MnDOT: Context Sensitive Design

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Context Sensitive Design (CSD/CSS) at MnDOT

- ‘Thinking Beyond the Pavement’ workshop (1998): FHWA, AASHTO, promoted CSD
  - MnDOT: one of 5 ‘pilot states’ to advance CSD (1999-2000)
  - MnDOT CSD/CSS and flexible design training, other activities and early guidance
- MnDOT CSD Technical Memorandum (2000, now ‘historical’)
- CSS designated by MnDOT as a ‘Flagship Initiative’ in 2009

Mn State Transportation Plan (2017)
- MnDOT to develop tools & resources to better reflect context
  - Allow for design flexibility, etc
Areas of land with a unique combination of characteristics that:

- reflect the place (as planned +/- or exists)
- the activities that people (‘users’) do, or will do there

- Refined enough to identify distinctions requiring different planning & design practices for mv speeds, multimodal mobility/access demands & service, and user group (modal) interactions
- Qualitative descriptions and approach; future and existing ‘land uses’

Natural

Rural

Rural Crossroad

Suburban Commercial

Suburban Residential

Urban Commercial

Urban Residential

Urban Core

*A small town typically includes many of the land use context types shown here, but may be of a smaller scale or length along a highway corridor compared to those in a larger built-up area.
Small City Throughroads

- Principles and approach piloted and researched in Scandinavia (1980's-1990's), etc
- Outcome-based approach (incl transitions)
  - Moderate traffic speeds
  - Better ‘fit’ with land use
  - Improve safety (for walking, biking, etc)
  - Support businesses and quality of life
  - Consider all community, O & M impacts
- Road ‘segmentation’ based on context(s)

From ‘Improvement of Small City Throughroads,’ FinnRA, 1993
Land use context characteristics

Qualitative characteristics (rural, suburban, urban)

- **Land ‘Uses’** (e.g. residential, commercial, industrial, mixed, park, etc)
  - *future, and existing uses* (e.g. comp plan)
  - *user groups* (people; how many, ages, abilities)
  - ‘activities’ (living, working, shopping, learning, going from A > B)
  - ‘intensity’ and ‘scale’
- **Density** of buildings
- **Building setback, frontage, off-street parking**

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Land Use Context Types: Potential uses, approach at MnDOT

**MnDOT Land Use Context Types Technical Memorandum (June 2018)**

- ‘Phase 1’ (June 2018)
  - MnDOT land use context types
  - Familiarize, identify LUCT’s; structure, segment plans & projects
- ‘Phase 2’ (in the works)
  - More: how to identify LUCT’s
  - New: how to use
  - ‘new geometric design framework’ (greenbk 7)
  - ‘Context’ = *land use context type & functional classification*
Land Use Context Types TM – Identification and Use
(June 2018)

- ‘Improved common land use context type guidance’
- Robust ‘framework’ for planning, scoping, pre- and final-design at MnDOT
- Reference LUCT’s as well as road functional class types for consistency
- Work with stakeholders, partners to identify contexts
  - correlate to MnDOT LUCT’s

Land Use Context Types TM – Use
(June 2018)

Use LUCT’s to structure and inform planning and design
- **First step**: divide plans, studies, project limits into segments matching LUCT’s
- **Then** (for now); reference/use appropriate context-base planning & design guidance
  - MnDOT RDM and TMs and PBPD guidance, and other (e.g. MPO, etc)
  - ITE Design of Walkable Urban Thoroughfares (2010)
  - NCHRP 855 Expanded Functional Class (2018)

More guidance coming ...
Identification

- Cross-references: LUCT's with regional, county/city land use classifications
- Rural small towns: typically many 'contexts' within small town; identify, use
  - Commercial main streets, some 'residential main streets' too
- Hard to identify, unique LUCT's

Use...
Land Use Context Types Phs 2 TM (draft)

More guidance coming ... aka Phase 2 tech memo ‘attachment’ (draft).

Use...

• Approach, unique situations, grouping of LUCTs
• ‘New Geometric Design Framework’
  • Context and performance
  • Performance outcomes and flexible design
  • Functional Class, and Access (urban/suburban art/collectors)
  • Access Mgt guidelines
  • Target Speed and Design Speed
  • Rural Small Towns
• High-Speed to Low-Speed Urban/Rural Highway Transitions

Land Use Context Types TM Phase 2 draft

Use...

• Approach
  • ID contexts
  • segment plans/projects by land use context types
• Unique situations, which LUCT ‘applies’? (e.g. different uses, sides of road)
  • LUCT with:
    • > length of similar land use(s)
    • > non-motorized users
    • if = choose > non-motor LUCT
MnDOT has always used land use + functional class; to vary degrees and effect

Early 2018: NCHRP 855 Enhanced Functional Classification System: land use + func class +

Later 2018: AASHTO Greenbook 7th Ed: ‘new geometric design framework’...

MnDOT ‘new geometric design framework’ = ‘Land Use’ + Functional Class + Outcomes

Land use context types, functional class, users = ‘Context’ (PBPD: who we are ‘serving’)

Outcomes: performance-based (PBPD: what we are trying to achieve)
  - ‘Triggering’ needs e.g. pavement, bridge, ‘safety’ etc
  - Goals (fed, state, reg, county, community/local)

Land Use Context Types – Use (draft concept)

Phase 2 tech memo (DRAFT CONCEPT): Use...new geometric design framework, and scoping process; by LUCT
Phase 2 tech memo (DRAFT): Use...Context based performance outcomes

Basically, people of all ages and abilities should be able to get to their destinations:
- reasonably safely
- reasonably efficiently, and
- reasonably comfortably
...no matter what mode they choose, and...

- Minimize fatalities and injuries for all users
- Fund and prioritize investments so assets are maintained in good state of repair
- Promote accountability through systematic management of performance, and maximize long-term benefits for each state transportation investment
- Provide multimodal and intermodal facilities and services to increase access to destinations for all people and businesses, and to encourage tourism
- Promote and increase the use of high-occupancy (HOV) and low-emitting vehicles
- Enhance economic development and provide for the economical, efficient, and safe movement of goods
- Provide a reasonable travel time for commuters
- Increase walking and bicycling, and transit by giving highest priority to modes with the greatest people-moving capacity and lowest long-term economic and environmental cost

Contexts – MnDOT Use (draft concept)

‘New Geometric Design Framework’

**Context-based, performance outcomes:**
- ROW’s serve people, daily activities; have economic, social, environmental functions
- At many scales (reg, comm, local)
- Each context contains all activities and functions, in various ways, to various degrees

‘transportation’ is a ‘connecting’ activity
Contexts – MnDOT Use (draft concept)

‘transportation’ is a ‘connecting’ activity, of
- regional
- community
- local
connections

Destinations, distances, modal orientation and performance varies, but all apply.

Context: speed, mobility, access (draft concept)

‘New Geometric Design Framework’

Current functional class system
• almost exclusively ‘motor-vehicle’

New geometric design framework
• mobility/speed/access functions vary conceptually
• land use context type ‘continuum’
• functional class ‘continuum’
• access: guidelines mv-based; need to be ‘modified,’ use ‘framework,’ new NCHRP 900, other resources
Use geometric design framework to help understand the distinctions in places and uses, and how they relate to target speed outcomes.

Road/routes’ physical connectivity; not an indicator of desired speed range (NCHRP 855)

- Context has a greater influence on desired or target operating speed & road design
- Natural, and Rural contexts: are different than ‘urban’/urbanizing
- ‘Urban’ contexts: more finely grained approach, suitably-slow target operating speeds
- Factors: ‘urban’ context, users, functional class; shape target mv operating speeds
- Some recent guidance: 3 speed groups; low = 35/30 mph or less, inter = 40/45, high = 50+
- Rural small town ‘main streets’: speeds may decrease in stages from rural to town center
  - 45 to 20 mph (running speeds) approaching and in small towns (AASHTO GB-7th)

Small City Throughroads: NCHRP 412

NCHRP Synthesis 412: Speed Reduction Techniques for High-to-Low Speed Transitions (2011)

Reviewed research, practices, Europe, US, elsewhere; findings and recommendations:

- N American experience: disjointed, limited; learn from others, apply appropriately
- More extensive/aggressive measures produce greater reductions in speed & crash occurrence
- Need distinct relationship between small city speed limit and change in roadway character
- Each city must be assessed, treated based on its characteristics, merits
- To maintain speed reduction downstream of transition, provide measures through small cities
- More attention to treating transition zone as a length of highway upstream of rural/urban threshold
NCHRP 737
Design; approach, possible treatments guidance
- Transition zone; length of highway upstream of rural/urban threshold
- Motorists: traveling at lower speed at start of settled area; speed reduction in transition

Thank You

What do you think?