Engineering

Presented by: Manager of Engineering Services
Discussion Overview

• Municipal Infrastructure, Planning, Design & Implementation
• Land Development & Site Servicing
• Street Light Design
• Mobility Friendly Infrastructure
• Asset Management
What is Municipal Infrastructure?

• Roads, Bridges and Culverts
• Storm Sewer Collection System
• Sanitary Sewer Collection System
• Waste Water Treatment Plant
• Sidewalk and Streetlights etc.
Infrastructure Planning

• Engineering Department oversees:
  • 5 year infrastructure planning for current and future growth
  • Replacement and Upgrading
  • Infrastructure Requirements for new developments
  • Capacity Building for future growth
  • Asset Management
  • And more!
Land Development & Site Servicing

Must meet the specifications and requirements outlined in:

• Subdivision & Development Control Bylaw 430,
• MMCD (Master Municipal Construction Document) Platinum,
• TAC (Transportation Association Of Canada) Design Requirements, &
• Best Engineering Practices
What is the Subdivision & Development Control Bylaw 430?

• Sets the specification, design criteria, and service standards requirements along project frontage. This includes:
  • Highway Improvements
  • Sanitary Systems
  • Drainage
  • Curbs, Sidewalks, and Walkways;
  • Streetlights & streetscaping
  • Etc.
Highway Design Considerations

• Highway classification;
• Design Speeds & Posted Speeds;
• Traffic Calming;
• Accessible Pedestrian facilities;
• Active Transportation
• Parking, and other considerations;
• Lifespan of infrastructure;
### Roadway Classification

<table>
<thead>
<tr>
<th>Traffic Volume (AADT)</th>
<th>Local</th>
<th>Collector</th>
<th>Arterial</th>
<th>Expressway</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1000</td>
<td>&lt;8000</td>
<td>5000-10,000</td>
<td>&gt;10,000</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Design Speed (KPH)</th>
<th>30-50</th>
<th>50-80</th>
<th>50-80</th>
<th>80-110</th>
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</table>

<table>
<thead>
<tr>
<th>Examples</th>
<th>Oracle Rd</th>
<th>Nickerson</th>
<th>Norwest Bay</th>
<th>Highway 101</th>
</tr>
</thead>
</table>
Traffic Calming

- Traffic Calming is required to improve safety and comfort by reducing:
  - speed
  - infiltration
  - shortcutting (rat-racing)
  - and inappropriate actions by motorists

- Traffic Calming is defined as a combination of mainly physical measures that reduce the negative impact of motor vehicle use.
Examples of Traffic Calming:

• Curb Extension (Curb Bulging)
• Raised Intersection & crosswalk
• Traffic Circles
• Speed Bumps & humps
• Traffic Diverters
• Turning Restrictions
• Etc.
Negative Traffic Calming Impact

• Mobility effects on neighbourhood residents
• Transit operation
• Additional Road Maintenance, such as snow removal & road painting
• Emergency Vehicle Response Times
• Visually unattractive & incompatible with adjacent buildings & uses
Factors for Choosing Traffic Calming

- Road Classification
- Topography
- Existing Street Design Standard, including road width
- On street parking & Driveway locations
- Transit, Truck Service & Emergency Vehicles Requirements
- Designated Cycling Routes
Curb Extension Advantages

- Improves Line of Sight
- Reduces pedestrian travel time
- Reduces driver uncertainty
- Narrower road causes driver to naturally reduce travel speed
- Limits parking near intersection

Figure 6.4.3: Pedestrian-Motorist Sightlines at Intersection Crossings
Traffic Calming – Inlet & Cowrie

Before (2013)

After (2018)
Traffic Calming – Dolphin & Trail Concept
Traffic Calming (curb bulging and raised crosswalk)
Raised Crosswalk at UBC
Accessibility

• “Accessible design is good design, it benefits people who don’t have disabilities as well as people who do.”

• This includes yellow tactile and directional grooves

Inlet & Cowrie Intersection
District’s Requirements for Sidewalk

• Downtown Core: 2.0m Wide
• Urban Areas 1.5m-1.8m, Separated from roadways with a boulevard
• All intersection letdowns to have tactile pads for visually impaired persons, complete with Directional Grooves
• Sidewalks are concrete, multi-use pathways are asphalt & concrete.
• Letdown grades are to meet accessibility guidelines
Minimum Sidewalk Width for Special need Pedestrian

- Person with a walking stick requires 750mm
- Person with crutches or walking frame requires 900mm
- Blind person with long cane or assistance dog requires 1100mm
- A visually impaired person who is being guided requires 1200mm
- A wheelchair user and an ambulant person side by side need 1500mm
Multi-use Pathways

- Safe Cycling and Pedestrian facilities
- Separate from traffic by a boulevard
- Multi-use path can be on both sides of roadway
- Multi-use path divided for pedestrian and cyclist use.
- Implemented on District’s Collector & Arterial Roadways
Active Transportation – Multi Use Pathway

100th Ave, Surrey BC
Proposed Cowrie & Trail Intersection - MUP
Proposed Cowrie & Trail Intersection - MUP
What is Smart Street Lighting?

• Dark Sky Friendly (minimize light pollution & spill)
• Motion Sensitive
• Dimming Capable
• Appropriate light levels for the current usage & demand
• Reduce electrical usage & greenhouse gas emissions
• LED bulbs have long life span, reduced maintenance
• LED Life Expectancy – 50,000 hrs or 14 years with 10hr daily usage
• Light level remain sufficient at intersections throughout night time for safety
District Street Lighting – BC Hydro Pole Mounted

- BC Hydro Lease Light
  - 250 watt High Pressure Sodium (HPS)
  - “warm” 2700k (reddish) colour
  - Lots of light pollution
  - Energy inefficient

2700K = Colour temperature
District Streetlight – Old Standard

- Old Decorative Metal Halide Streetlight
  - 175 watt
  - “neutral” 4000k colour
  - Medium light pollution
  - Partial Cut off
  - Not energy efficient
District Street Lighting – Modern Decorative

- Decorative LED Streetlight
  - 80-100 watt LED
  - “daylight” 5000k colour
  - Low light pollution
  - Energy efficient (60% more efficient than HPS)
Inventory of Streetlights in Sechelt

<table>
<thead>
<tr>
<th>Type of Light</th>
<th>Number of lights</th>
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<tbody>
<tr>
<td>BC Hydro Lease Lights</td>
<td>279</td>
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<tr>
<td>MH + HPS Streetlights</td>
<td>458</td>
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<tr>
<td>LED Streetlights</td>
<td>19</td>
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Streetlight Costs Comparison Cont.

<table>
<thead>
<tr>
<th>Type of Light</th>
<th>Monthly cost</th>
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</thead>
<tbody>
<tr>
<td>BC Hydro Rental Cost Per Light</td>
<td>$22.25</td>
</tr>
<tr>
<td>Power Cost per MH Light</td>
<td>$5.69</td>
</tr>
<tr>
<td>Power Cost per LED Light</td>
<td>$3.07</td>
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</table>

LED monthly costs 54% less than Metal Halide lights and High Pressure Sodium Lights
# Streetlight Costs Comparison
Based on August 2018 Hydro Bill

<table>
<thead>
<tr>
<th>Type of Light</th>
<th>Annual Maintenance Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>BC Hydro Lease Light Per Light</td>
<td>Included in monthly cost</td>
</tr>
<tr>
<td>Replacement Cost per MH Light</td>
<td>$300</td>
</tr>
<tr>
<td>Replacement Cost per LED Light</td>
<td>$55</td>
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</tbody>
</table>

LED costs 18% less to maintain than MH lights
Power usage & Greenhouse Gas Emissions

• LED uses \(~1/4\) (25%) the power for the same brightness as HPS & MH
• Reduces power demand by 75%
• Reduces greenhouse gasses by 75%
Lighting Distribution Types

Type I  Type II  Type III  Type IV  Type V

The basic patterns of the five main type classifications in the IESNA streetlight illumination distribution definitions. The blue squares indicate the placement of the overhead fixtures, over roadway center, lane center, or near curbside.
Full Cut-off (Dark Sky Friendly) Streetlights
Modern Decorative Streetlight Example – Dolphin Ave.
What is Asset Management?

• The way we manage the infrastructure we own
• We all practice asset management
• We practice asset management by fixing the leak in the roof of our house
• We practice asset management for vehicle maintenance
• These repairs prevent more costly damage down the road

These principles that we apply in everyday life should be applied to municipal assets
Useful Life of Infrastructure

- Infrastructure will not last forever
- With the aging infrastructure:
  - Increase in maintenance and operations cost
  - Significant increases of renewals and replacement costs

If we have a clear picture of current state of municipal assets, we can make a more informed decision of asset operations, maintenance and renewal.
Fairway Ave. – Stump Removal during sewer expansion project August 2018
Pavement Life Cycle & Rehabilitation Threshold

- Excellent: 100
- Good: 80
- Fair: 60
- Poor: 40
- Very Poor: 20
- Failed: 0

- Preventative Maintenance: e.g., ditch maintenance, crack sealing
- Rehabilitation
- Reconstruction

- 40% drop in quality at 75% of life
- $1.00 for renovation here
- $4.00 to $5.00 here
- 12% of life
Total Infrastructure Assets owned, operated and maintained by the District

- Sanitary Sewer (DOS) 50km
- Storm Sewer (DOS) 44km
- Sanitary Pump Stations 12
- KM of Paved Roads 88km
- KM of Sidewalks 25km
- Streetlights 480
- Streetlight Bulb Replacement 75/month (a bulb lasts 6 months, average)
Key Components of the International Infrastructure management Manual

• Life Cycle Approach
• Cost effective management strategy
• Defined level of service
• Demand management
• Risk management
• Sustainable use of physical resources
• Continuous improvements
Questions?

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