REPORT OF THE
CENTER STREETSCAPE DESIGN REVIEW
AD HOC COMMITTEE
to the
LEXINGTON BOARD OF SELECTMEN

Members

- Victoria C. Buckley, Commission on Disability
- Nancy Corcoran-Ronchetti, Planning Board
- Anne Laurin Eccles, Historic Districts Commission
- Margaret S. Enders, Bicycle Advisory
- John W. Frey, Tree Committee
- Jonathan A. Himmel, Tourism Committee
- Wendall C. Kalsow, Historical Commission
- Timothy D. Lee, Design Advisory Committee
- Pamela F. Shadley, Center Committee
- Howard L. Levin, Chair

Liaisons:

- Elaine Doran, Garden Club
- Wendy Manz, Capital Expenditures
- Glenn Parker, Appropriations
- Eric J. Michelson, Retailers Association
- F. David Wells, Historical Society
- Fred Johnson, Chamber of Commerce

FOREWORD

Following several years of discussion and meetings concerning the proposed renovation and revitalization of Lexington Center (the "Center Streetscape Project"), in April 2016 the Board of Selectmen adopted an Amended Charge (the "Charge") establishing a Center Streetscape Design Review Ad Hoc Committee. Over the following weeks, the Board finalized the appointment of members and liaisons to the Committee, and the Committee began work in June.

This is the final Report to the Board, including a revised Tier 1 Report.[1] It is composed as a response to the portions of the 25% Design proposal previously prepared by the BETA Group, insofar as the BETA proposal relates to design elements included in the Charge.

The Charge states as its central objective "To evaluate and make a recommendation on the various design elements (excluding engineering items related to traffic) for the Center Streetscape Project."

The Charge divides the work into three separate tiers, with target delivery dates of September 15, November 1, and December 15, 2016. For completeness and efficiency, the Committee reorganized the elements of the Charge, and this Report generally follows this outline:

Tier 1:

- Sidewalk materials and installation
- Lighting

Tier 2:

- Overall layout and site design: pedestrian, bicyclist, and driving experience
- Landscaping (trees, shrubs, structural soil)
- Irrigation and infrastructure
- Street Furnishings
    - Benches, Tables and Chairs
    - Bicycle Parking
    - Trash Receptacles/Recycling
- Roadway features: Crosswalk and median materials
- Buffers and Edges (planters, stone walls, bollards, edging)
- Stormwater including Infiltration basins

[1] The original Tier 1 Report was presented to the Board of Selectmen dated September 26, 2016.

Tier 3:

- Interpretive and Educational Elements
  - Embedded in and along sidewalk
  - Interpretive signage and markers
  - Materials (posts, plaques and markers)
  - Interface with Grain Mill Alley (activity area)
- Signage and Wayfinding
- Disruption, budgeting and cost control strategies
- Committee Follow-through
- Oversight and Project Management

The Ad Hoc Committee undertook a detailed examination of the history of the Center, the advantages and disadvantages of available sidewalk materials and designs, lighting and illumination styles and techniques, the layout and physical amenities as they affect pedestrians, bicyclists, and motorists, treescape and landscape, cultural, historical and educational elements, public safety, and construction management to ensure a successful project. A great deal of time and effort was devoted to accessibility concerns, to ensure those with various disabilities will find the Center as inviting and safe as possible. The Committee conducted research, and hosted expert presentations from consultants, authorities and community members.

The Committee's report was prepared with input from all of the Committee Members and Liaisons, and members of the general public who attended and contributed to its many meetings.

The revised Tier 1 component of this Report is responsive to comments received from Town Staff, the Board of Selectmen, and the public. We concur that "the Department of Public Works (DPW) should have flexibility in the design standards so that aesthetic recommendations in the Report do not outweigh safety considerations recommended or to be recommended by DPW and BETA Group." It is the Committee's understanding that future work by the DPW and BETA will use these recommendations, as authorized by the Board of Selectmen, as a guide for the development of the final construction documents and for actual construction.

The Committee continues to believe that the Committee's recommendations on construction procedures are within our scope. The Committee's construction recommendations are intended to add clarity and transparency to the final construction process implemented by DPW.

The Committee is pleased to present to the Board its Report on the following pages. The report, except for one element, was adopted by a vote of 9 to 0. The Committee's recommendation in favor of predominantly brick sidewalks was adopted by a vote of seven in favor, one opposed, and one abstention. A minority report on sidewalk materials, submitted by the Commission on Disability, is attached as an Appendix.

Respectfully submitted,

Howard L. Levin, Chair
January 19, 2017

EXECUTIVE SUMMARY

The core of the Board of Selectmen's charge to the Committee is:

> *"To evaluate and make a recommendation on the various design elements (excluding engineering items related to traffic) for the Center Streetscape Project."*
>
> *"The Center Streetscape Project is envisioned as a capital improvement effort that, when completed, will enable Lexington Center to achieve its many objectives of providing an inclusive, vibrant, and welcoming environment…preserving the Center's historic resources, addressing much needed maintenance, and augmenting streetscape amenities to support and expand commerce, tourism and leisure activities.*
>
> *"Mission: To ensure that Lexington Center continues to be the hub of Lexington's commercial, social, and leisure activity."*

The Committee recommends modifying the current 25% design to reflect a renewal of our existing Mid-Century Modern Streetscape which is unique to Lexington. To achieve this objective the site design should embrace and preserve the essence of the design objectives originally conceived in the 1966 "A Plan for Lexington Center," most especially the focus on creating a town center with its own distinctive character.

The Center needs to continue to function as the social and economic center of Lexington. The key character-defining design element of this mid-century modern design is the pedestrian promenade along the north side of Massachusetts Avenue. The key components of this promenade include: a uniform "carpet" of brick pavers, a double row of trees with seating areas between them, and octagonal shaped pedestrian scale lights. It is these elements that help create a unique Lexington Center, and which has influenced urban design nationally.

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In the first Tier of our report, the Committee broadly recommends that the current sidewalk materials in the Center core be replaced in kind; that is, if the sidewalks are brick, they should be replaced with brick. We see the streetscape project as a thoughtful restoration of a mid-century commercial district conceptualized by world-renowned landscape architect, Hideo Sasaki, a Lexington resident. The detailed recommendations of the Committee include specifications that will assure state-of-the-art universal accessibility, design excellence, and durability.

A clear distinction should be made between the existing molded or water-struck brick which is presently used in the Center and the proposed wire-cut brick. Both the existing and proposed brick will have a similar color range of red to brown and overall general appearance. The existing molded or water-struck brick has a quite irregular surface which is not considered acceptable for universal accessibility, as opposed to the uniform surface of wire-cut brick, which is acceptable under both the Massachusetts Architectural Access Board (MAAB) Rules and Regulations and the ADA. Another important distinction is that the existing brick is set on a sand or stone dust base which moves over time, while the proposed brick will be set on a
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concrete or asphalt base. The proposed setting method is similar to the standard method used in both Cambridge and Boston.

The Committee recommends, subject to cost considerations more fully detailed in this report, that the brick sidewalks continue to Woburn Street and Winthrop Road, anticipating expansion of public activities in front of the Town buildings and to the parkland extending to Fletcher Ave.

Our report includes many recommendations for substantial cost savings relative to the current 25% design. If necessary to reduce the cost of construction so as to enable the restoration of brick sidewalks in the core of the Center, the Board may consider cement concrete sidewalks with a brick border, but only along the curb on the east end of the project area extending to Woburn Street. While not ideal, a brick border, combined with our recommended extension of the tree-lined promenade, may be sufficient to visually connect the east end of the Center with its core.

We note that the use of placed cement concrete sidewalk panels installed with a brick border does introduce concerns with respect to changes in elevation, cracking and spalling not present in all brick construction. The Board should be mindful that while placed cement concrete is less expensive to install, it may be more expensive to maintain than brick, and in the Committee's view is less aesthetically appropriate for the Center.

Also part of the first Tier report is lighting. High quality roadway lighting and pedestrian lighting, designed to appropriate illumination levels, is one of the most important *safety* improvements for dusk, dawn and nighttime hours.

In order to illuminate six lanes of Massachusetts Ave. without adding to clutter and distraction, we have recommended replacing the current cobra-heads with tall slender roadway lights that should visually disappear. These will not detract from the character of the Center in the way that more elaborate, pseudo-historic light fixtures would. Detailed calculations for optimal brightness, hue (color temperature), and light distribution to be made by the consulting lighting designer should ensure that crosswalks, intersections and other vehicular areas receive adequate lighting while minimizing glare.

After the deliberation, the Committee is recommending continuing to use the distinctive 1960s Sasaki, lantern style sidewalk lighting design, in the core of the Center. We believe this lighting style is commercially available, updated to current LED and night sky lighting design standards, and will not require expensive customization. The Committee believes that the distinctive lighting styles outside the core commercial area, such as Emery Park, Cary Hall, and the Post Office areas should remain, as they add character to the Center.

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The second Tier of our report makes detailed recommendations with respect to the overall design of the streetscape and the related site amenities including landscaping and site furnishings. The Committee makes recommendations to improve the overall vision and design approach of the project and identifies elements to add and subtract to improve the design and help control cost. The Committee recommends performance standards and makes recommendations for amenities, including benches, street trees and related planting systems, bicycle parking, drainage and trash. Specifically, the report recommends that the Town:
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- Maintain the style of the existing benches and, over time, replace the teak with Ipe wood which is more durable.
- Increase planting soil for the street trees, using a combination of suspended pavements and increased tree wells. Add irrigation. Select street trees for low maintenance and urban vitality.
- Replace the bike racks and add more bicycle parking, individually, in clusters, and as seasonal "bike depots".
- Replace the planters with wood planters to match the benches.

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The third Tier of our report makes specific recommendations as to Interpretive and Educational Elements, Signage and Wayfinding, Budgeting and Cost Control Strategies, and Project Oversight and Management.

The Committee recommends that interpretive markers made of granite, bronze, or other durable material be embedded in the sidewalk, flush with the pavement. These markers should provide information on the history of Lexington, from the 1775 period through current times, and include information on the people and places that make our Town unique. These markers could be supplemented with online information via UPC codes, and possibly one or two traditional horizontal panels with images and information. The Committee recommends that wayfinding and signage in the Center be consolidated and updated, expanding the use of the "Lexington Oxblood Red" color scheme mounted on black poles to match the pedestrian lights, and have a uniform appearance.

The Committee has addressed costs throughout its deliberative process. Within the third Tier section of our report, there is information on items that the Committee recommends be deleted from the current 25% design, plus items that the Committee recommends be added to the project. We recommend that the consultant team update the current 25% plan and construction cost estimate for consideration by the DPW and Board of Selectmen, before the plan proceeds into final design. There are improvements within this project that may be eligible for Community Preservation Act funding, and other improvements that may be appropriate for town fund-raising, or private donations.

The nationally recognized standard for the treatment of historic properties, whether a colonial-period icon or midcentury modern streetscape, is the *Secretary of the Interior's Standards for the Treatment of Historic Properties,* which provides, in part, that "The historic character of a property will be retained and preserved. The removal of distinctive materials or alteration of features, spaces and special relationships that characterize a property will be avoided." If the Lexington Center project follows the *Secretary of the Interior Standards,* it can qualify for CPA funding under the preservation category.

One of the goals of the Committee is to create a communicative, collaborative way forward for this project, so that the work of the Committee is implemented and our Center receives the improvements that have been so vigorously discussed and, hopefully, approved by the Board of Selectmen. To that end, the Committee recommends the creation of a Project Oversight Committee that would work with the DPW and consultants during final design to assist in interpreting the recommendations as detailed specifications are developed, and to be a
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conduit with the public for ongoing questions and concerns. This Committee would also work with the DPW on the construction phasing, with the goal of mitigating impacts to our Center businesses, and to our community.

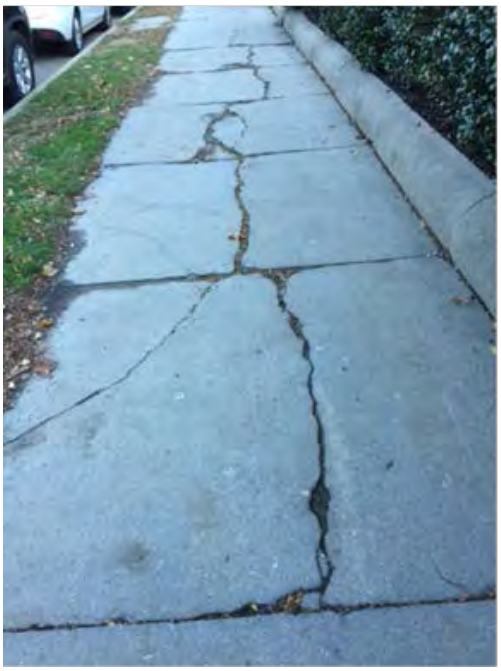
Thank you for the opportunity to submit this report.

NEED FOR THE PROJECT

In 2011 the infrastructure of Mass Ave in the Center was failing, and the street pavement needed major reconstruction. In addition, serious traffic accidents in the Center revealed the need for major safety improvements in the Center. Rather than just repair the street without addressing all parts of the Center, the Town hired a consultant team to prepare a Master Plan to address:

- SAFETY improvements
- Inadequate street and sidewalk lighting
- Non-conformance with ADA accessibility requirements
- Pavements, planting and site furnishings that need repair or replacement
- Improvements to our commercial center

It became apparent that many of the infrastructure materials in the Center were in need of repair or replacement in order to satisfy safety and accessibility requirements. Some of the current sidewalk conditions are illustrated in the following photographs:



In December of 2011, Pressley Associates presented a Master Plan for the Center at a public meeting:

The 2011 plan was met with general acceptance because it:

- Improved SAFETY in the Center
- Reorganized and clarified pedestrian street crossings
- Added bumpouts to narrow the street crossings
- Clarified traffic circulation / replaced deteriorated pavements
- Improved lighting on crosswalks and overall
- Improved bicycle access
- Replaced non-conforming brick sidewalks with ADA-compliant brick sidewalks;
- improved universal access throughout the Center
- Maintained and increased seating areas
- Improved planting, consolidated signage

In 2013 the Town hired the BETA Group to continue the project through construction. BETA conducted traffic studies and developed a 25% Plan:

The core requirements of the Center Plan have not changed:

- SAFETY is the first priority
- Improved accessibility, function and aesthetics are required.

In 2016 the Selectmen created the Center Streetscape Design Review Ad Hoc Committee to work through all aspects of the Center Streetscape plan. Our goal is to present a vision of the Center for the next 50 years.

REPORT OF THE COMMITTEE

The Lexington Center Streetscape Project sidewalk 'scope' runs along Massachusetts Avenue from the Cary Library to the intersection of Fletcher, Woburn, and Mass Ave[2]. [3]

The Center Streetscape Design Review Ad Hoc Committee is specifically tasked with a vision that calls for "providing an inclusive, vibrant, welcoming environment … enhancing and preserving the Center's historic resources, addressing much needed maintenance," and providing safe and comfortable access. As can be seen in the adjacent photograph, the "inclusive, vibrant welcoming environment" and the "Center's historic resources" predominantly consist of the brick sidewalk, brick "gathering areas" flanked by benches, a colonnade of trees and shrubs separating the pedestrian and vehicular areas, and concrete sidewalks on the east end of the project area.

Our Center is unique. During its initial deliberations, following a detailed review of the history of the Center, the Committee decided to approach this project as a renovation and preservation of the "mid-century modern" village center masterpiece envisioned by the 1966 Plan for Lexington Center, generally known as the Sasaki Plan, as implemented by our Town leadership a half century ago. This distinctive and successful concept of the Center underlies the Committee's vision for the next chapter of Lexington Center. Temptation to adopt faux historical features or theme park elements commonly found in some other downtowns, from "Victorian" streetlights to "colonial" bollards, has been avoided in favor of authenticity and simplicity.

Project Vision and Design Approach

The Committee recommends that the overall design vision and approach for the project reflect a thoughtful rehabilitation of our existing Mid-Century Modern streetscape design unique

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[2] There are approximately 3900 linear feet and 61,300 square feet of sidewalk on both sides of Massachusetts Avenue within the project scope. Approximately two thirds of the existing sidewalk areas are brick and the remaining one third are concrete.

[3] Although Massachusetts Avenue is a numbered route, the project does not fall within MassDOT jurisdiction and therefore the Town does not have to necessarily follow those standards.

to Lexington. To achieve this objective the design should embrace and preserve the essence of the design objectives originally conceived in the 1966 document A Plan For Lexington Center. This document's main objective for the Center was distinctiveness. To “rescue the Center from easy mediocrity, and that mediocrity is inadequate functionally or symbolically for a community of Lexington's aspirations and heritage.”

In the original design for the Center, five specific visual objectives were being sought:

1. A distinctive character for Lexington Center, to distinguish it from the mass of similarly sized and located centers.
2. A symbolic congruence among the Center's appearance, its functions, and the community it serves.
3. Clear visual relation between the Green, the Center, and Civic Areas.
4. An easily understood pattern and contents.
5. A memorable Center.

In addition to the above, the design for the Center should be:

1. Environmentally sustainable.
2. Universally accessible.
3. Visually appropriate.
4. Strengthen compatibility with Lexington's historic resources.
5. Safe and welcoming.
6. Sensitive to and serves as a catalyst for business activity.

By following these objectives, the result will be a distinctive revival of our historic downtown: one that is universally accessible, in concert with the environment, enhances and preserves Lexington's historic resources, complements and stimulates business activity, strengthens our sense of community, and is a welcoming, safe environment for all visitors.

We hope that this Report will achieve the goal of providing the Town with a road map for revitalizing the Center, in order to continue its central place in our 21st century community.

Tier 1—Sidewalks and Lighting

SIDEWALKS

After careful discussion and deliberation, the majority of the Committee recommends the sidewalk material to be square-edged wire-cut brick, with the stipulation that it needs to be *precisely installed* and *properly maintained*. The 25% design introduced a cement concrete pathway to the existing all-brick sidewalk sectors, and brick borders, a dramatic departure from the existing aesthetic of Lexington Center. The Committee concluded that the cement concrete pathway recommendation is aesthetically unacceptable, as such a pathway is incompatible with the historic nature of the Center and the distinctive character of our central business district. The Committee also found that the pathway recommendation was based on the assumption that only a cement concrete surface would comply with accessibility and vibration standards. In fact, the Committee concluded after extensive study that properly installed square edged wire cut brick complies with accessibility standards, and will equal or exceed the performance of concrete in this regard.

Sidewalks must meet the ADA guidelines as adopted by the Massachusetts Architectural Access Board (MAAB) and Public Rights of Way Accessibility Guidelines (PROWAG). There are concerns about vibration with segmented pavers, yet this health hazard can be minimized with specific design considerations.[4] It is the Committee's conclusion that brick is the appropriate aesthetic choice, functional choice, and is most responsive to the project vision.

The phrase "precisely installed" is included here because the Committee recommends that very specific material selection and installation procedures be included in the construction specifications, and that construction oversight be equally exacting. Our expert presenters have reported multiple times that material failures are due primarily to poor quality material or installation. We concur with the DPW that a maintenance protocol be developed and funded.

The majority of the Committee is mindful of the reservations expressed by the Commission on Disability, and its stated preference for a solution that includes cement concrete walkways. The replacement of the molded brick with square-edged, wire cut brick set on an improved base will allow the existing color, texture and experience of the material to remain, while becoming compliant with today's accessibility standards.[6]

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[4] Regarding sidewalk vibration aka "roughness:" The US Access Board retained the University of Pittsburgh Human Engineering Department to develop "a standard that will make sidewalks safer and more comfortable for wheelchair users." ASTM standard E3028 was approved in September 2016 and describes a method to collect and analyze data from a sidewalk to determine its roughness. It has been demonstrated that "Roughness can make sidewalks uncomfortable and risky for wheelchair users and others such as parents pushing strollers, postal carriers pushing three-wheeled carts, and people using wheeled walkers.

The Committee strongly supports the continuation of brick as the sidewalk material in the core of the Center. We are also extremely sensitive to the comments made about project cost, and understand that installed costs of brick are higher than cement concrete.[5] While cement concrete is generally considered a durable, cost effective sidewalk material, if it is appropriately detailed, specified and installed, it is not the appropriate aesthetic choice for Lexington Center. [6] Also, a mix of cement concrete with brick borders could be susceptible to differential settling which can cause tripping hazards, wheelchair discomfort, ongoing ADA compliance issues, and other shortcomings arising out of use of dissimilar materials in conjunction with each other.[7] Differential settling can be minimized with careful construction detailing, and the continuation of the base and subbase between dissimilar materials.

Since the initial Tier I Report was presented in September of 2016, the Committee has heard additional presentations by experts on both cement concrete and on vibration. The Committee shares the Commission on Disability's concern that vibration is an issue to many people, and shares their desire to create a comfortable environment for all. Based on data presented by Dr. Jonathan Perlman at two different meetings, it appears that measurements on exposure limits to vibration by both manual and electric wheelchair users result in very similar limits for both clay brick with no chamfer and poured-in-place concrete (12.82 hours and 11.62 hours respectively). We believe that the experience of users on both these materials can be improved from these time limits by careful design of joint size and non-chamfered edges. Dr. Perlman stated that these two factors are the greatest contributors to increased *roughness* on pavement surfaces.

The graph below illustrates the conclusions reached by the University of Pittsburgh study of the effects of sidewalk vibration and the relative characteristics of clay brick (with no chamfer) and poured-in-place concrete:

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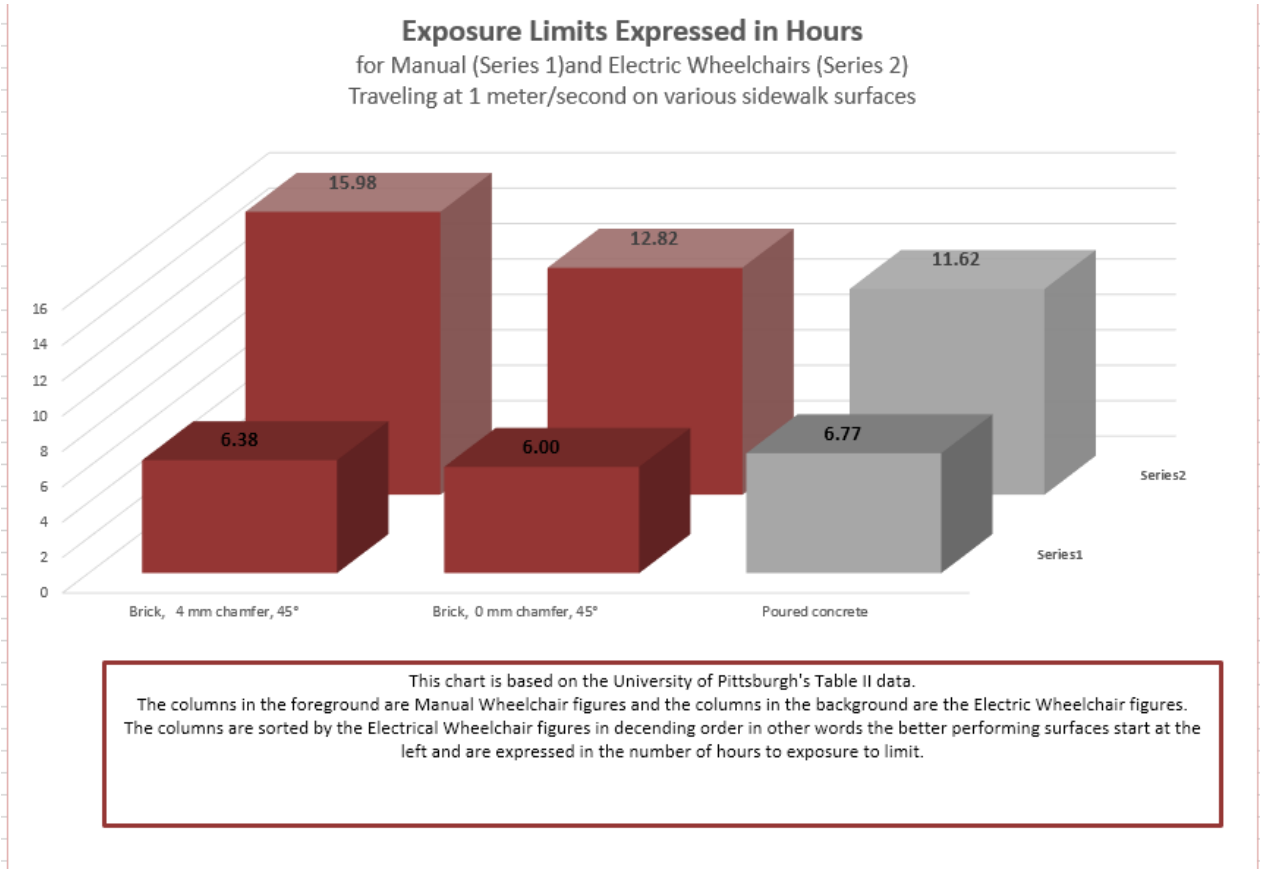
[5] While the installation cost of cement concrete pavement is less than that of properly installed brick pavement on a concrete or asphalt base, the Committee believes that the maintenance cost of cement concrete pavement is likely to be higher than brick pavement as the cement concrete may need to be replaced multiple times over the same period, and brick is more easily repaired. Further, repairs to concrete typically do not match the abutting cement panels due to the normal aging process of cement.

[6] It was stated by the Town Engineer that cement concrete needs to be reinforced, air entrained and troweled appropriately to preserve its structural characteristics and resistance to spalling and cracking.

[7] This can be readily observed in Lexington, particularly on the south side of Mass Avenue, where the worst cases of changes in level seem to occur where different materials meet.

Exposure Limits for Wheelchair Users, Brick vs. Concrete, (Source: University of Pittsburgh)



The above chart compares the performance of brick and cement concrete in terms of surface smoothness for electric and manual wheelchairs, expressed as hours of comfortable use. In essence, new, properly laid brick is smoother than, or as smooth as, a poured cement concrete surface.

PROJECT COST

In response to the concerns about project cost, the Committee believes it is possible that beyond the commercial core of the Center, the sidewalks could transition to cement concrete with a brick border (assuming it is carefully detailed to minimize differential settling). The brick border would need to continue the color and material from the center, extending the same color palate further towards Woburn Street, and it will need to collect the signage, parking meters, light and utility poles that typically are located along the back of the curb. On the east end of Mass Ave, this transition from all brick to concrete-with-brick-border could occur at the western driveway of the First Baptist Church on the south side, and at the exit drive between the Town Offices and the Post Office on the north side. Nevertheless, use of all brick remains the material of choice as far east as possible, especially on the north side.

Further discussion of project cost can be found later in this report.

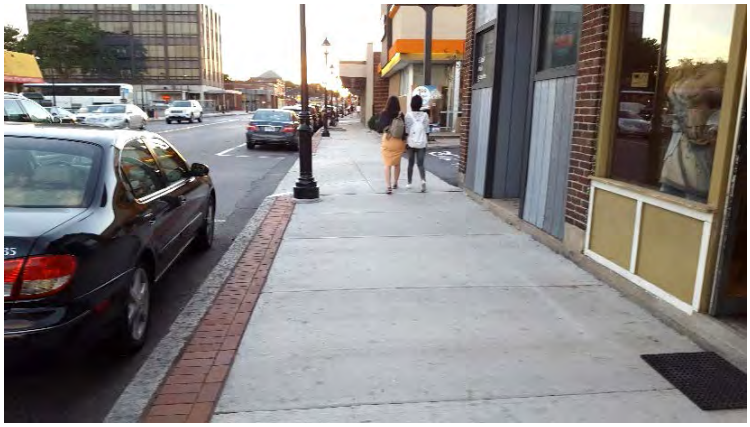
PHOTOS OF SIDEWALK MATERIALS AND EXISTING CONDITIONS

Photographs of examples of sidewalk materials discussed above are set forth below. Included are photos of existing conditions in Lexington Center that have been recently observed.

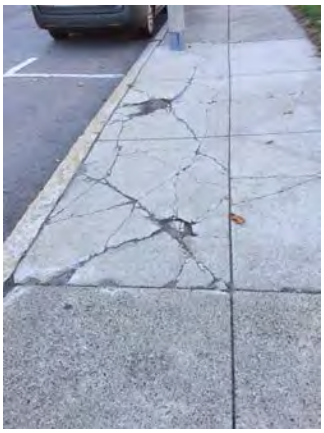
Example of wire cut, square-edged brick laid in a herringbone pattern

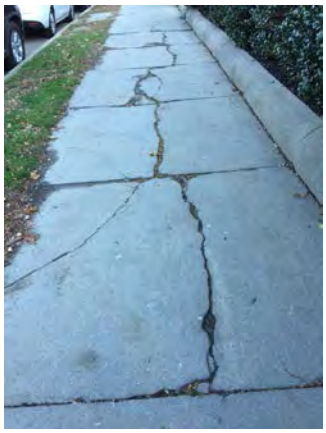
Example of cement concrete with sawn joints and medium broom finish

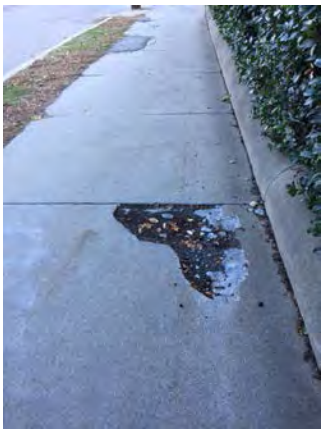
Example of cement concrete sidewalk with brick border



Examples of Existing Conditions Lexington Center, Concrete and Mixed Material Sidewalks, Older and Recently Installed Sidewalks:







ACCESSIBILITY BY PERSONS WITH DISABILITIES

With input from the Commission on Disability, the Ad Hoc Committee studied the impacts of different pavements on persons with disabilities.

Vibration for Wheelchair Users

- Whole-Body Vibration (WBV) exposure can be dangerous for wheelchair users.
- Studies are underway to implement a new ADA standard for *surface roughness*.
- As surface roughness increases, the magnitude of vibrations increases.

An existing ASTM Standard controls the *measurement* of roughness. A new ASTM (American Society for Testing and Materials) standard was approved in June 2016 for paving slabs and sidewalk smoothness and will be incorporated into the ADA over the next several years.

Dr. Jon Pearlman, University of Pittsburgh, in a study completed in conjunction with the Veteran's Administration, found roughness could be measured for various paving materials and connected to the vibration felt by wheelchair users.

Surface smoothness for electric and manual wheelchairs, expressed as hours of comfortable use. New, properly laid brick is smoother than, or as smooth as, poured slab concrete.

Vibration and Safety for People with Mobility Issues

After meeting a second time with Dr. Pearlman and going over his findings, the Ad Hoc Committee concluded that new, tight-laid, square-edge brick pavement, set in a pattern that minimizes joints in the direction of travel, meets the roughness requirements in the new ASTM standards.

In addition, the Committee met with Tom Hopkins, Director of the Massachusetts Architectural Access Board, on June 28, 2016. The Architectural Access Board is the arbiter of disputes concerning compliance with the Americans with Disabilities Act and state accessibility requirements. According to Mr. Hopkins, "Smooth, firm and level surface with no rise greater than ¼" is the ideal; wire-cut [*square-edge*] pavers can and do meet that requirement."

Visual Impairment

The most important issues for the visually impaired are correct lighting, and a contrast in materials. Illumination levels need to be designed for specific materials and settings. New white concrete should have lower lighting, to reduce glare. Aged, "dirty" brown* concrete should have increased lighting. Brick has similar Reflectance Factor to aged brown concrete.

**USAB Warning Materials Study*

Visual disturbance from pattern versus disorientation of a blank surface

Individuals with brain injury, from cancer or accidents for example, can suffer visual and spatial disorientation and find pattern surfaces (such as brick) irritating and disturbing. Other vision impairments, such as those issues commonly associated with age (macular degeneration,

glaucoma, diabetic retinopathy, etc.), cause pedestrians to look down to read the pavement for safe walking and path negotiation. Blank surfaces, such as poured slab concrete, can cause such individuals to 'drift' ("cumulative error in perceived changes in distance and direction"). Close, regular pattern (such as brick) can help with these problems. *Source: Foundations of Orientation and Mobility*

Conclusion with respect to ensuring accessibility for users with disabilities

On balance, the Ad Hoc Committee recommends correct lighting, strongly contrasting curb ramps, and the directional pattern of brick pavement to address the needs of mobility and visually impaired people.

The Committee concluded that the recommended brick surface

- Is universally accessible
- Provides a low level of vibration if installed and maintained correctly
- Is an easy material to repair over time
- Is compatible with the historic mid-century modern streetscape

NEW SIDEWALK SPECIFICATION SUMMARY

1) SIDEWALK PAVEMENT

   a) Wire cut, square edge clay brick paver with no spacers, full 4"x 8." No chamfer.
   b) Color shall have a range from red to dark brown, no orange.[8]
   c) Setting bed shall be an aggregate base compacted to a minimum of 95% density, a bituminous concrete binder course base with a depth from 3" to 4" (thicker where vehicles might have access or as warranted by the snow removal equipment), a ¾" bituminous concrete leveling course, and modified asphalt adhesive beneath the pavers all of which retard movement and uplift. A cement concrete base be should be considered as an additive alternate given the number of interruptions and the width of the sidewalk particularly on the North side of Massachusetts Avenue, or within the base scope in certain locations that require extra base strength.
   d) The DPW recommends either a bituminous concrete base or a cement concrete base depending on specific locations, and we are in agreement. We understand the DPW's comment about subsurface utilities and obstructions, especially on the north sidewalk.

[8] Visual disabilities, as well as complex neurological issues, can cause sensory noise and problems with both depth and spatial perception. While no sidewalk material can address all such disabilities, a limited palate of brick colors can provide important visual cues, while limiting sensory noise.

The Committee recommends the bituminous concrete base because it will be suitably stable, and is less expensive than a cement concrete base.

e) Pavers shall be set according to industry standards, including restraints (building, curb, metal edge, etc.) at all paver area edges.

f) Joints shall be hand-tight, in the 1/16" but not more than 3/32" range, and be swept with a sand/concrete sand mixture such that the pavers avoid direct contact with one another to minimize breakage.

g) Bricks will be laid in a pattern that minimizes joints crossed by travelers, thus minimizing vibration (examples are herringbone or running bond in the direction of travel). Herringbone pattern was determined by the University of Pittsburgh to be superior, from a vibration standpoint, to cement concrete sidewalks with their required panel joints.

   We agree with the DPW's recommendation that a "soldier course" of brick be provided at the edges of the clay brick pavement. Also, the herringbone or running bond recommendation is made as it is our understanding that it is the current recommended brick pattern for smooth walking surfaces, to minimize joints for disabled travelers. The Committee would like the final brick pattern to be discussed during the development of the construction documents relative to making the walking surface as smooth as possible.

h) Pitch sidewalk adequately to provide necessary drainage, while maintaining compliance with accessibility requirements.

i) Install drainage weep holes below the brick as necessary

j) Minimize tree root disruption by appropriate selection of plants, root control and maintenance. The discussion of suspended sidewalk over uncompacted soils, and other methods of increasing available soil to the plants is part of the Tier 2 report.

k) All transitions between other elements contained in the sidewalk zone shall have special attention in detailing, installation, and long-term maintenance to minimize differential settlement etc. – this includes but is not limited to medallions, utility access points, edge restraining strips, and the like.

l) The specifications shall include brick similar to the list of materials and installation method described on Exhibit A. The setting bed is comprised entirely of sand and bitumen.

m) Consideration should be given to special borders, e.g. soldier course, where the sidewalk meets building facades, in order to ensure smooth transitions into store entrances and visible edges to the sidewalk.

n) Final design and installation must conform to the most stringent, government approved accessibility standards, including AAB & ADA. Brick Institute Tech Notes should be used as a guide.

o) It is the Committee's intent that Lexington's sidewalks be designed and installed to comply with the newly developed "Wheelchair Pathway Roughness Index" from University of Pittsburgh research, which enables objective evaluation of sidewalks and pedestrian pathways to quantify roughness. This measurement standard is currently awaiting adoption by the U.S. Access Board and/or other federal, state and private agencies/organizations to address the roughness of sidewalk surfaces as it relates to universal accessibility. Compliance with the Wheelchair Pathway Index can be measured by contracting with PathVu, a private business arising from the University of Pittsburgh research. Should the new standard be adopted before the bid documents are finalized, it is expected that the new standard will be included in the Center Streetscape's bid specifications.

2) HANDICAP CURB RAMPS

a) Curb ramp configurations and slopes shall meet the requirements of ADA and AAB.

b) The Handicap central ramp aka direct path of travel shall be a brick similar to that above, except that the color shall be lighter for contrast. The triangular wings formed between the main sidewalk sections and the central ramp shall be made of the same brick as in section 1.

c) The outer joints of the ramp shall be a dark brick or other appropriate material to define the transition between the horizontal sidewalk and the sloped Handicap Curb Ramp. Use of a dark brick border is intended as a visual contrast signaling a change of grade. The warning panel and brick need to be of an appropriate contrast to meet the ADA standard.

d) Installation method shall be as described above.

e) The tactile warning strip shall be of a material recommended by the Commission on Disability. The Committee notes the DPW's comments on tactile warning strips. We recommend further consideration of this question during final design on the color and material of the tactile warning panel.

f) All of the existing ramps need to be replaced with these materials and in the locations in the final plans. We agree with the DPW recommendation that the replacement of the existing ramps should occur when the adjacent sidewalk is replaced UNLESS the existing ramps are non-compliant and then should be replaced before the Streetscape project is constructed.

3) Notes:

a) Curb replacement needs to be reconsidered. We understand that reusing existing curb is a cost savings, however the combination of new and existing curb may not work well, and since brick pavers are to extend to the street curb, the back of the curb will need to be sawn to receive the pavers. The Committee is aware of the cost of new curb, and believes that possible curb replacement should be discussed during final design, and related to specific site locations.

b) An adequate budget line item specifically for Center sidewalk maintenance should be included in the town's future annual budget. The budgeted amount should be determined based on the requirements of the inspection and maintenance protocol referred to above.

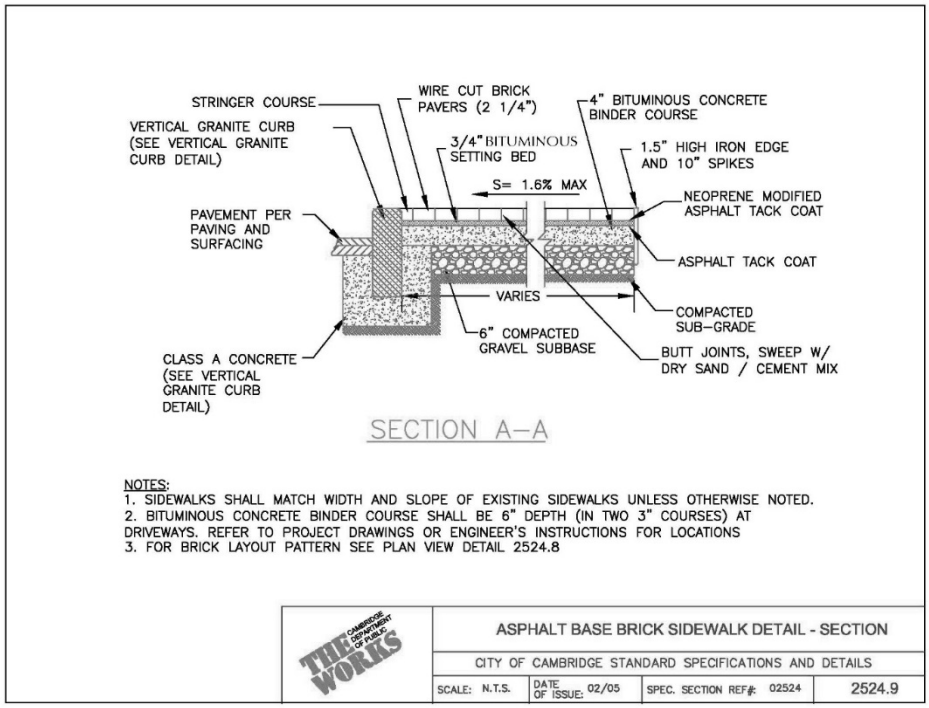
c) We believe that certain areas in the south side sidewalk may be repaired if they are non-compliant or are deteriorating. If this occurs, the south side sidewalk should be safe, compliant and usable until the phase of the Center Streetscape project occurs that rebuilds it.

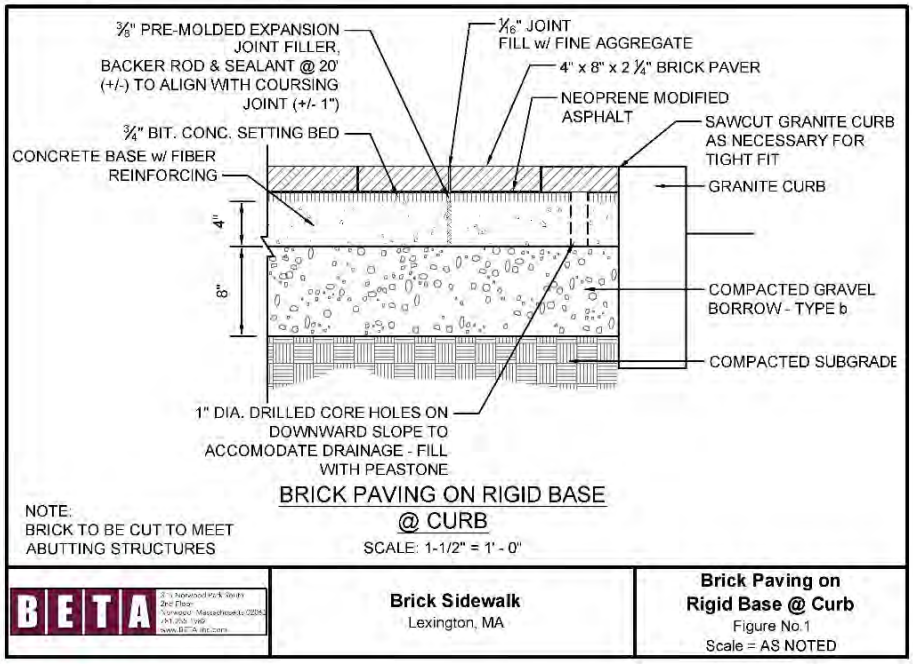
d) Life Cycle Costs (First Cost and Subsequent Costs) have been considered in these recommendations, although specific life cycle costs have not been developed. Our research made clear that proper installation will minimize maintenance costs, potentially reducing them below the cost of maintaining other materials.

The Committee understands that Life Cycle Costs are very difficult to estimate, as many assumptions about time frame, wear, and replacement costs must be made. It also may be true that a number of deteriorated, failing locations of pavements in our Center are due to poor installation, and that proper installation would reduce the damage and deterioration. In a nutshell, the Committee has learned during many presentations and discussions that proper design and installation should reduce maintenance costs, as the final product would be more robust. We are no longer recommending that Life Cycle Costs be developed by BETA Group as the Committee is making its pavement recommendations based on the goal of restoring the vitality and appearance of our current Center and honoring its mid-century landscape, while bringing it into compliance with current codes, expectations and public use of open spaces.

EXHIBIT A

The following details are supported by the Ad Hoc Committee. The first detail is used by the City of Cambridge and shows clay brick on an asphalt setting bed and base. The second detail is by BETA and shows clay brick on a concrete base.





LIGHTING

High quality lighting, designed to appropriate illumination levels, is one of *the* most important *safety* improvements for dusk, dawn and nighttime hours. In addition, street and site lights play an important role during daylight hours, as they are often the tallest elements on the street, and contribute to the character of the environment.

The Ad Hoc Committee understands that the BETA team includes a lighting designer: Ripman Lighting Consultants (www.ripmanlighting.com). We believe that the overall lighting plan and the more intimate pedestrian areas will improve with a specific focus on lighting design, which we assume will occur in future project work phases. The designer should not only look at illumination levels but also the placement of the different types of lighting, and the consideration of moonlighting, uplighting and holiday lighting to create a vibrant, attractive and interesting center. In addition, the designer should incorporate in the final design enhancements improve the safety of cyclists using the roads and crosswalks. The Committee expects that the lighting designer will develop alternatives based on these guidelines for further discussion and evaluation.

The Committee has been asked to provide a recommendation on the *style* of the site lights. The designers are responsible for the final locations, layout, distribution type and electrical connections and controls. Below are the Committee's recommendations for the final lighting design including performance standards for and expectations of the site lighting design.

LIGHTING DESIGN PERFORMANCE STANDARDS

The final site lighting, electrical, and control plan should:

a) Meet IESNA standards for the level of use of our Center. The standards include specific illumination requirements, including "average maintained footcandles" and "average to minimum uniformity ratio". The IES standards recommend "luminance for straight roadways and streets; horizontal and vertical illuminance is the selected method for pedestrian areas; and horizontal illuminance is used for intersections and interchanges" per IES RP-8-14. The lighting design should be evaluated and revised as often as necessary to meet the standards. The Committee and DPW are in concurrence with these standards.

b) Evaluate specific illumination levels needed at crosswalks, and correctly illuminate pedestrians. Consider bicyclists relative to illumination levels.

c) Use street lights to illuminate the vehicular areas, and use pedestrian scale lights to illuminate pedestrian areas, for safety and to contribute to ambiance and character.

d) The Committee prefers to use LED bulbs for lower electricity and maintenance costs. Bulbs in street lights should be in the 3000- 3500 Kelvin range, and pedestrian lights should be in a warmer Kelvin range to mimic traditional incandescent sidewalk lighting, for the appropriate color (see appendix). We assume that the DPW and consultant team will make recommendations on the appropriate bulb type technology.

e) Locate lights in coordination with the street trees, to avoid light/tree branch conflicts.

f) Balance the height and visibility of the poles with the desire to minimize the number of poles which can be sidewalk obstructions.

g) Design all site lighting with black poles and luminaires, as this may allow different lighting styles to be visually tied together, and will also allow the DPW to more easily repair damage.

h) Adjust the final light selections to fit the needs of each specific area, for example the lengths of street with and without overhead wires. The aesthetic goals shall be maintained for all specific conditions.

i) Use these recommendations for the entirety of Mass Ave from the Minuteman Statue to Woburn Street so that there is a consistent illumination level and a consistent aesthetic appearance for this entire stretch. A change of lighting style at the Woburn Street intersection will contribute to the announcement that westbound traffic is entering a new downtown zone.

j) Minimize the number, and address the aesthetics of the electrical control panels. Locate them down side streets if possible.

k) Consider including artwork on the panels.

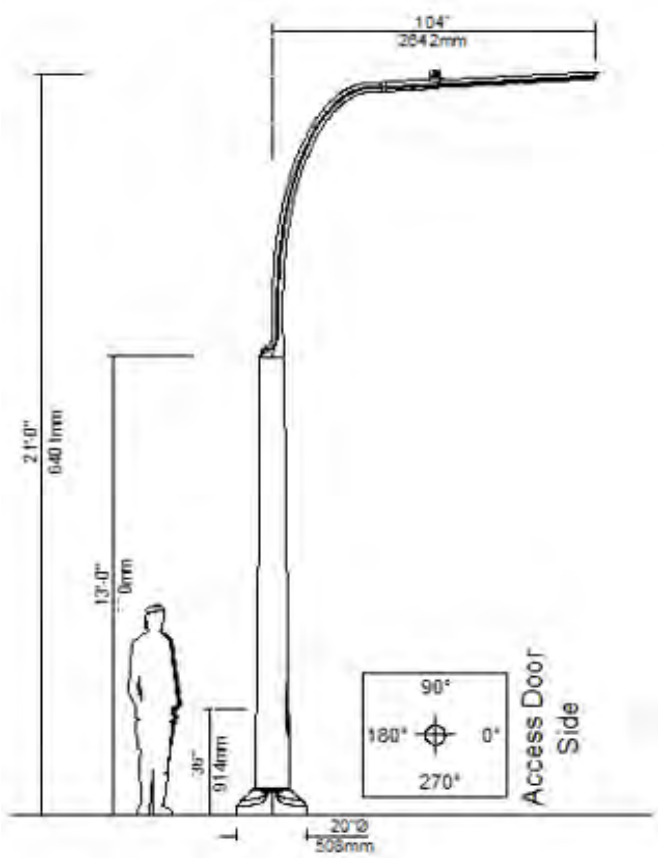
l) Holiday lighting, used for several months of the year, should be examined and updated. This should include minimizing light scatter effects, and provision of safe and convenient electric supply.

The Committee assumes that these general performance standards will be used during final design.

LIGHTING RECOMMENDATIONS

The Committee knows that there are many different types of existing lights between the Minuteman Statue and the Woburn Street intersection (the area of the Streetscape project). We know that there are several more types of lights around the Battle Green. We have kept this in mind as we make our recommendations for the Center Streetscape lighting. Our recommendations focus on STREET LIGHTS, PEDESTRIAN LIGHTS as well as existing pedestrian lights as follows.

STREETLIGHTS



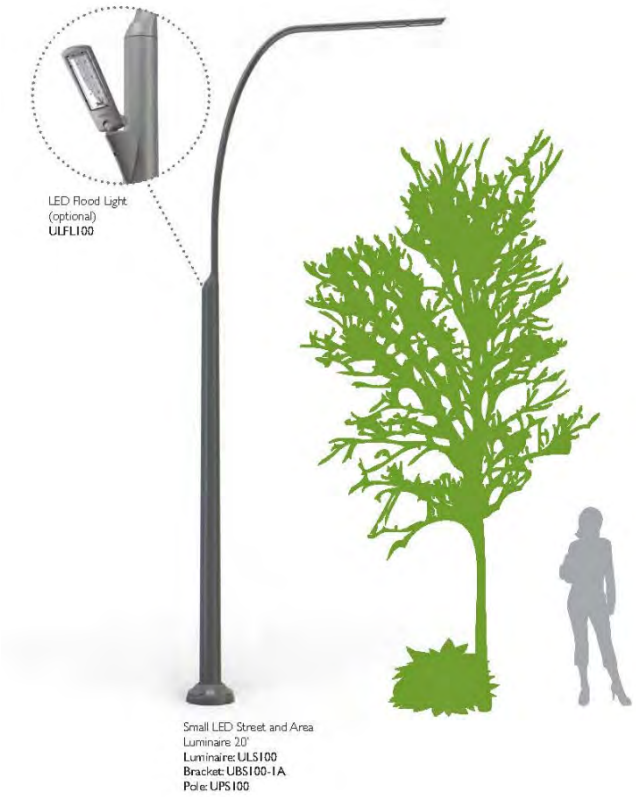
i) Tall roadway lights should visually disappear, as much as possible. The poles should be in the 20' – 30' height range, as low as they can be while still illuminating 6 lanes of travel and parking. We understand that the taller the lights, the greater the area of illumination, and therefore the fewer number of poles; this should be balanced, however, with the aesthetics of the poles and the sidewalk obstructions.

ii) The luminaires (the light heads) should be as small as possible while providing the correct amount of illumination. The luminaire and arm should be able to be mounted on existing utility poles (for the south side of the east end of Mass Ave). Poles should be round, and the arm should have some curve/elegance.

iii) The lighting design should assess whether there can continue to be street lighting only on the south sidewalk through the heart of the Center, or if staggering the street lights on both sides of the street is necessary for appropriate illumination levels. Currently there are NO streetlights on the north side of Mass Ave in the heart of the Center and the Committee would like the lighting design to consider maintaining this.

iv) The poles should be able to accept banner arms, and also additional sidewalk lights on the sidewalk side of the pole where needed.

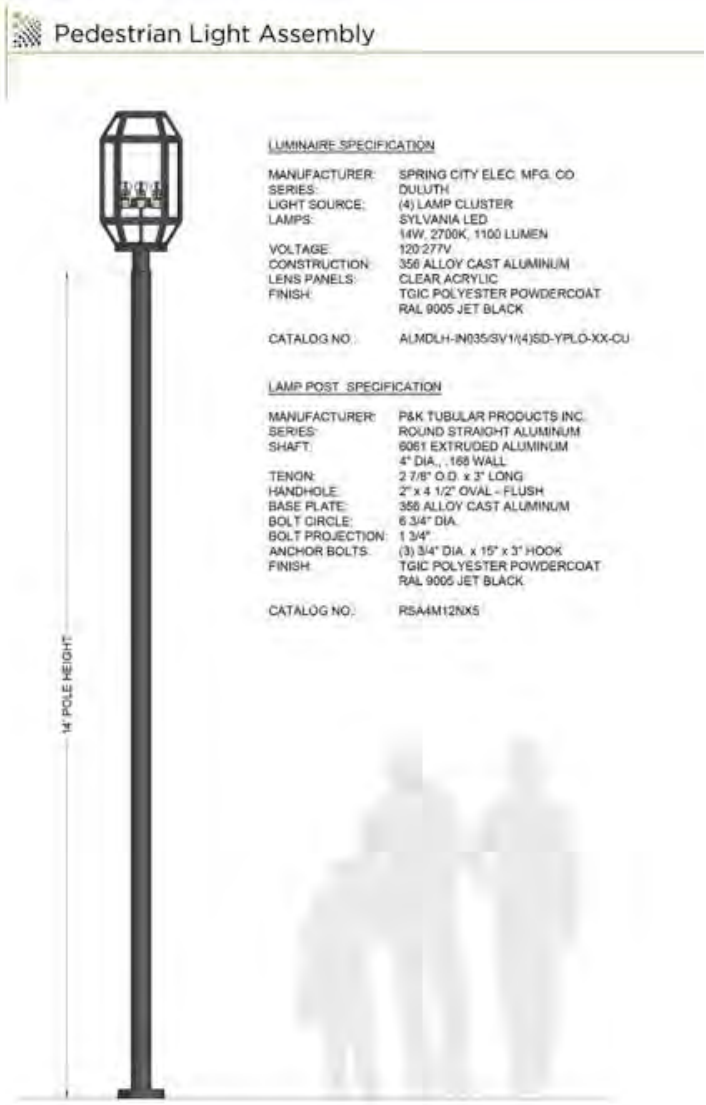
v) The accompanying images are of the type of street light being recommended.


LED Flood Light
(optional)
ULFL100
Small LED Street and Area
Luminaire: 20'
Luminaire: ULS100
Bracket: UBS100-1A
Pole: UPS100

PEDESTRIAN LIGHTS IN THE HEART OF THE CENTER AND ALONG MASS AVE

a) Pedestrian lights in the Town Center should resemble the 1965 Sasaki lights. If possible, these lights should be from a catalog and not be custom. They should be octagonal, painted black, with smooth round poles, and no ornamental top. The top panel should be a solid shield to eliminate light going straight to the sky. They should use LED bulbs or other type of efficient bulb to reduce electricity use.

b) These lights should be used in the Center from the statue to the Woburn Street intersection, wherever pedestrian lights are needed for additional illumination.



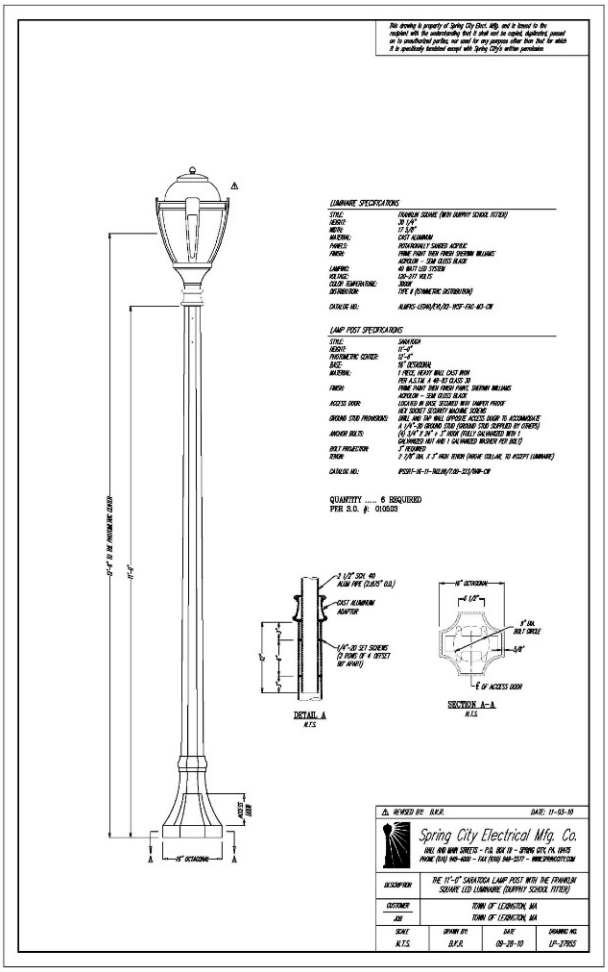
Proposed pedestrian Light in the Center, consistent with existing light, but painted black with LED bulb

PEDESTRIAN LIGHTS IN THE "MUNICIPAL" AREA, BEYOND THE BACK OF THE MASS AVE SIDEWALK

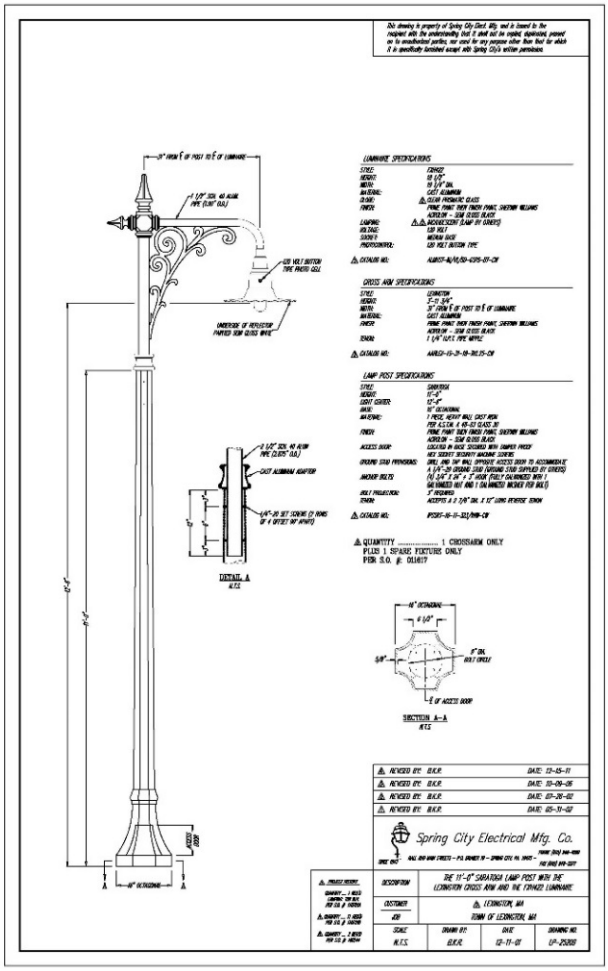
The Center area includes lights that are not technically in the "streetscape". We have discussed these, and support their continued use in areas beyond the streetscape area.

a) Lights at Cary Hall and Town Buildings, and on town-owned land outside the main commercial core, can continue to be those currently installed at the Town Offices.

b) Pedestrian Lights at Depot Square Park: Depot Square Park should maintain its ornamental lights, as this is a park and not a streetscape. Along the sidewalk, add roadway lights as needed for illumination continuity in the street.



----Existing Light at Cary Hall



----Existing Light at Depot Square Park

Existing Lights in Lexington Center--Evening

Existing Lights in Lexington Center--Daytime

Tier 2—: Layout, Furnishings, Trees, Irrigation

The following component of our Report and covers the following subjects:

- Overall layout and site design: pedestrian, bicyclist, and driving experience
- Landscaping (trees, shrubs, structural soil)
- Irrigation
- Street Furnishings: Benches, Tables and Chairs
- Bicycle Parking
- Trash Receptacles/Recycling
- Roadway features: Crosswalk and median materials
- Buffers and Edges (Thin planters, Stone walls, Bollards, Edging)
- Stormwater infiltration

To evaluate each Tier 2 component and its relationship and value to the Center Streetscape Design, the Ad Hoc Committee conducted its own research and hosted presentations from consultants, experts, and community members. This gathered information helped the Committee formulate their recommendations.

Presentations related to Tier 2 components:

- Kelly Carr from the BETA Group - Design process, street trees and plant beds
- Jeff Bowman from Irrigation Consulting - Urban irrigation
- Nadene Worth from Landscape Forms - Determining material selection for site furnishings in outdoor environments
- Peggy Enders from the Town of Lexington Bicycle Committee - Bicycle use and parking
- Andy Balon from Bartlett Tree Experts - Urban soils, trees and urban landscape maintenance

To address cost control measures the Committee also evaluated and identified components or elements of a component that could be modified, reduced in scope, or eliminated to control or reduce the overall cost of the project. These items are generally identified here and discussed in greater detail within this Tier section.

- Overall Design - Simplify the overall design of the streetscape
- Landscaping – Installation methods and irrigation will reduce life cycle costs, plant maintenance, and plant replacement
- Site Furnishings – No movable tables & chairs

- Buffers & Edges - Eliminate decorative embellishments such as bollards, walls, posts & rail fencing, less movable planters.
- Roadway Features – No decorative roadway paving and markings
- Stormwater Infiltration – Simplify methods of infiltration

OVERALL LAYOUT & SITE DESIGN

OVERALL LAYOUT & SITE DESIGN RECOMMENDATIONS

The Committee recognizes and appreciates that there have been numerous meetings and many design iterations developed for this project. The Committee would like to thank all who have given their time to participate in the process thus far. Taking this into consideration, and after numerous meetings of its own to review, discuss and analyze the currently proposed streetscape design, the Committee has determined that the basic design philosophy and design approach should be adjusted to achieve a successful outcome.

The Project Vision and Design Approach

As stated above, the Committee recommends that the overall design vision and approach for the project reflect a thoughtful rehabilitation of our existing Mid-Century Modern streetscape design unique to Lexington. To achieve this objective the design should embrace and preserve the essence of the design objectives originally conceived in the 1966 document A Plan For Lexington Center. This document's main objective for the Center was distinctiveness. To "rescue the Center from easy mediocrity, and that mediocrity is inadequate functionally or symbolically for a community of Lexington's aspirations and heritage."

In the original design for the Center, five specific visual objectives were being sought:

1. A distinctive character for Lexington Center, to distinguish it from the mass of similarly sized and located centers.

2. A symbolic congruence among the Center's appearance, its functions, and the community it serves.
3. Clear visual relation between the Green, the Center, and Civic Areas.
4. An easily understood pattern and contents.
5. A memorable Center.

In addition to the above, the design for the Center should be:

1. Environmentally sustainable.
2. Universally accessible.
3. Visually appropriate.
4. Compatible with Lexington's historic resources.
5. Safe and welcoming.
6. Sensitive to and serves as a catalyst for business activity.

By following these objectives, the result will be a distinctive revival of our historic downtown that is universally accessible, in concert with the environment, will enhance and preserve Lexington's historic resources, complement and stimulate business activity, strengthen our sense of community, and is a welcoming, safe environment for all visitors.

Overall Design Recommendations

The revised design should respectfully and carefully preserve and restore the vision of the original design concept while meeting both the current and future needs of the Community. The design should incorporate technical advancements in materials, and methods that are proven, sustainable, cost effective, easily maintained, and will assure safety and universal accessibility.

The Committee recommends that the current twenty-five percent streetscape design documents be revised to reflect the project vision and design approach and the following specific design recommendations.

SPECIFIC LAYOUT & SITE DESIGN RECOMMENDATIONS

Woburn Street to Edison Way

It is important to note that at the writing of this report the roadway and signalization design for the Woburn Street intersection has not been finalized or approved. The Committee cannot comment on the streetscape design features related to the current intersection design. Instead the Committee is responding to the overall design concept for the balance of the streetscape design.

The Committee recommends increasing the sidewalk width along the north side of Mass. Ave. from either Edison Way or Town Office Building depending on the final roadway and turn

lane alignment. This recommendation will allow more trees to be planted in tree wells and/or plant beds between the sidewalk and the roadway, and it will extend the concept of a 'promenade' while strengthening the physical and visual connection between the central business district, Cary Hall civic area, Fletcher Park and the Woburn Street intersection.

Edison Way to Meriam Street

The central business district is the heart of the project and requires the greatest level of historic design sensitivity to accomplish the project's objectives.

The current tree lined pedestrian promenade with 'eddies out of the stream of movement for pleasurable pause' was designed to create a powerful element that would give a 'distinctive character to Lexington Center, helping differentiate it from the multitude of commercial areas now similar in appearance but representing communities far different in character and heritage.' This design philosophy has held true for more than forty years and should hold true into the future.

The design should be simplified by eliminating:

1. The granite bollards (unless needed for safety);
2. The stone walls (except in front of 1628-1634 Massachusetts Avenue. A retaining wall may be necessary to create the proposed seating area);
3. The wood rail fence with granite posts at Cary Hall;
4. Realignment of the existing roadway curb layout except to increase sidewalk width, for drainage improvements or parking and crosswalk bump out adjustments and additions;
5. Median strip and crosswalk decorative paving;
6. The seating area in front of Cary Hall. (The seating area proposed in front of Cary Hall should be reconsidered and coordinated with the design currently being developed for this area);
7. Some paving and enlarged planting areas in front of 1640-1656 Massachusetts Avenue;

> *"Visual objectives are rarely achieved by simple embellishment"*
> *--A Plan for Lexington*

The design should be improved by adding:

1. Bicycle parking in designated nodes or clusters along both sides of Mass. Ave. and at Fletcher Park (See bicycle parking under site furnishings and amenities);
2. Adequate trash and recycling receptacles. Locate on or adjacent to paved surface away from intersections and crosswalks;
3. Seating that allows accessibility for all (room for wheelchairs, good maneuvering and leg room);
4. Additional tree wells/plant beds to those currently proposed on both sides of Mass. Ave.;

5. More trees and planting then currently proposed along the north side of Mass. Ave.;
6. Curbing to create plant beds and edges;
7. Only barrel planter replacements, no other movable planters to be used;
8. Both temporary and public art installations

LANDSCAPING

The Committee has been asked to provide recommendations related to the design and installation methods for the landscaping. The Landscaping includes the design layout, selection and installation methods for all trees, shrubs and herbaceous plantings within the scope of the project area. Nutritious soil, water, air, and drainage are important basic needs for all plants and should be considered essential components in the development of the landscape. The design consultant is responsible for final locations, layout and distribution of planting types that are in concert with the Committees recommendations.

Existing Landscape

The current landscape within the project area consists primarily of deciduous canopy street trees, evergreen shrub hedges, mixed shrub plantings, and decorative planters with seasonal planting. The strongest and most important landscape element is the street trees. The trees located in the core of the project are the most important vertical landscape element. They help create the 'Promenade' conceived for the north side of Mass. Ave. in the 'A Plan For Lexington Center' comprehensive report, soften the existing architecture, define space, and create shade. To strengthen the appearance and enhance the simplicity of the existing streetscape design, the primary canopy trees were originally all the same type and species of tree. This created a strong, uniform, visual element giving the Center its distinctive character.

LANDSCAPING PERFORMANCE STANDARDS

Planting Procedures and Installation Standards

1. Have all existing plantings, particularly the street trees, assessed by an independent certified arborist/horticultural consultant
2. This evaluation report should provide recommendations for keeping, removing and caring for each plant especially the street trees. The landscape design should incorporate these recommendations accordingly
3. Comply with the Town of Lexington Tree Bylaw
4. Have all tree removals and tree selections coordinated and approved by the Tree Committee and other related Committees including but not limited to the Design Advisory Committee
5. Have the appropriate permits in hand prior to removing any trees approved for removal

6. Planting pits & tree wells should allow for a planting hole that is 2.5 times larger than the trees root ball diameter
7. Individual tree wells should have a minimum depth of 3’-0” or a depth that equals the height of the tree root ball, plus two-inch mulch cover, plus two inches of air space, plus tree grate installation requirements whichever is greater
8. Trees planted in a suspended pavement system should utilize a suspended tree grate system
9. Individual tree wells that are not part of a suspended paving system should be as large as possible with a minimum width of either 6'-0” by 6'-0” or a minimum width of 4'-0” and a minimum length of 8'-0” unless the site conditions, such as utilities, do not allow

Plant Selection

1. Select plants that are hardy to our region, urban landscape conditions and the microclimate they will be planted in.
2. All plants shall meet the American Standard for Nursery Stock guidelines and requirements.
3. Select trees with generally an upright and open branching habit that will provide adequate shade and visibility for adjacent storefronts and signage.
4. Select trees and shrubs that have drought tolerant tendencies and generally minor pest and disease issues.
5. Select trees and shrubs that are generally considered low maintenance.
6. Specify trees with a minimum caliper size from 3” to 4”. 4” caliper trees should be irrigated and used between Meriam Street and Edison Way on both sides of the Mass. Ave.
7. All trees should have a minimum branching height requirement of 6'-8” above finish grade.
8. Select trees that are not a host for the Asian Longhorn Beetle.
9. Select trees that have tolerance of varied soil conditions such as compaction, pH and salt
10. Select trees that will be sturdy enough to support holiday lights.
11. Locate street trees in coordination with the site lighting and utilities to avoid light/tree branch and tree root ball conflicts.

LANDSCAPING RECOMMENDATIONS

Landscape Design

The overall design objective is to visually retain the existing landscapes layout, especially the street trees. To achieve this the Committee recommends utilize the existing planting and tree locations as much as is feasibly possible whether existing trees and shrubs remain or are replaced especially between Meriam Street and Edison Way.

Meriam Street to Edison Way

The Committee recommends reestablishing the tree-lined 'Promenade'. The same tree type and species should be used for the primary deciduous canopy tree on both sides of Mass. Ave. A second tree type can be used in groups for added interest and species diversity along the north side of Mass. Avenue. The plant beds on the north side of Mass. Ave. should be combined wherever possible to create 'U' shaped seating areas. Plant beds should have raised curbs to help reduce soil compaction. The curbs can have openings or drains incorporated to optimize rainwater runoff collection into the planted areas. Shrubs should be used to create seating areas and separation from vehicular traffic. These shrubs should be tall enough to create a visual barrier from the street and parked cars when seated. Trees and shrubs selected for this area should have either insignificant flowering or fruiting interest or flower early and fruit late to limit bird and bee interaction.

> *"This [beautification] involves far more then embellishment. It involves the design of roadways, and it involves the use of landscaping less as embellishment than as a structural element in achieving the above [design] objectives."*
>
> *--A Plan for Lexington*

Installation Method (See Exhibit A)

On both sides of the street a suspended paving system, such as Silva Cell, and irrigation is being recommended to provide the maximum amount of soil, eliminate soil compaction, and create an optimum growing environment for the tree and shrub plantings. This system can be installed under the entire paved pedestrian area, in blocks or in linear strips to connect plant beds based on tree and plant bed arrangements.

Edison Way to Woburn Street

The Committee recommends continuing the tree-lined promenade by extending the primary street tree planting. This will strengthen the physical and visual connection to the core business district by creating a continuous tree canopy. The street trees can continue along the north side from Edison Way to Woburn Street and from Edison Way to the first utility pole along the south side. To create a double row or 'Allee' additional trees can be planted on the north side behind the sidewalk from the exit drive between the Post Office and Town Offices to Woburn Street. This will further strengthen the promenade connection to Woburn Street. The existing and proposed tree wells along the north side of Mass Ave. should be increased in size to allow for more soil volume and planted with additional trees and shrubs or herbaceous plant material to add interest and reduce foot traffic in the plant beds. The balance of the trees used in this area can be a mix of deciduous trees of different types and sizes. Some flowering trees may be added for interest. Shorter trees are recommended for the south side of the street under powerlines.

Installation Method

Trees planted along the north side of Mass. Ave. should be planted in tree wells at least four feet wide, at least ten feet long and backfilled with loam. Adequate irrigation, aeration, and drainage should be added to create the best growing conditions possible. The street trees planted on the south side of Mass. Ave. should be planted in four feet by eight feet tree wells with tree

grates that are suspended above the planting soil to allow rain water collection and eliminate soil compaction.

Waltham Street

The Committee recommends adding at least two street trees to the west side of Waltham Street between Massachusetts Avenue and Vinebrook Road. These trees should be planted in four foot by eight-foot tree wells with tree grates suspended above the planting soil to eliminate soil compaction, and allow rain water collection.

Recommended Tree Species (See Exhibit B)

Trees recommended have been selected based on their history of success planted in similar landscape conditions. It is important to note that street trees are impacted by a variety of conditions that can cause stress to the tree. These impacts can limit the ideal growth habit of the tree including height.

Medium to Large Street Trees – Typically greater than 35'-0” in height.

These trees can be used in any planting condition proposed for the project except under power lines or wires but can be planted behind power line locations. Suitable for suspended pavement, tree wells, or open landscape planting areas. Columnar varieties can be considered for certain locations.

- **Ginkgo biloba 'Autumn Gold’, Ginkgo**

  50'-0” plus in height by 30'-0” plus spread, variable and irregular in form. Limit use to male cultivars to avoid fruit. Unique leaf form, yellow fall color.

- **Gleditsia triacanthos 'inermis' 'Skycole', Thornless Honeylocust**

  Typically grows 40'-0” plus height by 25'-0” plus spread, pyramidal growth with a central leader. It is a thornless and nearly seedless variety. Leaves turn an attractive yellow in fall.

- **Tilia tomentosa 'Sterling', Silver Linden**

  60' -0” plus height by 30'-0” plus spread, round pyramidal habit, pale green-yellow fall color, good winter form.

- **Zelkova serrata 'Green Vase', Japanese Zelkova**

  50'-0” plus height by 40'-0” plus spread, vase-shaped habit, Flaky bark with orange patches as it matures, excellent bronze-orange fall color.

Small Trees - Less than 35'-0” in height.

These trees can be planted under utility wires or in open landscape planting areas. Columnar varieties can be considered for certain locations.

- **Parrotia persica, Persian Ironwood**

  20'-35'-0” height by 20'-30' spread. A single trunk tree, with an upright to rounded shape. Leaves emerge reddish-purple in spring, mature to a dark green in summer and change to variable shades of yellow, orange and red in fall. Bark of mature trees exfoliates to show patches of color beneath and provides good winter interest.

- **Carpinus Betulus, European Hornbeam**

  25-30'-0” height by 15-20' spread. Slow growth habit, upright, uniform shape, yellow fall color, columnar variety available.

- **Liriodendron tulipifera 'Little Volunteer', Tuliptree**

  25'-35'-0” height by 20'-25'-0” spread. Compact, upright tree. Lime green tulip-shaped flowers that bloom in the summer. Foliage turns golden yellow in the fall.

- **Prunus x incam 'Okame', Okame Cherry**

  20-30'-0” height by 20-25'-0” wide. Vase shaped to round form at maturity. Excellent heat and cold tolerance.

  Pink flowers in early spring, excellent bronzer-red foliage in the fall. Should not be used as a primary street tree. Supplemental watering required during summer months.

- **Cornus kousa, Kousa Dogwood**

  Grows to 30'-0” height and similar spread at maturity. Upright when young and grows to rounded form, white flowers in spring, red to purple fall foliage, exfoliating bark interest in the winter, no disease issues, shows good drought tolerance, not suitable as a street tree. Supplemental watering required during summer months.

IRRIGATION

The Committee recommends that the project include irrigation as part of the project scope and that the design team include an irrigation consultant to determine the most cost effective and efficient way to provide water to all planted areas. The Committee expects that the irrigation consultant will develop alternatives based on these basic guidelines for further discussion and evaluation. The Committee believes that the Town's investment in new planting and the plantings overall health, longevity and everyday appearance will be dramatically improved with a specific focus on irrigation.

SITE FURNISHINGS AND AMENITIES

- SEATING (benches)
- BICYCLE PARKING AMENITIES (racks, loops)
- BUFFERS & EDGES (stone walls, thin planters etc.)

- TRASH RECEPTACLES & RECYCLING
- TREE GRATES

SEATING (See Exhibit C)

Existing Benches

The existing teak wood benches located within the project area have been very successful and have held up very well over the years. The style is visually simple and relatively comfortable.

Seating Performance Standards

Seating should:

1. Be comfortable, sturdy, durable, easy to clean, repair, maintain and replace;
2. Can be secured to the ground;
3. Be universally accessible to all and meet ADA use standards – intermediate armrest;
4. Be constructed from an unfinished sustainably forested tropical hardwood such as Ipe;
5. Have a seat height of 16-20” from ground level;
6. Have flat armrests with a height of 24-30” from ground level;
7. Have a simple style compatible with the existing mid-century streetscape;
8. Be properly maintained and cleaned per the manufactures guidelines and requirements

SEATING RECOMMENDATIONS

Replacement Bench Options

The Committee understands from testimony provided by a site furnishings expert that a more durable tropical hardwood material, such as Ipe, is the preferred material for long term use. However, we have not been able to identify style options that are like the existing benches and manufactured from Ipe. Therefore, the Committee recommends, over time, replacing the teak benches with Ipe wood benches once alternatives in the same style become available, which are more durable and will weather gray. Replacement benches should be a mix of lengths with some benches having middle armrests for users who need additional assistance. As an alternative to benches with middle armrest individual chairs in the same style can be used. The existing memorial plaques will be transferred to the new benches.

Alternative Seating/Placement

The Committee recommends adding another bench type that is backless and modular in nature to also allow flexibility for users. This seating alternative should also meet accessibility

use requirements. The Committee recommends placing these benches in larger open spaces such as in front of CVS and the Mass. Ave. end of Grain Mill Alley.

Bench Placement

Generally, the location of benches has also been successful. The Committee recommends creating a variety of seating area types and sizes. In some locations seating options for multiple users are limited and additional seating is needed to allow for easier conversation and interaction. Some seating areas should be enlarged and combined to create a 'U' shaped area and plant bed. This will allow room to add benches of different sizes and to accommodate a wider variety of use and wheelchairs.

Tables & Chairs

Having tables and chairs for alternative seating and eating is a desirable addition to the Center. However, the Committee recommends that this type of seating should be provided and managed by the abutting businesses interested in having outdoor seating for their business.

Seasonal Seating

Because the parklet installed during the summer months has been successful the Committee recommends adding another parklet at the western end of the Center, for additional seating and bicycle parking.

BICYCLE PARKING PERFORMANCE STANDARDS AND AMENITIES

A growing number of residents and visitors traveling to the Center, both daily and seasonally, arrive by bicycle. Encouraging this trend by making bicyclists feel welcome in the Center is good for Lexington's economy and the vitality of the Center Business District. The Committee understands that it is hard to control where bicycles are parked in the Center especially during the busiest season, when bike parking convenient to shops and restaurants is limited. Understanding the current parking options and amenities alternatives, the Committee recommends the following for bicycle parking.

PERFORMANCE STANDARDS

Bicycle parking amenities should:

1. Be located based on current traffic patterns, flow and desired destinations.
2. Be selected and installed to comply with APBP (Association of Pedestrian and Bicycle Professionals) standards for bicycle parking, including:
    - Support for an upright bicycle by its frame horizontally in two (2) or more places;

- Space to secure the frame and one or both wheels to the rack with a cable, chain, or u-lock;
- Design that prevents the bicycle from tipping over;
- Ability to support a variety of bicycle sizes and frame shapes;
- Diameter of locking pole: no more than 1.5 inches.

3. Be coordinated with the Bicycle Advisory Committee as locations and rack types are selected.

BICYCLE PARKING AMENITIES RECOMMENDATIONS

Bicycle Parking Locations & Wayfinding

- Bike racks should be strategically located in several parking 'hubs' or nodes to provide adequate parking throughout the project area and discourage bicycle parking in non-designated locations.
- In addition to the current racks or parking hubs it is recommended that parking hubs be added at the following locations: Next to the Edison Building on Edison Way; in the municipal parking lot on the south side of Massachusetts Avenue; and in the Vinebrook Building Parking lot.
- Seasonal parking should be introduced as well. Another pop-up bike parklet should be considered at the west end of Massachusetts Avenue for the months of May through October when the demand for bike parking and outdoor seating is high.
- This would require losing two vehicular parking spaces on either the north or south side of the street or lawn space at the Visitors' Center, but would provide parking for eight to ten bicycles per parking space as well as room for visitors to enjoy their take-out food and drink at tables.
- The Committee recommends that wayfinding signs be added at the Bikeway exits to direct users to bicycle hub parking locations. Parking control signs should be in bike parking areas or in the sidewalk paving.

Bicycle Racks (See Exhibit D)

There are three types of bike parking amenities available for visitors within the project area with most located between Meriam Street and Edison Way. Most of these racks were obtained through an MAPC grant and include:

- 13 - 6' x 33" "coat hanger" racks;
- 8 - 19" x 36" Inverted "U" racks;
- 3 - 12" x 32" single-sided "Spartan" racks

Only one of these rack types – the Inverted "U" -- meets APBP standards. The Committee recommends the following.

1. Existing Inverted “U” (or similar single) racks can be used but should be wider than the existing 19” racks to promote bicycle stability and installed three feet from a roadway curb edge to encourage more than one cyclist to use the rack.
2. The existing coat-hanger racks do not conform to current APBP standards and are considered unsightly by some. Given their utility, these racks should be repurposed at other locations in Lexington that need bike parking – including along the Bikeway behind the town center. (To allow for use on both sides of the coat-hanger rack the racks should not abut any vertical element, building, light pole etc.) These racks should be replaced in the project area with one of the recommended racks and installed in clustered groups to accommodate the same number of bicycles.
3. The current 25% design proposal recommends the installation of 22 Inverted “U” racks on the south side of Mass Ave and 24 on the north side in groups of between 1 and 3 racks (there are currently 6 Inverted “U” racks on the south side). There is concern that an array of individual racks along the sidewalk may be not only unattractive but also pose trip hazards. The Committee recommends that the design team work with the Bicycle Advisory Committee to establish the optimal number and locations for these racks.
4. When new bike parking is added, the Committee recommends installing one or more of the following.
   - The standard “Hoop” or “Inverted U” rack, currently installed along the south side of Mass Ave. It is considered a functional rack and conforms to ABPB standards. However, the current version in the town center is only 19” wide, creating stability problems for some bicycles. There are many variations of the standard Inverted U rack. (See picture)
   - The Dero “Swerve” rack complies with APBP standards, is a variation of the standard Inverted U rack but is a popular choice with architects and universities because of its aesthetic design and efficient use of space. The “Swerve” rack in stainless steel was approved by the HDC for use in the Grain Mill Alley bike node; it will be installed in a cluster of 9 racks. (See picture)
   - The Committee recommends consideration be given to the Varsity Bike Dock rack, manufactured by Ground Control Systems, as a possible good choice for bike parking clusters or the seasonal bike parking at the existing south side Parklet and the proposed Parklet on the west end of the Center. This rack has some interesting features that warrant further investigation. (See picture)
   - Finally, Bike racks can be both functional and beautiful. In the spirit of introducing functional public art to the Center, one or two artfully designed bike racks should be considered to inject a bit of color and interest to the Center Streetscape. These more expensive bike parking racks might be part of a community fundraising effort.

BUFFERS & EDGES RECOMMENDATIONS

EXISTING PLANTERS

Currently the center has decorative wood barrel planters for seasonal planting displays. This program has been appreciated and proven successful through the years. These planters are wood, heavy, and not in concert with the existing mid-century style.

PLANTER PERFORMANCE STANDARDS

The proposed planters should:

1. Be simple in design
2. Have a style that is aesthetically compatible with the Center's mid-century design
3. Be durable and movable
4. Be made from a material suitable for outdoor environments – Fiberglass, steel and wood, cast concrete or cast stone
5. All be the same basic, solid, color with a matte finish
6. Have relatively low maintenance requirements
7. Continue as part of the current program
8. Have electrical outlets for holiday lights

PLANTER RECOMMENDATIONS (See Exhibit E)

The Committee recommends replacing the barrels with another wood planter that is aesthetically compatible with the Center's mid-century design. These planters should be durable, similar in size to the existing planters and easy to maintain and replace in the future. These planters can be placed throughout the project area primarily along the roadway. No other freestanding publicly funded planters are recommended for the project area.

WALL RECOMMENDATIONS

The Committee does not recommend adding any landscape walls to the project. Currently there are no freestanding masonry landscape walls within the project area. The Committee finds this element a non-essential, decorative embellishment and generally out of context with the existing landscape, especially the mid-century design in the Center.

Where vertical barriers are needed to define spaces the Committee recommends a landscape solution or hedge like those that currently exist.

BOLLARDS/ POSTS / POST AND RAIL FENCING RECOMMENDATIONS

Currently there are no bollards or post and rail fencing within the project area. The Committee finds these elements create non-essential barriers, and are unnecessary decorative embellishment and visual clutter, and therefore do not recommend adding any to the project.

CURBING AND EDGING RECOMMENDATIONS

The existing granite curbing that surrounds trees and plant beds on the north side of Mass. Ave. between Meriam Street and Edison Way should remain in place or be salvaged and reused to surround newly configured plant beds if deemed compatible with new curbing material. Curbing should be modified or installed to allow storm water run-off to flow into the planting areas.

TRASH RECEPTACLES AND RECYCLING RECOMMENDATIONS (See Exhibit F)

The existing trash and recycling receptacles have proven successful and their design is simple and compatible with the existing streetscape. The Committee recommends keeping the existing trash and recycling receptacles located within the project area. They are generally in good condition and functioning well. An assessment should be completed for each receptacle to determine if it should remain, be cost effectively repaired or replaced. Additional receptacles should be added to the project area as required to meet the trash and recycling demands. The Committee recommends conveniently locating receptacles equally throughout the project area out of main user travel areas and away from crosswalks.

TREE GRATES (See Exhibit G)

There are a few locations, mostly along the south side of Massachusetts Avenue, where the sidewalk width and tree well width are limited. This limited walking surface encourages foot traffic on the root zone of the street trees causing soil compaction which limits uptake of air, water and nutrients to the tree. Tree grates have been discussed as a solution that would maximize the usable surface for circulation and protect the root zone of the tree from compaction. Although tree grates can reduce soil compaction, as the tree matures tree grates can have an impact on the health of the tree's trunk if the openings are not periodically widened. They also can serve as receptacles for litter and if raised by the tree’s growth or lack of maintenance can cause a trip hazard.

The American's with Disabilities Act does not specifically address tree grates. The relevant section 302.3 addresses gratings within the "accessible pathway". The U.S. Access Board has issued a new Accessible Rights-of-Way Design guide. The Design guide has this to say regarding tree grates: "Metal gratings are of particular concern to pedestrians who use walking aids. When wet, the grids can be extremely slippery, and the elongated openings can become a sliding track for the tip of a crutch or cane. Slip-resistant finishes or nonmetallic materials are available at additional cost for installations where the location or extent of exposed gratings may pose a problem for pedestrians.

Where possible, gratings and similar sidewalk fittings should be located off the travel path. Note, however, that **"tree gratings--unless part of the pedestrian circulation route—need not meet surfacing provisions**." In this case the tree grate area will be within the pedestrian circulation route but not within the primary route of circulation.

TREE GRATE PERFORMANCE STANDARDS

Tree grate system should:

1. Be a simple suspended grate system that will allow for a range of installation scenarios.
2. Be a suspended paver grate system that permits bridging tree plantings with a wide range of hard surfaces in a variety of situations.
3. Can be ordered in special sizes and shapes to accommodate many different below grade conditions.
4. Be purchased from a company with a history of success and experience in designing and producing suspended paver tree grate systems.
5. Use methods, castings and components that meet all industry standards.
6. Meet the coefficient of friction safety standards established by the Ceramic Tile Institute, and ADA.
7. Be complete and ready to install from the factory to reduce labor costs.
8. Be available in unfinished, galvanized or powder coated finishes.

TREE GRATE RECOMMENDATIONS

In locations where the suspended paving system is being installed a suspended tree grate system is recommended. This suspended grate system will allow for a smaller grate opening, paving to be installed closer to the tree trunk, and rainwater infiltration. This will dramatically increase the usable walking surface, reduce the slipping hazard and eliminate any root zone compaction. Maintenance to the tree grates will still be required as the tree matures to prevent tripping hazards and damage to the tree trunk.

In locations where the suspended paving system is not being used a standard tree grate system can be installed. This standard tree grate can be installed to be suspended above the tree well soil level to eliminate soil compaction and allow for storm water infiltration.

ROADWAY FEATURES RECOMMENDATIONS

The Committee recommends against installing any decorative pavement treatments, such as brick, concrete pavers or cement concrete paving, in any area of the roadway including the median in front of the Post Office. Paving materials react differently to cold, heat and use causing them to move differently over time. This movement will make the paved surface a hazard, and non-compliant with ADA, and ultimately require more expensive maintenance and repair.

The median treatment should be asphalt concrete and have minimal road markings, no diagonal striping, to visually discourage pedestrians from crossing the street or to use it for a waiting zone. This is the widest section of roadway and not a safe travel route for pedestrians. To optimize user safety, minimize project cost and reduce long term maintenance expenses the Committee recommends crosswalks be installed in accordance with the guidance provided in the Manual of Uniform Traffic Control devices latest edition (MUTCD) in concert with all other proposed roadway markings. Furthermore, the town standard 'Continental style' shall be the specific marking used as detailed at the bottom of Figure 3B-19 in the aforesaid manual.

STORMWATER INFILTRATION

Rain water surface runoff and roof drain runoff falling on pedestrian sidewalk areas should be directed and captured in planting beds and tree wells throughout the project area whenever possible making it available for plant growth. Plant bed areas that are curbed should have drains or breaks in the curb that allow water to be distributed into the planting area. Healthy, mature trees provide significant stormwater benefits, and suspended pavement systems provide opportunities for integrated stormwater/soil benefits. In suspended pavement system applications filled with a bio-retention soil mix, approximately twenty percent of the soil volume can be used for stormwater storage. A typical tree in this type of soil can hold a significant amount of rainwater, preventing overflow into surrounding impervious surface areas and roadways.

EXHIBIT A – SUSPENDED PAVING SYSTEM

Modular Suspended Paving System (Example)

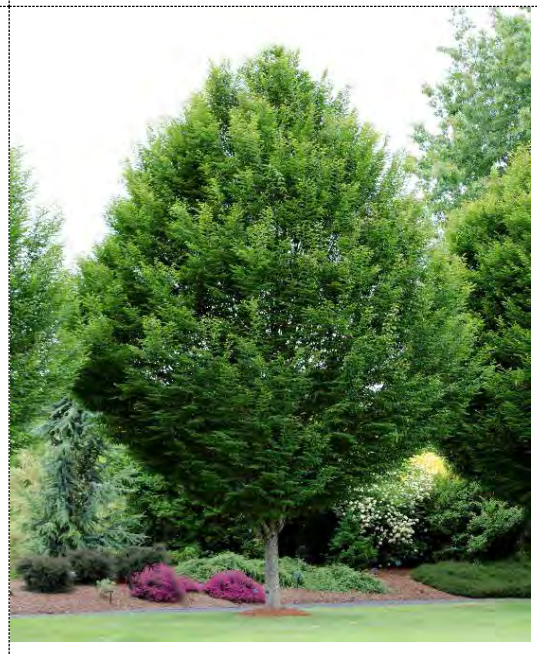
EXHIBIT B - TREE SELECTIONS

Medium to Large Street Trees

Ginkgo biloba 'Autumn Gold', Ginkgo 50'-0” plus in height by 30'-0” plus spread, variable and irregular in form. Limit use to male cultivars to avoid fruit. Unique leaf form, yellow fall color.	
Gleditsia triacanthos 'inermis' 'Skycole', Thornless Honeylocust Typically grows 40'-0” plus height by 25'-0” plus spread, pyramidal growth with a central leader. It is a thornless and nearly seedless variety. Leaves turn an attractive yellow in fall.	

Tilia tomentosa 'Sterling', Silver Linden 60' -0” plus height by 30'-0” plus spread, pyramidal form, pale green-yellow fall color.	
Zelkova serrata 'Green Vase', Japanese Zelkova 50'-0” plus height by 40'-0” plus spread, vase-shaped habit, Flaky bark with orange patches as it matures, excellent bronze-orange fall color.	

Small Trees

Parrotia persica, Persian Ironwood 20'-35'-0” height by 20'-30' spread. A single trunk tree, with an upright to rounded shape. Leaves emerge reddish-purple in spring, mature to a dark green in summer and change to variable shades of yellow, orange and red in fall. Bark of mature trees exfoliates to show patches of color beneath and provides good winter interest.	
Carpinus Betulus, European Hornbeam 25-30'-0” height by 15-20' spread. Slow growth habit, upright, uniform shape, yellow fall color, columnar variety available.	

Liriodendron tulipifera 'Little Volunteer', Tuliptree 25'-35'-0” height by 20'-25'-0” spread. Compact, upright tree. Lime green tulip-shaped flowers that bloom in the summer. Foliage turns golden yellow in the fall.	
Prunus x incam 'Okame', Okame Cherry 20-30'-0” height by 20-25'-0” wide. Vase shaped to round form at maturity. Excellent heat and cold tolerance. Pink flowers in early spring, excellent bronzer-red foliage in the fall. Should not be used as a street tree. Supplemental watering required during summer months.	

Cornus kousa, Kousa Dogwood Grows to 30'0” height and similar spread at maturity. Upright when young grows to rounded form, white flowers in spring, red to purple fall foliage, exfoliating bark interest in the winter, no disease issues, shows good drought tolerance, not suitable as a street tree. Supplemental watering required during summer months.	

EXHIBIT C – SEATING

Backed Bench (example only)	
Backed Chair (example only)	

EXHIBIT D – BICYCLE PARKING

Inverted "U Bike Rack

Decorative Inverted "U Bike Rack

The Dero "Swerve Bike Rack

The Varsity Bike Rack

Alternative Rack	
Alternative Rack	

Alternative Rack	
Alternative Rack	

Alternative Rack	
Alternative Rack	

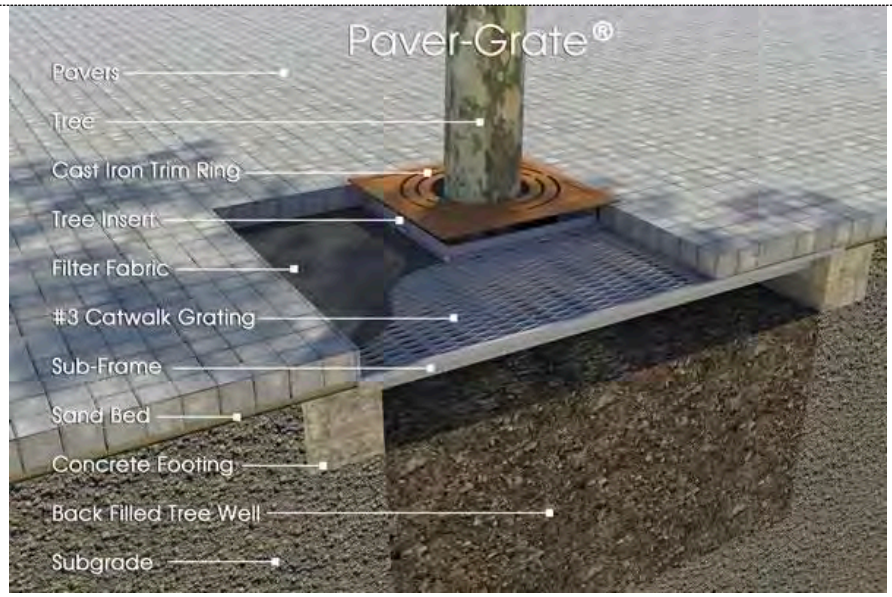
EXHIBIT E – PLANTERS

Planter (New)	
Planter (Weathered)	

EXHIBIT F – TRASH & RECYCLING RECEPTACLES

Existing Trash Receptacle (Example)	
Existing 'BIG BELLY' Trash & Recycling Receptacles	

EXHIBIT G – TREE WELL GRATES

Suspended Paving Tree Well Grate	
Suspended Tree Well Grate	

Tier 3—: Interpretive and Educational Elements, Wayfinding, Construction and Oversight

HISTORICAL AND INTERPRETIVE ELEMENTS

The Ad Hoc Committee's recommendations address the goal of introducing educational and historic elements that would attract and inform both visitors and citizens while motivating them to explore the entire Center. Elements would be drawn from the entire history of the Town, from the 1775 period (well showcased in the Battle Green area) to the present.

Sample granite inlay:

To this end, the Committee recommends the introduction of historic medallions (in bronze, granite, or other material to be determined) to be set flush in the brick pavement to the side of the pedestrian way and centered in the area of each cluster of benches on the north side of the street. The historic medallions would be placed (oriented) to be read from the sidewalk path of travel, not the benches.

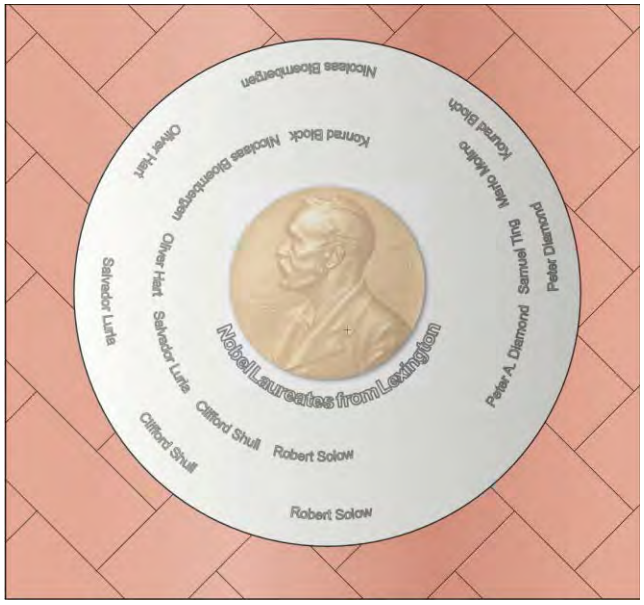
A few markers may also be placed on the south side, for example, by Cary Library.

Please see following examples of treatments for such embedded historic markers or medallions:

Grain Mill Alley

Our Farming Past

Bicycle Heyday



Our Nobel Laureates

Many other options may be drawn from the rich history of our Town:

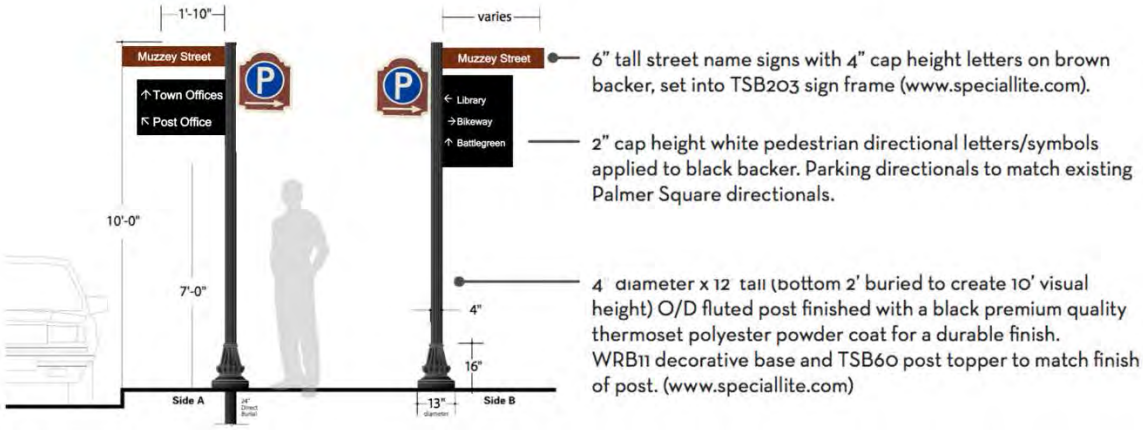
The Conscience Land
Mid Century Modern
Captain Parker's Men
Railroad and Trolley
Houses of Worship – from one to many
Lexington Town Halls
The Hunt Block and Fire
The Cary Library
The Cary Memorial Hall
Merchant Commuters in the Victorian Age
The Bowling Pin Building
Hotels and Taverns
Old Post Office
The Central Block and Fire

The Committee recommends we adopt these embedded sidewalk medallions rather than building- or post-mounted markers, to maintain the relative absence of signage clutter in the Center, and to provide a unique series of "stopping places" whose focus would be provocative and informative.

There may be opportunities for larger, pedestal mounted interpretive signs in the project area, but no more than one or two, and only in larger areas where pedestrians can pause, like in front of the Edison Building near Edison Way. In addition, UPC symbols could be added in the future when an on-line informational / interpretive website is created.

SIGNAGE AND WAYFINDING

The Committee commends the recent efforts to de-clutter Center signage, and the introduction of the new blue (international standard) "P" parking signs on the Lexington brown and white shield. We recommend replacing the existing gray metal signposts, where used, with new black ones consistent with the black posts proposed for all the new lighting fixtures. We also recommend consolidating signs on a limited number of single posts (as shown in the example below) in the support of clarification and ease in wayfinding. Street name signs may also be changed to the brown color matching the extant shield signs. Signs and posts will meet MUTCD and AASHTO requirements.



The above is an example only. Actual posts and final dimensions to be determined.

CONSTRUCTION COST ASSESSMENT

The Committee has discussed costs at each and every meeting. We are fully aware of the funding challenges and the needs for many investments in our town. Yet, our downtown is critical to our merchants, residents, visitors, and to our very psyche and pride in being a Lexingtonian. With the discussion of each element and material the Committee members and public contributors have discussed and evaluated costs. This section of the report briefly evaluates the recommendations that the Committee is making with the most recent construction cost estimate that corresponds with the 25% design.

Committee Recommendations That May Reduce Construction Cost

1. Site Lighting: the simple pedestrian lights, and especially the simple and straightforward roadway lights should be less expensive than the large historic-themed lights in the 25% design.
2. Elimination of certain Site Elements:
    a. Granite walls
    b. Granite bollards
    c. Movable seats and tables
3. Elimination of the seating area, including site walls and a historic element, at the intersection of Mass. Ave. and Woburn Street. Appropriate design features at that location should be developed as part of the reconstruction of that area.
4. Elimination of the seating area in front of Cary Hall.
5. Reduction of the curbing that would be relocated: on the east end the 25% design called for moving the curb 1'-2'. We recommend the street curb locations remain as is (except for bumpouts and other safety elements).
6. Changing the flush concrete median pavement to striping
7. Simplifying the site design

Committee Recommendations That May Increase Construction Cost

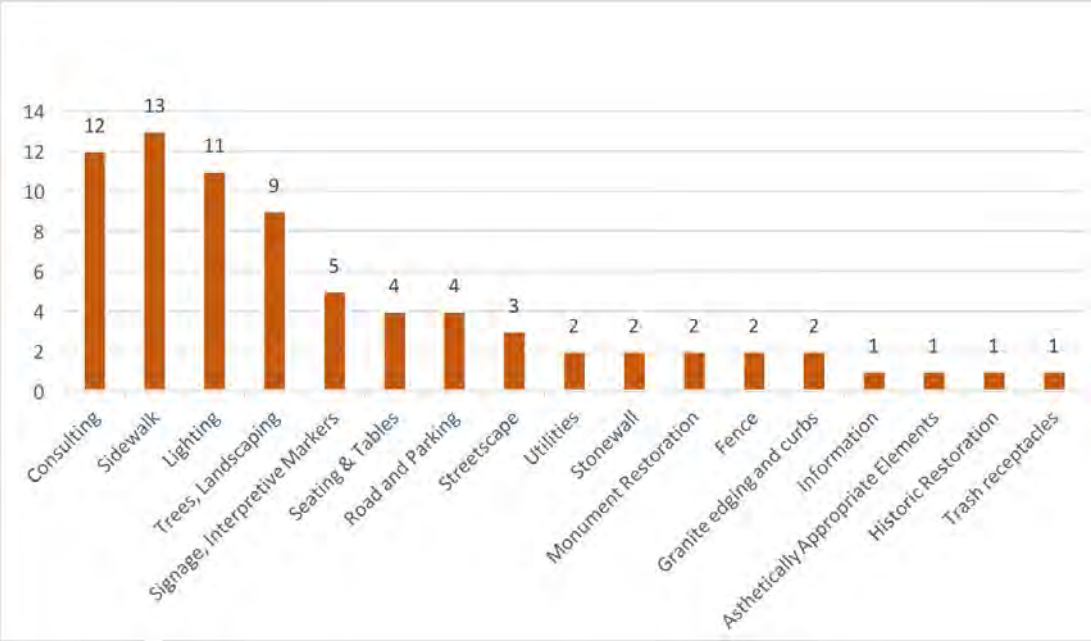
1. Pavement in the Core Center: We understand that the 25% estimate included a 6' concrete travelway along the buildings. The Ad Hoc Committee's recommendation that the entire sidewalk be comprised of brick would increase cost.
2. Pavement on the East End: the Plan calls for widening the sidewalk to 11' with 6' of that width being brick and 5' being concrete. The basic plan recommended by the Committee is to make the entire sidewalk brick (an increase in cost); an alternative would be to make the sidewalk concrete with a 2' brick band (a decrease in cost).
3. While the 25% design included structural soil for the trees, the Committee is recommending the use of suspended pavements to allow for greater soil volume for the planting.
4. The addition of an irrigation system for the plant material.

The Town's consultants would need to perform a redesign of the project based upon the Committee's recommendations. An updated construction cost estimate would quantify the changes in construction cost that are outlined above, and recommended by the Committee.

FUNDING

The Committee has discussed funding within our public meetings, and also with other individuals and groups in the town. We know that Town Meeting must approve the design fees and construction funding, and we are trying to find ways for the project to be paid for that are beyond a bond.

One funding source appears to be the Community Preservation Act as administered by the Community Preservation Committee. The following chart identifies project types that have been approved by other CPC's in communities across our state.



Based on this research and initial discussions, the Ad Hoc Committee believes that some components of the Streetscape project would be eligible for CPA funding, under the applicable regulations.

The nationally recognized standard for the treatment of historic properties, whether a colonial-period icon or midcentury modern streetscape, is the *Secretary of the Interior's Standards for the Treatment of Historic Properties.* The most appropriate of the four standards for Lexington Center is the *Standard for Rehabilitation.* The most relevant individual standard is: "The historic character of a property will be retained and preserved. The removal of distinctive materials or alteration of features, spaces and special relationships that characterize a property will be avoided." If the Lexington Center project follows the *Secretary of the Interior Standards,* it can qualify for CPA funding under the preservation category.

The Town can also consider community fundraising for certain specific elements (such as the new historic medallions or bike racks), or bench donations as a way to address costs and to involve the community.

CONSTRUCTION PHASING AND STRATEGIES

This section of our report discusses construction phasing and strategies in a general way, with other specific recommendations being included in the section on Project Oversight and Management.

During the course of the Committee's public meetings, there were many comments concerning the impact of the construction of this project on local businesses and traffic. The Committee shares these concerns. Construction planning should generally include and address the following:

1. Phase construction to anticipate costs and funding. While one construction phase may be preferable (in the get-it-over-with mentality), it is likely that the project will need to be divided into two or three phases.

2. Prioritize the construction phases into the project areas that 1) need addressing due to depleted lifespans or absolutely necessary reconstruction; 2) use logical ending points to facilitate vehicular and pedestrian traffic; 3) require the construction to have finite and consolidated construction zones and not be spread entirely throughout our downtown; 4) result in an entirely complete section of the project.

During construction, there are specific requirements that should be included in the bid documents. These requirements would encourage the contractors to maintain safe and accessible project sites.

1. The bid documents should include a Traffic Management Plan that is prepared by the consultant team. The bid documents should also require that the contractor submit a construction schedule that fully delineates each phase of the construction (including submittals and mockup approvals), submit an Emergency Protocol plan, and that the contractor must follow all OSHA requirements.

2. The Engineering Division will work with abutters and the contractor to minimize disruptions and access issues during construction.

3. Specifications shall require the contractor to provide a safe Handicapped Accessible route of travel for pedestrians during construction.

4. The contractor must maintain traffic flow during construction, with adequate signage for vehicles and pedestrians.

5. The construction site must be left clean and tidy at the end of each work day.

6. The bid documents shall require that the installing contractor build a mockup of greater than 8'x8'with full construction section for the sidewalk plus a handicap curb ramp. Approved mockup shall be matched in all subsequent work and can become a permanent portion of the installation. The mockup should be sized to be inclusive of a curb ramp plus enough sidewalk pavement so as to reflect the majority of the design conditions.

7. The Town should implement a web based, smart phone, community feedback system that "captures locations and pictures of sidewalks defects that you pass by every day" and transmits it to the DPW for evaluation and correction. The Town is implementing the PeopleGIS package which may serve this purpose and be operational by the time the Streetscape project is built. These systems could be used during construction to report issues, or after construction to report maintenance concerns.

PROJECT OVERSIGHT AND MANAGEMENT

The Committee devoted a great deal of time and effort to considering how to ensure that the Project will be carried out successfully. Lexington's Streetscape project has all the elements of projects Lexington's DPW manages well. The project includes roads, sidewalks, plantings, traffic signals, illumination, and site furnishings, many elements that the DPW has managed well in other projects. Like other road projects, this project is funded with Town Meeting Articles, engineers are solicited, selected, and hired based on specially tailored Scopes of Work, and the projects go through a series of design phases, bidding, additional Town Meeting funding Article(s), and construction.

We recommend that the following management requirements be incorporated into the final design and construction process:

Project Oversight:

a. We recommend that the Town establish a Project Oversight Committee to work with the DPW and with the designer during final design, and with the DPW during construction. The Oversight Committee would contribute to providing leadership for the implementation of the project in a manner that is consistent with the recommendations and intents of this report. We believe the Oversight Committee is important in maintaining continuity and quality control on the ongoing project decisions. The Project Oversight Committee should include representatives with appropriate design and construction experience. The Committee would not have day-to-day oversight of the consultant team or the contractor, as that is the responsibility of the DPW. This citizen group would assist with continued project outreach and public relations.

   The Committee includes this recommendation in its report because greater communication with the DPW regarding decisions during the final design and

construction phases will be beneficial to the community. The Engineering Division is the leader of this project. We believe creating a public feedback loop will improve the final design, public awareness, and will encourage greater quality control and oversight of the contractor during construction.

In general, the Oversight Committee would:

- Review interim and final bid documents during the design phases
- Review mockups by the contractor during construction
- Work as requested by the DPW, including input to possible contractor-generated project substitutions, and public relations

b. The Oversight Committee, or a subset of the Committee, would review the drawings and specifications before they go out to bid. The purpose of this effort is to confirm that the materials and installations methods that are in the final bid set are consistent with the agreements made with the community. Almost all of the surface treatment items will be Special Provisions rather than Standard Specifications if MassDOT forms are used. The Oversight Committee will work with the DPW to make sure that the Special Provision specifications are as strong as possible, and will meet the intent of the design.

c. As discussed at several meetings and confirmed with the DPW, the Ad Hoc Committee recommends that a dedicated Project Manager be hired or assigned for the entire Streetscape Project. Not only is a project of this size worthy of a dedicated Project Manager, but the prioritization of this person on this project will protect their time and prevent them from being pulled away on too many other town projects.

d. The DPW will bring in one or more independent inspectors, with oversight from the Engineering Division, during the construction phase to augment the Project Manager. The exact number will be determined by the Engineering Division in response to the complexity of the project.

Project Management:

This section relates to how the project would develop during the next phases of work.

a. The Ad Hoc Committee recommends that additional expertise be added to the team if it is not already part of the consultant team.

    1. A historian who would prepare a Historical Assessment of Lexington Center. As discussed at many meetings, the Ad Hoc Committee believes that the 1966 Plan and its resulting success over the ensuing decades is a critical component of why our Center has been successful. This historian would conduct research into our Center, assess what is current there, and prepare a report that discusses the components of our Center that are important historically, and those that may be less important. This report could become a guide to the revised design layout for our Center.

2. An independent cost estimator. As previously noted, the Ad Hoc Committee discussed construction costs at every meeting. We know that the consultant team is responsible for the project construction cost estimates. Should it be desirable during the course of the project, an independent construction cost estimator *could* be added to the team to evaluate and confirm estimated construction costs.

3. A lighting designer. The Committee has made recommendations on lighting types for the lighting designer to work with. We understand that Ripman Lighting Consultants is already on the consultant team, and we assume they would be engaged in the future work phases.

4. A graphic designer / interpretive specialist for the historic artwork. The Committee believes that the medallions and other recommendations are important enough to have a specialist involved in their creation.

b. The Ad Hoc Committee knows that the overall design plan for the Center Streetscape Project will need to be revised based on these recommendations. The Committee knows that this redesign will need to be based on the guidelines prepared by the historian and the Board of Selectmen's acceptance of the Ad Hoc Committee's recommendations. Generally, the Committee suggests the following:

    1. Augmentation of the consultant team with the requested expertise
    2. Preparation of an updated concept plan for the entire project area
    3. Review with the newly established Oversight Committee
    4. Revisions to the plan and an updated construction cost estimate for the entire project
    5. Assessment, revisions, and meeting with local boards and committees for feedback
    6. Preparation for a Public Meeting / Public Meeting
    7. Revisions and conclusion after the Public Meeting that would establish the site improvements and the construction budget going forward
    8. Reestablishment of the Phase I construction site area and budget
    9. Continuation of Phase I into 75% design, final bid documents, bidding and construction.

    In essence, this process revises the current 25% design to respond to the Committee's recommendations, and to the need for an updated construction cost estimate. This process should result in a mutually shared understanding of the project's scope and budget.

MAINTENANCE

Maintenance has been discussed at each meeting of the Ad Hoc Committee. We know that only minimal maintenance has occurred during the last few years, as the DPW awaits the Streetscape project. It has been appropriate to do minimal maintenance on infrastructure that

will soon be reconstructed. The DPW has been doing a good job cleaning our Center and this section of our Report compliments them, and outlines the expectations going forward.

This section of our report addresses maintenance of our future new Lexington Center Streetscape. This brand-new project will require care for it to remain a shining jewel in our town. We would like to propose that a Maintenance Protocol be established now, and that expectations be widely understood and shared. We are suggesting a draft protocol within this report. The maintenance protocol shall be further refined by the DPW.

In general, the Lexington *Center Maintenance Specification* should:

a. Be established specifically for our downtown business district, with readily identifiable boundaries.

b. Be funded annually with a consistent budget. The work could be performed by the DPW or the maintenance of our Center could be publically bid with annual or biannual contracts.

c. Be a readily available document so the standards are understood.

d. Engage the electronic reporting system so that individuals can report issues.

e. Require a minimum of monthly inspection for consistent maintenance.

The specific tasks that the *Lexington Center Maintenance Specification* should include are:

SIDEWALK PAVING AND CURBING

- Keep sidewalks clear and clean
- Remove snow
- Repair pavements with consistent materials as soon as possible. Asphalt patches should be limited to temporary winter repairs. Tripping hazards and discontinuous surfaces should be repaired immediately.
- Replace pavements immediately, as needed
- Clean and repair curbs as needed

LIGHTING

- Replace bulbs, repair and adjust as needed to maintain appropriate illumination levels
- Repair or paint posts when damaged
- Test lighting levels annually to verify that the design-level illumination is being maintained

SITE ELEMENTS

- Clean benches. Teak benches shall be washed with soap and water; no pressure washing
- Repair or replace benches as needed
- Clean, repaint, repair bicycle parking as needed
- Monitor post office boxes and encourage replacement or adjustment if needed

- Clean, repair and fill planters (if not done by a separate group)

TRASH RECEPTACLES

- Emptied twice a week in active months, weekly in other months
- Wash trash receptacles

SIGNAGE

- Repair, replace, add and remove signage as necessary to provide information and contribute the overall impression of our Center
- Maintain the interpretive plaques, medallions and signs

PLANTING

- Prune, mulch, straighten protect plants as necessary
- Assess for pests and diseases
- Maintain in-ground systems: evaluate, inspect and repair below-grade loam, drainage and aeration
- Weed and mulch planted areas

IRRIGATION SYSTEM

- Inspect at spring start-up and winter shut down
- Repair, replace heads, valves and infrastructure as required

The conclusion of this section notes that the Committee heard consistently throughout its process that maintenance is absolutely critical to maintain universal accessibility and safety at all times. It is also critical for the economic vitality of our community, the impression of our town by our visitors and residents, and the pride we take in our community.

The Ad Hoc Committee recommends that the maintenance budget and protocols be established BEFORE construction is complete, so that our community will be able to enjoy and safely use our newly re-invigorated Center well into the future.

[END OF MAIN REPORT]

ADDENDUM -- MINORITY REPORT ON SIDEWALK MATERIALS OF THE COMMITTEE ON DISABILITY

Revised Minority Report of the Center Streetscape Design Review Ad Hoc Committee –
Tier One Sidewalk Materials

Purpose of Minority Report

This report is being submitted because the Commission on Disability's preferred choice of sidewalk materials is concrete with wire-cut brick on the sides which is less expensive at installation. The majority of the Ad Hoc Committee, however, voted for the entire surface area to be wire-cut square-edge brick.

The revised report incorporates information gathered from additional expert presentations made to the Ad Hoc Committee since September 2016 as well as the deep concerns of the Commission on Disability. The disability community has strong reservations about the choice of brick directly related to its characteristics. The Commission urges that the decision about sidewalk materials be based on needs and functionality rather than only appearance and aesthetics.

Commission on Disability and Related Sidewalk Standards

The charge of the Commission on Disability is "to ensure that people with disabilities are fully integrated into all aspects of the Town and can participate seamlessly and without barriers. The Commission makes recommendations concerning the implementation of the Americans with Disabilities Act (ADA) within the Town. Members review and recommend policies as they affect those with disabilities, and provide information, guidance, and technical assistance."

The pertinent regulations for ADA-compliant sidewalks are: Massachusetts Architectural Access Board Guidelines (2006); PROWAG (Public Rights-of-Way Accessibility Guidelines, 2010) from the US Access Board – best practice guidelines; ADA (Department of Justice) 2010 Guidelines. According to these regulations, sidewalks need to be continuous common surfaces, without level changes more than ¼ inch; sidewalks must be stable and firm; sidewalks need to have a cross slope less than 2%. Many forms of brick as well as other surfaces may be able to be installed to meet the technical requirements of the ADA. However, the ADA's spirit of universal design, civil rights, equality and accessibility is bigger than the regulations.

There is also a new ASTM (American Standard Test Measures) which strives to measure surface roughness (discussed further below).

Additionally, the 2015 Town Meeting voted 140 to 9 in favor of Article 42, which states: "To provide a welcoming and comfortable experience for individuals of all abilities, the Town will endeavor at all times to use smooth, safe and aesthetically

appropriate materials when constructing sidewalks and other passageways on town-owned walkways. Bricks and other small discrete pavers may be used as decorative edge treatments, but shall always be installed to create the smoothest surface possible, ensuring safety for citizens who have trouble traversing uneven surfaces."

How Sidewalk Material Choice Affects Disabilities

While brick may meet the technical requirements (under very specific circumstances), the Commission on Disability believes it is a surface, except when installed as decorative trim, that is an unnecessary hazard for individuals with disabilities.

There are several things to consider. The first is vibration. This has been studied by the University of Pittsburgh. Vibration disturbances are a real and dangerous health hazard. Walkers, wheelchairs, crutches, strollers, shoes and canes can get caught in the seams and then people trip, lose balance or fall. Vibration issues can cause spasticity, pain, loss of balance and disturbances of correct positional seating. However, there are some individuals with disabilities who gain a positive sensation from irregular surfaces. This is a unique and atypical physical reaction to vibration or roughness that is not shared by other disabilities, such as ALS and Parkinson's. It should also be noted that the Pittsburgh research was done on test sidewalks, not sidewalks used daily with regular wear and tear.

University of Pittsburgh researchers have been working on a way to objectively measure roughness. Their method is based on the international roughness index approach which is used for vehicular pavements. This is known as the "Wheelchair Pathway Roughness Index". Jon Pearlman presented to the Committee that the roughness standard has been approved as ASTM E3028 and that it currently is awaiting approval from the US Architectural Access Board.

The focus on the impact of surface continuity on mobility is one area of concern for individuals with disabilities, but there are others.

- For individuals with neurological issues, brick causes a dramatic and disorienting experience of sensory overload due to ambiguity of signals related to depth perception. Concrete on the other hand is seen as causing less "neurological noise" and less confusing sensory input.
- Individuals with low vision are unable to discern variation in the surface of bricks and there is no bright contrast on brick sidewalks like there is on concrete accented with brick. The high contrast of concrete pathways with brick accents supports all global issues related to wayfinding and spatial problem-solving.
- Individuals with macular degeneration need color contrasts as their usable visual field is peripheral only. This is not there in brick.
- There are a host of sensory processing issues beyond low vision issues, including syndromes occurring following TBI; both post-trauma vision syndrome and midline shift syndrome cause significant disequilibrium and balance issues that are further complicated when there is little contrast and the surface is

variegated like brick. The brick is perceived as not being flat enough even when laid smoothly.

Sidewalks that are firm, seamless and stable, such as concrete, resist indentation from the forces applied by a walking person's feet and reduce the rolling resistance experienced by a wheelchair. When a pedestrian or wheelchair user crosses a surface that is not firm or stable, energy that would otherwise cause forward motion is displaced which impedes travel unnecessarily.

Recent research has looked at the internalized reactions of individuals to brick on pathways of travel. The authors examine the impact of urban sidewalks as being "physical locations of inequality for people with disabilities". Bricks are seen as unwelcoming and bricks emphasize the lack of equality for disabilities (*Disability and Qualitative Inquiry: Methods for Rethinking an Ableist World* by Ronald J. Berger and Laura S. Lorenz, 2015).

At meetings of the Ad Hoc Committee and at the first Public Hearing, many senior citizens as well as Commission on Disability members voiced their concerns about wire-cut brick. Current statistics on adults in the US with disabilities from the CDC are staggering: hearing - 16.8%; vision - 9.1%; mobility - difficulty walking 1/4 mile - 7.1%; physical function difficulty - 15.1%. The percentage of adults over 18 years old and with at least one basic action difficulty or complex activity limitation is 32.4%. For adults aged 65+, this percentage is 60.5%, not a minority. The Commission on Disability urges the Committee to listen to its residents with disabilities.

<u>Characteristics of Concrete</u>

Since the first minority report in September, there have been several meetings with experts to discuss concrete. In November, the Commission on Disability invited Craig Dauphinais, from the Massachusetts Concrete & Aggregate Producers Association (MaCAPA) to share his expertise on concrete as a sidewalk material. MaCAPA represents concrete and aggregate producers and other ready mix suppliers, and their role is related to outreach and education. He summarized the advantages of concrete as being its versatility, durability, and competitive cost. He said proper installation is crucial – if installed correctly the life span can be 40-50 years with little to no maintenance. He noted that when installing concrete one should place the seams at the points where cracking is expected to happen to avoid maintenance.

A second presentation made by Mehdi Zarghamee, Engineer from SGH, also emphasized the functionality and durability of concrete. He stated that design life depends on proper installation, how well compacted the subgrade is and the design of the concrete mix.

ASTM standards for concrete also emphasize the crucial importance of careful installation. The key factor in sidewalk longevity is the quality of construction. Even a

concrete sidewalk can fail after several years if poor materials are used and good design and construction practices are ignored.

A common criticism of concrete is the misconception that it is not salt-resistant in colder climates. This is no longer the case as the technology has evolved sufficiently to improve concrete's reaction to salt. Traditional salts (not magnesium chloride) are less damaging to the surface than they used to be. There are salt-resistant concrete mixes as well as additives that enable concrete to be salted. Some of these additives are non-hazardous, environmentally safe penetrating chemical treatments that: increase durability; eliminate trip hazards (flaking, chipping, popping, pitting, dusting, or spalling); reduce maintenance and repair needs after being applied once.

Another concern was raised that concrete sidewalks with brick trim could not be done due to the difficulty placing dissimilar materials side-by-side. The experts said that was unfounded, provided the base was designed properly to avoid differential settlement.

Setting/Installation of Concrete

The National Research Council of Canada's Institute for Research in Construction emphasizes that: **"**proper compaction and preparation of the subgrade beneath the concrete sidewalk is essential. The uniformity of the compaction is just as important as the degree of compaction. Uniform compaction diminishes differential settlement of the concrete sidewalk and reduces the chance of crack development." They say that there should be a granular subbase layer between the compacted subgrade and the concrete. They also advise: "To minimize cracking, control joints should be cut into the slab at spacings of about 4 feet transversely across the length of the sidewalk". This is recommended to be done with a saw blade at a depth of ¼ inch.

Other installation and setting have been researched, such as reinforcing concrete with bars when the sidewalk is placed over excavations such as tree roots or sewer laterals, to prevent settling or cracking of the sidewalk.

Lexington DPW professionals agreed with the specifications described in the presentations made by the experts in concrete.

Maintenance of Concrete

In terms of maintenance people often think that concrete is more difficult to maintain than brick. Again, this seems to depend on proper installation, which can influence the longevity of the concrete, as well as how quickly repairs are made. There are several maintenance methods: saw cutting (advantage is precision and quality); grinding; patching and ramping; removing and replacing concrete slabs.

A report entitled "How to Reduce Sidewalk Trip Hazards on Tight Budgets: Managing ADA Compliance, Risk, and Budget, by Gary Beneduci (2010) provides the following advice about maintenance: "When trip hazards range between a quarter inch

and two and half inches, saw cutting is the most effective method to remove trip hazards…Complies with ADA standards for removal and slopes. Meets OSHA recommended standards for slip resistance. Appears clean and neat. Cuts precisely removing trip hazards in difficult-to-reach places. Removes hazards quickly. Stretches budgets…costs about 10 times less than removal and replacement…In summary, with trip hazards 2 ½ inches or less, saw cutting stretches budgets, by lengthening the life of concrete sidewalks that might otherwise be replaced".

Both concrete presentations agreed that maintenance is a non-issue if proper installation is done. This includes choosing the right cement mix, air entrainment, reinforcement and appropriate finishing.

Concrete as a Material Choice

Another important decision related to material choice is cost. Concrete is considerably more cost-effective than brick. The costs of installation appear to be roughly $250 per square yard for brick and $70 per square yard for concrete. Since the Streetscape project involves approximately 61,300 square feet (6,811 square yards) of sidewalks, this cost comparison is crucial. Lexington is facing difficult budgetary decisions currently and project decisions should reflect an understanding of the fiscal restraints. In January 2016, the DPW prepared a report for the Selectmen based on the Beta 25% design plans that stated that if cement was used without brick the cost savings would be $700,000. The report also stated that if the south side sidewalks were replaced with cement the cost would be $15,540 as compared with $55,500 for brick.

The Commission on Disability has reviewed and researched sidewalk materials for over ten years due to its diligent concern about safe travel for all. The reasons that concrete is their material of choice include:

- the fewer seams in the sidewalk the better – segmented pavers like bricks present too many edges or seams;
- the contrast issues for people with visual issues are better with concrete than brick since concrete is brighter, and, if placed with brick as decorative edges, this contrast attribute is further enhanced;
- the flat surface of concrete is easier to manage than bricks for those with neurological, disequilibrium and balance issues;
- if installed properly (reinforced, air entrained), concrete is stronger, more rigid, more versatile, more durable and more predictable;
- concrete is rigid whereas bricks are not – bricks shift and push against each other, with more surface irregularities over time, and more vibration/roughness;
- new technology in the concrete industry have made concrete more resistant to freeze/thaw cycles than bricks – when bricks heave, dozens of joints or seams become obstacles;
- snow removal is easier and more effective on concrete since bricks have so many seams – easier snow removal reduces icing and trip hazards in winter;
- concrete can be more salt-resistant than bricks;
- installed correctly, concrete has very low maintenance;

- concrete is lower in cost to install by about 72%.

Aesthetics vs Function

Due to the many and varied effects of multiple types of disabilities it can be very difficult to balance the desire for aesthetics with functionality. The Commission on Disability believes that concrete with brick edges is already a reasonable compromise position. Even if the unevenness of wire-cut brick sidewalks could be overcome (as promised), brick is still a problem for those with neurological, sensory or visual issues. Even if we are careful about vibration and smoothness brick still does not work. Looking only at smoothness ignores whole disability groups.

The Commission on Disability stresses that the Committee and the Board of Selectmen be aware that safety and functionality are important, and should always come before aesthetics. Another issue to remember is that if there are problems with roughness, unevenness, or even cross slope on the newly recommended wire-cut brick sidewalks, the people most affected will be those with disabilities, not the ones who wanted that choice of material. It is puzzling why the expressed needs of individuals with disabilities are frequently dismissed as being anecdotal and not objective whereas the subjective desires and preferences of those preferring brick are accepted as being more important. The choice of sidewalk material should be based on real life concerns and health needs rather than personal preferences and likes.

At the second Public Hearing, many of the statements made in the Minority Report were challenged since the ADA requirements can allegedly be at least nominally met with wire-cut brick. The Commission on Disability urges the Board of Selectmen to look beyond the limits of the ADA, to get ready ahead of time for new standards pending approval concerning roughness and to examine instead the spirit of the ADA which seeks to be inclusive for all. Brick cannot meet the needs of people with non-mobility based needs. References are appended to this report to demonstrate how difficult these issues are.

People with disabilities are protected by the ADA and other regulations to have safe, smooth access to the Center. There appears to be consensus on this point, but the larger issue relates to the choice of materials. The Commission has tried to detail the many reasons why individuals with disabilities have problems with brick as the primary material, such as mobility issues, visual problems and neurological/sensory overload. Individuals with disabilities historically have not had a voice in the community decision-making process. It is the Commission's hope that the current decision-making process will reflect their input with the understanding that a decision to endorse an all brick solution is one that chooses an historical aesthetic that did not integrate the voices of all its constituents, as at the time in history, individuals with disabilities were largely unseen and never heard.

Summary of Recommendations of the Revised Minority Report

The recommendations from this revised minority report are as follows:

- Lexington Center sidewalk materials should be concrete with brick edges in accordance with Article 42 and the needs of the disabled community. All taxpayers deserve to be able to traverse safely in their town.
- Lexington should contract with PathVu (business based on the research of Jon Pearlman) to assess relative sidewalk surface roughness according to ASTM E3028. Study should include current conditions in Lexington as well as other sites where proposed materials have been installed.
- The tactile warning pads for crosswalks being proposed are cast iron. A study by the Institute for Human Design in Cambridge identifies issues with cast iron as a material for those using vision mobility canes. The Commission on Disability urges the Selectmen to opt for high contrast plastic tactile warning pads instead of the cast iron type to ensure safety of citizens with low vision.
- Since concrete is 72% cheaper at installation, more complete information and comparisons of full life cycle costs should be completed with full awareness of the budgetary issues of the Town. Since CPA funding might be considered, it is important that the historical elements of the Center Streetscape project be suggested for possible CPA funds, including the wire-cut brick decorative edges of the proposed sidewalks, thereby leaving adequate funding for promoting safety by using concrete for the pathways.

Lexington Center must be safe and accessible for all--including elders and the thousands of people who live here and visit each year and have disabilities, however those disabilities were acquired (through birth, illness, injury, or aging). Brick alone, even if nominally ADA compliant, fails to achieve that. Lexington is a community that doesn't settle. It always strives for the best, which is why mere ADA compliance is not good enough for Lexington--it would leave too many people behind, and would deprive the community of the diversity and vitality that this population brings to the Center. Lexington is a can-do community of innovation and generosity of heart. It is possible to have attractive sidewalks worthy of the community's values that combine both brick and concrete.

Respectfully submitted,
Victoria Buckley
January 12, 2017

Resources About Environment and Disability

- https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/sidewalks/chap4a.cfm
- http://www.pedbikesafe.org/PEDSAFE/resources_guidelines_sidwalkswalkways.cfm
- http://safety.fhwa.dot.gov/ped_bike/tools_solve/fhwasa13037/fhwasa13037.pdf.
- Surfaces that are not visually consistent (all one color and texture) can make it difficult for pedestrians with vision disabilities to distinguish the difference

between a change in color and pattern on the sidewalk and a drop off or change in level. http://www.bikewalk.org/pdfs/sopada_fhwa.pdf

- While walking performance is similar between groups in normal light, poor ambient lighting results in decreased foot placement accuracy in older adults with AMD. Improper foot placement while walking can lead to a fall and possible injury. Thus, to improve the mobility of those with AMD, strategies to enhance the environment in reduced lighting situations are necessary. Optom Vis Sci. 2014 Aug;91(8):990-9. doi: 10.1097/OPX.0000000000000316.

- Effect of ambient light and age-related macular degeneration on precision walking. Alexander MS[1], Lajoie K, Neima DR, Strath RA, Robinovitch SN, Marigold DS.

- Santa Rosa's Department of Public Works has found a solution that saves both time and money while making the sidewalk compliant with Americans with Disabilities Act (ADA) and trip hazard free. The City's Public Works officials recently learned of a company that uses a unique, diamond blade saw to "shave" down the raised portion of the sidewalk, avoiding the need for major repairs and saving the city a significant amount of money while increasing exponentially the number of trip hazards they are able to address throughout the city. The contractor, Precision Concrete Cutting, demonstrated the technique for city officials a few months ago. The results were impressive enough that the city hired the company for a pilot project.
- https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/sidewalks/chap4a.cfm in Section 4.4.2 \

"Because people with visual impairments obtain information about the environment in many ways, the most effective cues convey information in more than one format. For example, truncated domes can be detected not only by texture but by sound and color contrast as well. The greater number of sensory qualities (color, texture,resilience, and sound) the cue has, the more likely it will be detected and understood (Sanford and Steinfeld, 1985). The following are common types of accessible information added to sidewalk environments: Raised tactile surfaces used as detectable warnings; Raised tactile surfaces used for wayfinding; Materials with contrasting sound properties; Grooves; **Contrasting colors for people with low vision (sec 4.4.2.5)**; Audible and vibrotactile pedestrian signals

- http://www.afb.org/info/low-vision/living-with-low-vision/creating-a-comfortable-environment-for-people-with-low-vision/235
- https://c.ymcdn.com/sites/www.nibs.org/resource/resmgr/LVDC/102411.lvdc.conceptpaper.pdf
- https://c.ymcdn.com/sites/www.nibs.org/resource/resmgr/LVDC/2010wkshp.rogers.es.pdf?hhSearchTerms=%22sidewalks%22

- http://www.interiorsandsources.com/interior-design-news/interior-design-news-detail/articleid/6191/title/informedesign-releases-em-implications-em-on-design-for-people-with-neurological-disorders.aspx
- https://books.google.com/books?id=Q9WrBwAAQBAJ&pg=PR13&lpg=PR13&dq=designing+environments+for+neurological+disorders&source=bl&ots=S0lhiNPN55&sig=HYfgmJTNMvl-m5RYlKqKgOur4Uw&hl=en&sa=X&ved=0ahUKEwjy3eqT0vbQAhWELcAKHStXCbEQ6AEISjAI#v=onepage&q=designing%20environments%20for%20neurological%20disorders&f=false
- https://workdesign.com/2015/03/the-future-of-neuro-architecture-has-arrived/
- http://www.internationalbrain.org/articles/residential-design-impacts-quality-of-life-for-neurodisabled-individuals/
- Color and Contrast of Detectable Warnings http://sites.udel.edu/dct/files/2014/07/4F-Contrast-276a7vx.pdf
- Accessible sidewalks and street crossing http://www.bikewalk.org/pdfs/sopada_fhwa.pdf
- Chapter 4 - Sidewalk Design Guidelines and Existing Practices https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/sidewalks/chap4a.cfm

[END MINORITY REPORT]