



Street Lighting – Color Temperature by Context

March 2022

Richard Stepp, P.E. – Roadway Design Office

What is Correlated Color Temperature?



Correlated Color Temperature (CCT) is a way to describe the color of light produced by lamp options:

- **Lower** color temperature is “warmer” or “softer”, and is more amber or orange (candlelight)
- **Higher** color temperature is “cooler”, and is whiter with increasing blue content

“Old”
High Pressure Sodium



Existing 2200 Kelvin HPS

“New”
LED Options



3000 Kelvin

4000 Kelvin

Background:

- “Old” High Pressure Sodium lights installed throughout Florida in previous decades (2200K CCT)
- “New” LED lights installed throughout Florida since 2016
- Previously:
 - FDOT Specifications require CCT ≤ 4000K
 - No further guidance given
 - Majority of installations 4000K



UPDATE:

Per *Roadway Design Bulletin 22-02*, new requirements are given for street light color temperature by roadway context.

***RESULT:* The majority of roadways will use warmer, 3000K light.**



Considerations for Choosing Color Temperature:

- ★ • **Optimum Driver Visibility – Roadway Safety**
 - 1) **NEW National Research Study: NCHRP Solid State Lighting – Volume 2**
 - 2) **FDOT Analysis: “detection distance” & “stopping sight distance”**

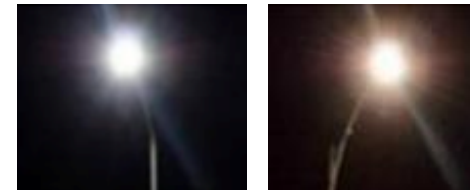
CONCLUSIONS:

- ***3000K has same driver visual performance as 4000K for most locations***
- ***4000K does benefit some limited high-speed roadway contexts***

Considerations for Choosing Color Temperature:

Next...

- Environmental Needs
- Aesthetic Needs
- Health Benefits
- Energy Efficiency
- Maintenance Benefits
- National Trends



NEW: Color Temperature by Context

Table 231.2.3 Correlated Color Temperature (CCT)

Design Speed	Context	CCT
Arterials and Collectors		
≤ 35 mph	All	2700K ¹ or 3000K
≤ 50mph	All	3000K
≥ 55mph	C1 & C2	3000K
≥ 55mph	C3 ²	4000K
Limited Access Facilities		
All	All	3000K
Notes:		
1. Consider use of 2700K per <i>FDM 231.2</i>		
2. Higher number contexts may apply		

NEW: Color Temperature by Context

Table 231.2.3 Correlated Color Temperature (CCT)

Design Speed	Context	CCT
Arterials and Collectors		
≤ 35 mph	All	2700K ¹ or 3000K
≤ 50mph	All	3000K
≥ 55mph	C1 & C2	3000K
≥ 55mph	C3 ²	4000K
Limited Access Facilities		
All	All	3000K
Notes:		
1. Consider use of 2700K per <i>FDM 231.2</i>		
2. Higher number contexts may apply		

4000K is used for high-speed suburban contexts

- 4000K shows a detection distance advantage to accommodate larger stopping sight distance for ≥ 55mph

NEW: Color Temperature by Context

Table 231.2.3 Correlated Color Temperature (CCT)

Design Speed	Context	CCT
Arterials and Collectors		
≤ 35 mph	All	2700K ¹ or 3000K
≤ 50mph	All	3000K
≥ 55mph	C1 & C2	3000K
≥ 55mph	C3 ²	4000K
Limited Access Facilities		
All	All	3000K
Notes:		
1. Consider use of 2700K per <i>FDM 231.2</i>		
2. Higher number contexts may apply		

3000K is used for all other contexts

- Implemented where same statistical visual performance as 4000K is provided
- Used for over 95% of roadway miles (Estimated)

NEW: Color Temperature by Context

Table 231.2.3 Correlated Color Temperature (CCT)

Design Speed	Context	CCT
Arterials and Collectors		
≤ 35 mph	All	2700K ¹ or 3000K
≤ 50mph	All	3000K
≥ 55mph	C1 & C2	3000K
≥ 55mph	C3 ²	4000K
Limited Access Facilities		
All	All	3000K
Notes:		
1. Consider use of 2700K per <i>FDM 231.2</i>		
2. Higher number contexts may apply		

2700K is used for low-speed applications

- Light color is particularly insignificant at low speeds (2200K performed well)
 - **Benefits** aesthetic areas, residential areas, natural areas, historic areas, parks, campuses, or wherever locals prefer it
 - *Example: City of St. Augustine prefers warmer light*



NEW: Color Temperature by Context

Table 231.2.3 Correlated Color Temperature (CCT)

Design Speed	Context	CCT
Arterials and Collectors		
≤ 35 mph	All	2700K ¹ or 3000K
≤ 50mph	All	3000K
≥ 55mph	C1 & C2	3000K
≥ 55mph	C3 ²	4000K
Limited Access Facilities		
All	All	3000K
Notes:		
1. Consider use of 2700K per <i>FDM 231.2</i>		
2. Higher number contexts may apply		

Supporting Policy:

Complete Lighting Replacement Projects

- New policy is not retroactive
- Leave existing luminaires in place unless an all-new lighting project is warranted *for reasons other than CCT*
- **EXAMPLES** - Replacement lighting system is:
 - **justified** for road widening, upgrading to LED, replacing aging system with high failure rates, meeting current illumination requirements
 - **not justified** for only changing from existing 4000K to 3000K

NEW: Color Temperature by Context

Table 231.2.3 Correlated Color Temperature (CCT)

Design Speed	Context	CCT
Arterials and Collectors		
≤ 35 mph	All	2700K ¹ or 3000K
≤ 50mph	All	3000K
≥ 55mph	C1 & C2	3000K
≥ 55mph	C3 ²	4000K
Limited Access Facilities		
All	All	3000K
Notes:		
1. Consider use of 2700K per FDM 231.2		
2. Higher number contexts may apply		

Supporting Policy:

Individual Light Replacements or Additions

- Where small numbers of luminaires are added or replaced for maintenance, retrofits, or other purposes:
 - Table 231.2.3 does not apply
 - ***Instead...***
match the CCT of the existing lighting system to maintain color consistency

NEW: Color Temperature by Context

Table 231.2.3 Correlated Color Temperature (CCT)

Design Speed	Context	CCT
Arterials and Collectors		
≤ 35 mph	All	2700K ¹ or 3000K
≤ 50mph	All	3000K
≥ 55mph	C1 & C2	3000K
≥ 55mph	C3 ²	4000K
Limited Access Facilities		
All	All	3000K
Notes:		
1. Consider use of 2700K per <i>FDM 231.2</i>		
2. Higher number contexts may apply		

Supporting Policy:

Roadside Facilities

- Use the same CCT as the nearest roadway lighting for consistency...
- Such facilities include, but are not limited to:
 - Sidewalks
 - Shared use paths
 - Toll plazas
 - Rest areas
 - Weigh stations

NEW: Color Temperature by Context

Table 231.2.3 Correlated Color Temperature (CCT)

Design Speed	Context	CCT
Arterials and Collectors		
≤ 35 mph	All	2700K ¹ or 3000K
≤ 50mph	All	3000K
≥ 55mph	C1 & C2	3000K
≥ 55mph	C3 ²	4000K
Limited Access Facilities		
All	All	3000K
Notes:		
1. Consider use of 2700K per FDM 231.2		
2. Higher number contexts may apply		

Supporting Policy:

Environmental Areas

- The CCT requirements of **FDM 231.2.1** supersede the requirements of **Table 231.2.3**.

NEW: Color Temperature by Context

Table 231.2.3 Correlated Color Temperature (CCT)

Design Speed	Context	CCT
Arterials and Collectors		
≤ 35 mph	All	2700K ¹ or 3000K
≤ 50mph	All	3000K
≥ 55mph	C1 & C2	3000K
≥ 55mph	C3 ²	4000K
Limited Access Facilities		
All	All	3000K
Notes:		
1. Consider use of 2700K per <i>FDM 231.2</i>		
2. Higher number contexts may apply		

The End

