CONSIDERATION OF HOUSTON'S PAVEMENT DESIGN STANDARDS

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1. Background

In the past, throughout the United States, concrete pavements were routinely designed and constructed for the design life of 20 to 30 years. More recently, there has been a movement towards construction a longer design life among governmental agencies. Some of the agencies are: The City of Arlington (50 years), State of California (40), State of Washington (50 years), and State of Minnesota (60 years).

2. The City of Houston Roadways

The City of Houston has road network of more than 16,000 miles that are classified into local/residential, collectors, and thoroughfares. There are five main types of pavement which exist in the City of Houston network of roadways:

- Rigid Pavement (Concrete);
- Flexible Pavement (Asphalt);
- Composite Pavement (Concrete overlaid by Asphalt);
- Asphalt Overlays; and
- All Other pavements (Brick, Paving Stone, Gravel).

3. Proposed Change in Pavement Design Life

Since the expected life of utility lines is more than 50 years, a need was identified by the City of Houston to develop pavement replacement strategies for the same time period (50 years).

4. Advantages of 50-Year Design Life

In addition to match the design life of utility lines, the added advantages of using pavement design life of 50 years (long-life pavement) are:

- Pavement having reduced premature construction and materials related failure.
- Pavement having reduced potential for cracking, faulting, and spalling that will result in an extended time to the first rehabilitation.
- Minimal traffic intervention due to minor maintenance and rehabilitation.

5. Economic Justifications

The 50-year design life will have the following economic benefits:

- Lower consumption of raw materials (cement, aggregates, steel) over the design life.
- Lower energy consumption because of lesser raw material processing, reconstruction and traffic congestion.
- Reduction in pollutants because of manufacturing, construction, congestion.
- Higher safety due to infrequent construction zones.
- The overall project cost will be increased by 5% to 6%, but life cycle cost will be reduced.
- User cost will be reduced (vehicle operating costs, user delay costs, accident cost) because of fewer and shorter work zone periods for future maintenance.
- Life cycle costs of 50 year design life (compared to 20 years) will be reduced which will result in long term cost savings to tax payers.

6. Current Requirements and Proposed Minimum Standard

- **Concrete Slab:** The minimum concrete slab thickness

Description	**Minimum Concrete Slab Thickness**	
	Current	**Proposed**
Residential	6 inches	**6 inches**
Collector	7 inches	**9 inches**
Major Thoroughfare	8 inches	**11 inches**

- **Subgrade:** The minimum subgrade stabilization depth is proposed as follows:

Description	**Minimum Subgrade Stabilization Depth**	
	Current	**Proposed**
Residential	6 inches	**8 inches**
Collector	8 inches	**12 inches**
Major Thoroughfare	8 inches	**12 inches**

- **Subgrade:** Or, the following table will be used for the minimum subgrade stabilization depth.

Plasticity Index	Minimum Subgrade Stabilization depth
≤ 30%	8 inches
> 30% and ≤ 40%	10 inches
> 40% and ≤ 50%	12 inches
> 50%	Evaluation will be needed

- **Others Items**

Description	Current	Proposed
Compressive Strength at 28 days	3,500 psi	**4,000 psi**
Flexural Strength at 28 days	600 psi	**630 psi**
Expansion Joint Spacing	80 feet	**40 feet**
Corrosion Protection of Bars	None	**Required**
Subgrade Compaction ASTM D-698	95%	**98%**

7. Summary

- By increasing pavement life to 50 years (from 20 years), pavement will have reduced potential for distresses that will result in an extended time to the first rehabilitation.
- The initial project cost will be increased between 5% and 6%.
- Reduces cost over the life of a roadway with lower maintenance cost and extended time to reconstruction.
- Life cycle cost will be reduced.
- By designing concrete pavements for 50 years with lower life cycle costs, the City of Houston will meet the needs of the present without compromising the ability of future generations to meet their needs.