupancy is sporadic. The equipment must be designed to handle the full occupancy, especially the ventilation air. The use of energy recovery wheels and carbon dioxide sensing helps to manage these systems and utilize ventilation air as it is needed, which significantly decreased the heating and cooling requirements when the space is not fully occupied. Code requires the use of energy recovery if more than 30% of the total supply air is for ventilation. These units require additional mechanical space. Carbon dioxide sensors will be provided at each zone to control the associated zone VAV box and its associated air handler. The use of carbon dioxide sensors and VAV boxes allows for demand ventilation at the air handler to lower the amount of outside air to meet the occupant needs as measured at the CO2 sensors.

Air handlers should be located in mechanical rooms or mezzanine/attic spaces with full access to those spaces. The air handlers will be provided with economizer sections that require louvers sized for 100% of the supply air and 100% of the exhaust air. This will

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have to be coordinated with the architect to blend into the façade. If possible, roof vents could be used for exhaust air.

If stand-alone energy recovery units for ventilation air are provided, the toilet and other misc. exhaust can be routed to the energy recovery units. If this is not possible, in-line exhaust fans with roof vents or wall louvers will be required to exhaust these spaces.

Misc. Systems

The elevator machine room will be cooled, heated, and ventilated per code requirements. We anticipate that the use of a fan will be adequate for a two-story elevator.

The vestibules will be provided with cabinet unit heaters.

The tele-communications room will be provided with split system air conditioning designed to work in low ambient conditions.

The electrical and mechanical rooms will be heated and ventilated.

Controls

The building will be provided with a new DDC system tied into an energy management system. As the design progresses, the team will determine if the Town prefers web-based control (to be utilized by off-site maintenance contractor), stand-alone control via a PC at the building, or possibly remote control by the Town. Since there is a chilled water plant and a heating hot water plant, we recommend that a full graphics package be provided.

Electrical:

Electrical Service

A new 400amp, 480/277V, 3 phase service will be provided for the new building. It is expected that the Utility company, Eversource, will require a pad mounted transformer as opposed to pole mounted transformers. Secondary service conductors, consisting of 4, 600kCMIL + #2G in 4" conduit and one spare 4" conduit will be extended underground from a main distribution panel (MDP) to the utility transformer. Two (2), 4" primary feeder conduits will be extended from the transformer to a utility pole on Main St or a new pole coordinated with Eversource. A new transformer pad, approximately 6'x6' will be provide for the utility transformer. The underground primary and secondary feeder conduits will be concrete encased PVC conduits type EB. The service will be secondary metered and so the transformer and primary feeders will be provided by the Eversource.

An emergency and standby generator is not being included at this time.

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Building Electrical Design Load

Electrical load is based on the preliminary design area of: 25,000sf

Interior lighting load	25 kW
External Lighting	10 kW
HVAC loads	100 kW
Computers/Work Stations	25 kW
Data Closets	5 kW
Elevator	30 kW
Misc. power	25 kW
Connected Load	230kW
+20% Spare Capacity	275kW

Electrical Branch Circuit Panelboards

Electrical branch circuit panelboards will be dead-front type with thermal-magnetic molded case circuit breakers. Panelboards will be provided with copper phase, neutral and equipment ground busses. All panelboards will be Underwriters Laboratories (UL) listed and labeled, and comply with NEMA standard PB1 for panelboards. The main distribution panelboard (MDP) will be 400A, 480/277V, 3ϕ and will feed major mechanical equipment, elevator, and sub-feeders for branch lighting, receptacle and other building circuits. It is expected that one 100A, 480/277V, 3ϕ panelboard will be needed for lighting loads and at least three or four 100A, 208/120V, 3ϕ panelboards for the remaining branch loads. The 208/120V panelboards will require either a single dry type, step down transformer approximately 75kVA or 112.5kVA in size, feeding a main 208/120V, 3ϕ panel board or separate smaller, 30kVA or 45kVA, transformers serving individual 208/120V panelboards. Panelboards may be located in a central dedicated electrical room on the lower level, but it is recommended to have at least one 208/120V panelboard on the 2nd floor to reduce circuit lengths to 2nd floor loads. Panelboards can also be located, flush mounted in selected walls within library spaces to reduce the size of dedicated electrical room(s). A separate 208/120V elevator panelboard will be located in the elevator machine room to accommodate Code required, elevator branch circuiting.

Electrical Branch Wiring

In general, wiring will be insulated conductors installed in metal conduit or metallic tubing run concealed in the finished areas or exposed in the unfinished areas such as mechanical and electrical rooms. Minimum conduit size will be 1/2 inch.

Metal clad MC type cable may be used for branch circuit wiring where concealed above ceilings and in dry wall partitions. MC type cable shall not be used for the branch circuit homeruns.

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All conductors will be copper, 75 degree C insulation, type XHHW or THHN/THWN rated 600 volt. Minimum wire size for power and lighting circuits will be # 12 AWG.

Lighting

With LED technology advancements, there are many options for new fixtures. Lighting will play a large role in creating desired atmospheres in the varying room functions. Below are preliminary potential approaches, but final approaches and fixture selection will require significant coordination with the Architect and Wayland:

Suggested Lighting Approaches

1st floor, Children room	Linear, extruded aluminum, pendant, LED, aircraft cable suspension – Fixture profile to be determined. Additional lighting accents for "playful" atmosphere
1st floor, conical room	General LED lighting coordinated with skylight. Additional lighting accents for "playful" atmosphere
1st and 2nd floor, general stack areas	High stacks to have integrated LED lighting with/integral localized occupancy sensor control. General ambient lighting from recessed LED lighting.
1st floor, general stack area, 2 story space	High stacks to have integrated LED lighting with/integral localized occupancy sensor control. Decorative LED pendant(s) or chandelier(s) in 2 story space.
Offices, Tech Lab, Comp Workroom	2'x2', high performance, "volumetric" LED troffers
Circulation Desk(s)	Dedicated LED pendant(s), possibly multiple small round pendants located over counter for dedicated lighting.
Multipurpose/Meeting Rm	Lighting to be coordinated with ceiling design. Recessed LED down lighting or pendant cylinder LED downlights for presentation functions. Perimeter LED track lighting on gallery walls.
Stairs	Surface or recessed linear LED fixtures at landings with wall mounted linear LED indirect/direct at mid landings.
Main Entry including main exterior entrance	Architecturally integrated "feature" lighting, modern/clean/inviting/sophisticated atmosphere.

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2nd Floor, Teen Center	Linear, extruded aluminum, pendant, LED, aircraft cable suspension – Fixture profile to be determined. Additional lighting accents for "energetic/lively" atmosphere
Utility Spaces	Surface, wraparound LED fixtures
Restrooms	Recessed, linear LED slot over toilet fixtures with either recessed LED downlights or wall mounted vanity fixture over mirror
Exterior Egress	Architectural LED wall fixture over doors.
Exterior Accents	LED wall washing, grazing, striping, possibly w/subtle colors as appropriate to accent selected façade surfaces – conical children's room, circular entry, etc…
Parking areas	Pole mounted LED fixtures, "modern" appearance, 16' pole heights.

New emergency lighting will consist of emergency battery ballasts integrally mounted in the general lighting fixtures.

New automatic lighting controls will be needed to meet current Energy Code, recently updated to the IECC 2015. A networked, distributed control approach, such as nLight or Encelium will be used. This approach consists of occupancy sensors connected to addressable relays located within the space controlled. Addressable relays are connected together for centralized networked control. Daylight sensors will be added for daylight harvesting and dimming control of lighting at perimeter windows (primary sidelight zones) and skylit areas.

A multiscene dimming system will be provided for control of the Multipurpose/Meeting Rm functions and gallery track lighting. Exterior lighting will be on time clock & photo cell and connected to the network system.

Fire Alarm

A new analogue addressable fire detection and alarm system meeting the requirements of the NFPA-72 and 780 CMR 907 will be provided. The fire alarm system shall consist of a fire alarm control panel, annunciator, automatic smoke and heat detectors, manual pull stations, audible and visible alarm signals, and connections to automatic fire suppression systems. The system will report to the Wayland Fire Department either through the digital communicator connected to a central alarm service or with a radio master box coordinated with the fire departments receiving system. The system will have all code required auxiliary functions, such as initiating elevator recall. As a fully sprinkled building, full automatic detection is not required. As a minimum, automatic detection such as smoke detectors or heat detectors will

be provided in the electrical rooms, closets, data/telephone rooms, lobbies and at the top of the stairways. Fire suppression systems shall be tied to the fire alarm control panel

Communication Systems

New communication services will be brought to the building with two (2), 4" conduits extended underground to a utility pole on Main St or a new pole coordinated with service providers. Service cabling will be extended to the building by the service providers.

A new structured cabling system will be provided for telephone and data outlets. Interior horizontal cabling will be provided from the telecommunication room to voice/data outlets. If possible a dedicated telecommunication room, approximately 8' x 8' in size, will be provided for housing 19" racks, patch panels, Wayland network equipment, wall mounted 110 style telephone punch blocks as well as security system head end equipment. Ladder style cable tray will be provided for organizing cabling distribution within the room.

All wiring, outlets and terminations will be installed to comply with EIA/TIA 568 standards and exact requirements will be coordinated with Wayland standards. Horizontal cabling will consist of 4 pair, Category 6, UTP cabling for telephone and data connected to modular telephone and data jacks. Wireless access points will be provided for full wireless access throughout the building.

Security Systems

The building will have new security systems consisting of the following:

- Intrusion detection for the exterior doors via door contacts
- Card access control points for main entrance.
- CCTV surveillance system, IP based, POE (Power Over Ethernet) cameras connected to a central digital video recorder system in the main telecoms room.
- Book security

CCTV cameras will be located in collaboration with Wayland's public safety, library staff and facilities department input. It is expected that cameras will be placed on the exterior of the building for general views of the building perimeter. Interior locations may include stairways, stack areas and computer labs. CCTV will be IP based facilitating password protected access through Wayland's network. It is not expected that dedicated personnel will monitor camera images in real time, but will have archive storage allowing review based on events. Category 6 cabling will be extended from patch panels in the the Telecommunications room to cameras. POE Ethernet switches and digital video controllers will be provided based on number of cameras and storage capacity needs. System shall be based on Pelco VideoXpert recorder/controller with 48TB storage and Pelco Satrix IP series stationary cameras.

An intrusion detection system will consist of door contacts in exterior doors and motion detectors in 1st floor areas. A keypad will be located at a selected location for arming/disarming the system.

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The door access system will based on Lenel 1320 card reader controllers. Card readers will be located at selected exterior and interior doors. Composite cabling will be extended from central control panels in the Telecommunications room to door hardware.

It is assumed Wayland will utilize a book security system of some type and the project will include connection of alarms, detector gates and other peripheral equipment.

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