

Level of Traffic Stress

Without separation, a road can be an uncomfortable place to be when walking, biking, or rolling. High speeds, multiple lanes, and loud engines can make you feel out of place and unsafe.

Design decisions need to consider both physical and psychological needs. Facilities for walking, biking, and rolling need to be **comfortable**. The best way to do that is with **space, separation, and visibility**. But every road is different, so how do we know *how much* space, separation, and visibility is needed?

LTS: Level of Traffic Stress

In designing facilities for walking and biking, we use Level of Traffic Stress (LTS) to determine how much space and separation to provide. LTS measures the stress that someone walking, rolling, or biking feels on road segments and crossings. Even though stress is unique to each individual, it is associated with quantifiable roadway characteristics that we can measure. LTS aggregates these characteristics to produce a score between 1 and 4.

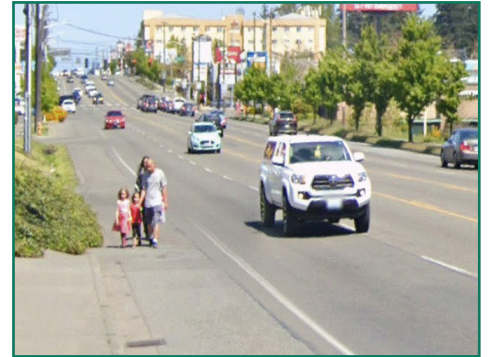
You may be familiar with Level of Service (LOS); where LOS grades are based on vehicle congestion and delay, LTS grades are based on user comfort.

A road with an LTS of 1 is best, being suitable for users of all ages and abilities. A road with an LTS of 4 presents the highest stress level. Only those who have a high level of confidence or who do not have other options will use an LTS 4 road. The family pictured above is walking on a road with an LTS of 4. WSDOT's goal for Complete Streets projects is to provide facilities with a LTS of 2 (comfortable for most adults) or better.

How do we determine LTS?

LTS considers several factors that contribute to discomfort for people outside of vehicles. A roadway with a combination of the following characteristics will have a higher LTS that will need to be addressed by appropriate walking, rolling, and biking facilities:

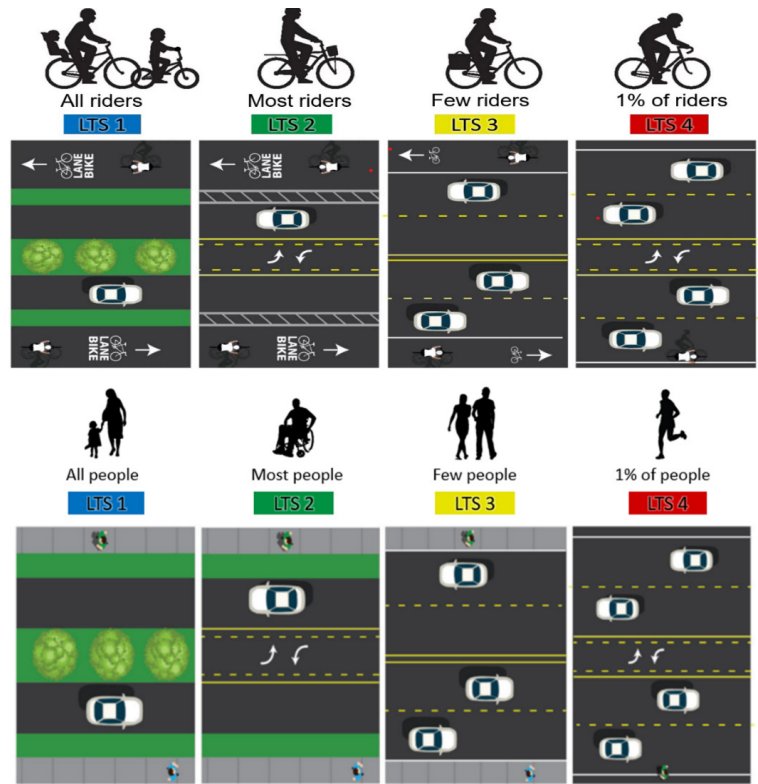
- **High traffic volumes (Annual Average Daily Traffic (AADT))**
- **High vehicle speeds (measured by posted speed)**
- **Multiple vehicle travel lanes**
- Indirect routes for walking, rolling, and/or biking
- High volumes of truck traffic
- Frequent driveways
- Unmarked, infrequent crosswalks



Roads like this are common in Washington, and have an LTS of 4.

Level of Traffic Stress	Description
1	Suitable for all ages and abilities; children could walk or bike here independently. Separated and/or barrier-protected.
2	Comfortable for most adults, including most adults experiencing disabilities. Some separation, no barrier.
3	Tolerable for enthusiastic and/or confident adults. Little space, no separation.
4	Only used by highly confident people, or those with no alternative. No dedicated space, no separation

WSDOT's basic LTS considers the three biggest factors in determining comfort: traffic volume, vehicle speeds, and the number of vehicle travel lanes. When these metrics increase, LTS increases, and so does the need for separation.



Creating Low Stress Roads

There are many ways to create a low stress environment for people walking, rolling, and biking. Some of the best methods are:

- Traffic calming (design roads for lower vehicle speeds, which could include fewer, narrower travel lanes)
- Providing space and separation for people walking, rolling, and biking
- Improving visibility at road crossings

These improvements are proportional. A busy, 6-lane arterial road may need bike lanes separated by concrete barriers. A slow, 2-lane residential street may not need bike lanes at all. WSDOT uses **LTS tables** to match treatments to roads based on their characteristics.

How to Read an LTS Table

LTS tables relate stressful road conditions to a given road treatment and produce an LTS score. These tables answer questions like “If we have a road with a 5’ sidewalk, 4 lanes, a 30 MPH speed limit, and 2000 AADT, then what Level of Traffic Stress will a person experience when they walk on it?” Below is an example LTS table, with high LTS in red and low LTS in green.

Pedestrian LTS: Minimum sidewalk width (5')								
Lanes	AADT	≤ 20 MPH	25 MPH	30 MPH	35 MPH	40 MPH	45 MPH	≥ 50 MPH
1 thru lane per direction/ lane one-way	0-750	1	1	2	4	4	4	4
	751-1500	1	1	2	4	4	4	4
	1501-3000	1	1	2	4	4	4	4
	> 3000	2	2	2	4	4	4	4
2 thru lanes per direction	0-7000	2	2	2	4	4	4	4
	> 7000	2	2	3	4	4	4	4
3+ thru lanes per direction	Any	2	2	3	4	4	4	4

For more information on Designing for LTS, please refer to [WSDOT's Design Manual and Design Bulletin: Designing for Level of Traffic Stress, Bulletin #2022-01](#).

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