Asphalt Mixes Specifically Designed for Urban Applications

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Outline

- Urban pavements
- Specificities of urban pavements
- Required performances
- Urban bituminous techniques
- Conventional asphalt mixes
- Special mixes and techniques
Pavements

Rural
- Highways
- County roads
- Trails

Urban
- Residential
- Commercial
- Industrial
Residential & commercial

- Ring roads
- Streets, avenues...
- Intersections
- Urban settings
- Parking lots
- Dedicated lanes (buses)
- Sidewalks & trails
- Bicycle lanes/trails
Pedestrian Trails
Dedicated Bus Lanes
Industrial

Streets, avenues...

Parking lots trucks & cars

Sidewalks & trails

Intersections

Industrial platforms
Specificities of Urban Pavements

- Multifunction
  - automobiles, delivery vehicles, bicycles, pedestrians, public transportation, utilities...
- Movement conflicts
- Variable speed
- Diversity in axial loading
- Significant impact of construction
  - Pavements & underground work
- Street ... it’s more than a highway
  - societal role, cultural et environmental
Specificities of Urban Pavements

• “Urban Heat Island Effect”
Required Performances

- Selection of mixes
  - trade off to identifier
- Street is not a highway
- Requirements related to:
  - comfort
  - safety
  - access to underground utilities
Required Performances

- ease of placement at variable thicknesses
- waterproofing
- “compactability”
- workability
- adherence i.e. skid resistance
- aesthetics
- rolling noise
- ease of repaired
Ease of Repair...
Urban Bituminous Techniques

- Trend in asphalt mixes “urban vs. rural”
  - French context

<table>
<thead>
<tr>
<th>Characteristics - Properties</th>
<th>Urban mixes</th>
<th>Mixes for high volume roads</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal maximum aggregate size</td>
<td>6 or 10 mm</td>
<td>10 or 14 mm</td>
</tr>
<tr>
<td>Natural sand</td>
<td>Usually needed 10 to 25%</td>
<td>Exceptionally accepted ≤ 10 %</td>
</tr>
<tr>
<td>Binder grade</td>
<td>70/100 or 50/70</td>
<td>50/70 or 35/50</td>
</tr>
<tr>
<td>Binder content</td>
<td>5.9 to 7.0</td>
<td>5.7 to 6.1</td>
</tr>
<tr>
<td>Richness modulus</td>
<td>3.6 to 4.1</td>
<td>3.5 to 3.7</td>
</tr>
<tr>
<td>Compaction</td>
<td>93 to 96 %</td>
<td>91 to 95 %</td>
</tr>
</tbody>
</table>

*Extracted from the book “les enrobés bitumineux”*
Urban Bituminous Techniques

• Nominal maximum aggregate size
  ➢ noise, workability, thickness, comfort, cleaning & aesthetics

• Natural sand & softer binder
  ➢ workability, thickness et « compactability »

• Higher binder content et volume of effective binder
  ➢ cohesion, moisture resistance, waterproofing, workability, thickness et « compactability »

• Higher compaction level
  ➢ moisture resistance, waterproofing & durability
# City of Edmonton

## Construction Specifications

**Section 02066**

**SGC HOT-MIX ASPHALT CONCRETE**

**January 2014**

<table>
<thead>
<tr>
<th>Requirement</th>
<th>ACF-HT</th>
<th>ACF-LT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mix Type</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Selected Parameters</strong></td>
<td>100</td>
<td>75</td>
</tr>
<tr>
<td>Number of Gyrations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gyrations N&lt;sub&gt;design&lt;/sub&gt;</td>
<td>160</td>
<td>115</td>
</tr>
<tr>
<td>Gyrations N&lt;sub&gt;maximum&lt;/sub&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Density at N&lt;sub&gt;maximum&lt;/sub&gt; (%G&lt;sub&gt;mm&lt;/sub&gt;)</td>
<td>98.0 Max</td>
<td>98.0 Max</td>
</tr>
<tr>
<td>Bailey CA-CUW</td>
<td>&gt;95 to 105 Max.</td>
<td>60 to 85 Max.</td>
</tr>
<tr>
<td>Air Voids, % of total mix (virgin mix)&lt;sup&gt;3&lt;/sup&gt;</td>
<td>4.0 +/- 0.4%</td>
<td>3.0 +/- 0.4%</td>
</tr>
<tr>
<td>VMA, %</td>
<td>14 Minimum</td>
<td>15 Minimum</td>
</tr>
<tr>
<td>Voids filled, %</td>
<td>70 - 80</td>
<td>73 - 85</td>
</tr>
<tr>
<td>Tensile Strength Ratio % (AASHTO T283)&lt;sup&gt;2&lt;/sup&gt;</td>
<td>80 Minimum</td>
<td>80 Minimum</td>
</tr>
<tr>
<td>Minimum Film Thickness&lt;sup&gt;3&lt;/sup&gt;, mm</td>
<td>7.5 min.</td>
<td>7.5 min.</td>
</tr>
<tr>
<td>APA (mm, 52°C, 8,000 cycles)</td>
<td>5.0 max.</td>
<td>7.0 max.</td>
</tr>
</tbody>
</table>

**Note 1:** The mix design air voids shall be selected at the midpoint of the specified range, or the lowest value within the range, in which all the other mix design criteria are met.

**Note 2:** Minimum Tensile Strength Ratio to be determined in accordance with AASHTO T283, with optional freeze-thaw, at air void content of 7.0 +/- 0.5%.

**Note 3:** Minimum film thickness to be determined to Appendix C2065.B
## Conventional Asphalt Mixes

<table>
<thead>
<tr>
<th>Property to improve</th>
<th>Possible solutions</th>
<th>Trade off...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compaction</td>
<td>↑ binder content</td>
<td>↑ rutting</td>
</tr>
<tr>
<td></td>
<td>softer binder</td>
<td></td>
</tr>
<tr>
<td></td>
<td>gradation (↑ sand)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>gap graded</td>
<td></td>
</tr>
<tr>
<td></td>
<td>natural sand</td>
<td></td>
</tr>
<tr>
<td>Moisture resistance</td>
<td>anti-stripping agent</td>
<td>↑ rutting</td>
</tr>
<tr>
<td></td>
<td>↑ binder content</td>
<td></td>
</tr>
<tr>
<td></td>
<td>lime treatment</td>
<td></td>
</tr>
<tr>
<td>Rutting</td>
<td>↓ binder content</td>
<td>↑ modulus</td>
</tr>
<tr>
<td></td>
<td>gradation (↓ sand)</td>
<td>↓ fatigue</td>
</tr>
<tr>
<td></td>
<td>aggregates (angularity)</td>
<td>↑ thermal cracking</td>
</tr>
<tr>
<td></td>
<td>additives (LDPE)</td>
<td>↓ compaction</td>
</tr>
<tr>
<td></td>
<td>harder binder</td>
<td></td>
</tr>
<tr>
<td>Modulus</td>
<td>harder binder</td>
<td>↑ thermal cracking</td>
</tr>
<tr>
<td></td>
<td>optimisation of binder content</td>
<td>↓ fatigue</td>
</tr>
<tr>
<td>Fatigue</td>
<td>↑ binder content</td>
<td>↑ rutting</td>
</tr>
<tr>
<td></td>
<td>↑ compaction (gradation)</td>
<td></td>
</tr>
<tr>
<td>Thermal cracking</td>
<td>softer binder</td>
<td>↑ rutting</td>
</tr>
</tbody>
</table>
Conventional Asphalt Mixes

**Dense graded mixes**

**Gap graded mixes**
Conventional Asphalt Mixes

French BBTM 0/6 mm « gap graded »

SMA 0/6 mm « gap graded »

SP 0/5 mm « dense graded »
Special mixes and techniques

- Rugoville
- Colclair®
- Neoclean™
Rugoville

RUGOVILLE
The ultimate in urban comfort
Rugoville

**RUGOVILLE**

- Overlay for street maintenance or rehabilitation
- Adaptable to most supports
- For repaving, accepts thickness variations
- Compact, waterproof and long-lasting
- Homogeneous and aesthetic
- Good skid resistance
- Low rolling noise

**RUGOVILLE**

- A specific formulation
  - Grading 0/8
  - Derived from RUGOCOMPACT
  - Gap-graded 2/4
  - Choice of binder depending on traffic
  - Resistant to rutting and creep
  - Good tyre grip

**RUGOVILLE**

- An environment-friendly urban overlay
  - Warm application: No fumes, no smells, energy savings
  - Driving comfort and economy
  - Minimal site preparation required
  - Laid down in a single layer
  - Long service life
  - Protects pavement base
Colclair®

Gamme des produits spéciaux

COLCLAIR
Colour is life
Colclair®

- COLCLAIR is a range of light-coloured products, with a natural or coloured appearance
- The COLCLAIR range is produced using BITUCLAIR binder: a translucent synthetic bitumen
- COLCLAIR is
  - Mainly hot-mix or warm-mix asphalts
  - Cold mix asphalt
  - Cold micro asphalt concrete
  - Surface coatings
  - Mastic asphalts
- COLCLAIR makes it possible to
  - Create quality spaces
  - Identify spaces according to use
  - Enhance visibility and save lighting costs in towns or in tunnels

- The BITUCLAIR binder
  - Translucent synthetic binder
  - A range adaptable to all traffic levels (contains SBS)
  - Manufactured and tested in COLAS
  - Can be used in dedicated mixing plants or other installations with a metering
  - Available in hot-melt bags for small quantities

- BITUCLAIR emulsions
  - Coating
  - COLMAT
  - Spray coating (coatings, tack coats)

- Formulation: formulations are adapted to use
  - 0.5 asphaltic concrete or cold mix for cycle tracks, pedestrian zones, private drives, etc.
  - Very thin asphaltic overlay for tunnels and bus lanes
  - Acoustic HANDOSOFT or RUGOSOFT
  - Thin asphaltic concrete for urban pavements
  - Cold micro asphalt concrete for emergency lanes and footpaths
  - Surface dressing in a natural environment
  - Etc.

- Photometric characteristics
  - The photometric characteristics of COLCLAIR are optimized for lighting calculation (tunnels, etc.)
Colclair® (Canadian References)

Dawson City, Yukon, 2009

Montréal, 2011

Montréal, 2013
Neoclean™

Gamme des produits spéciaux

NEOCLEAN
Trackless Tack-coat
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