ASSESSING THE EFFECTIVENESS OF THE FUSED GRID

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Canadian Institute of Transportation Engineers Conference
June 2015
What is Fused Grid?

- Developed by the Canada Mortgage and Housing Corporation
- A new neighborhood design that can:
  - encourage active transportation
  - reduce vehicular use
  - increase road safety
  - reduce emissions
  - promote healthy living
Motivation for the Fused Grid

Safety
- 1.24 million deaths every year
- Lead cause of death for Canadian children and young people
- 8th worst epidemic worldwide

Health
- Half of Canadians do not meet physical activity guidelines
- Physical inactivity has massive costs: diabetes, obesity, heart diseases, etc.

Environment
- 15 per cent of GHG emissions from cars
- In Canada, transportation consumes 29% of energy

Economic
- The financial losses associated with road collisions as high as 6.6% of a country’s GDP
- In Canada, losses totaled 5% of GDP
Origins of the Fused Grid

Two most common street patterns in North America:

1) Traditional Grid

2) Cul-de-sac or Loops & Lolly-pop
What does it look like?

- 400 m square neighborhood units
- 400 m spaced minor collectors
- 800 m spaced major collectors
- 1600 m spaced arterials
What does it look like?

Local roads give access only

Mixed land-use blocks at road couplets

Off road pathways and parks
Methodology

Assess FG under two frameworks

– Healthy Development Index (HDI):
  • Developed in Peel Region of Ontario (Dunn et al. 2009) by public health and community planning experts
  • Focuses on the planned land use design

– Sustainable Transport Safety (STS) Principles:
  • Developed by Dutch Road Safety Research Institute (Wegman et al., 2008)
  • Serious road crashes declined more than 70% since its application
What is HDI?

• An evidence based tool used to assess the health impacts of developments

• It consists of seven elements:
  o Density
  o Service proximity
  o Land use mix
  o Street connectivity
  o Road network and sidewalk characteristics
  o Aesthetics
Density

HDI Requirements
- Minimum residential density of 85 units/hectare
- Minimum Average Floor Area Ratio of 2.5 (non-residential)

The Fused Grid design
- Density: 85 units/ha.
  - FG provides good traffic performance despite the high density (IBI Group 2007)
- Higher residential density near the central arterial corridor
- Intensified commercial zones near arterials
Connectivity

**HDI Requirements**
- Max. block size: 1.5 ha.
- 150+ intersections/km²

- Auto-centric connectivity metrics give a higher rating to high intersection density

- Two types of connectivity:
  - Through cities
  - Into, out of, and across neighborhoods

- Ideal Case
  - Extensive internal AT networks
  - Extensive external vehicle mobility networks
Connectivity

• Extensive internal AT networks earned better scores
• Increased direct routing for pedestrians increases walking

The Fused Grid design

  ◦ FG has a high AT connectivity compared to vehicle connectivity
Proximity to Services

**HDI Requirements**
- 100% of the residential units within a maximum of 800 m of at least 20 neighbourhood services
- ≥ 70% of the residential units within 400 m of a transit stop
- ≥ 75% of the residential units within 30-min transit trip of 140,000 jobs

**The Fused Grid design**
- Twinned arterials with a high number of services
- Residents can walk/bike to all services within minutes
- Transit routes run through collectors
Land Use Mix

HDI Requirements

- provide outdoor public spaces
- provide new services to an existing neighborhood
- provide mixed housing types
- Include ground floor pedestrian use along commercial, mixed-use, and multifamily buildings
Land Use Mix

The Fused Grid design

- Self-contained community
- 8% of community land is outdoor public spaces
- 30% of street space is reclaimed for additional development and off-road AT networks
- Ground floor pedestrian use along commercial buildings
- Mix housing types
Road Network & Sidewalk Characteristics

HDI Requirements
- Traffic Calmed
- Complete Streets Design

The Fused Grid design
- Different traffic calming measures
- 50 km/h speed limits on arterials and 15 km/hr on local roads
- cul-de-sacs with AT cut-throughs
- Separated bike routes on major roads
- High-level and pedestrian level street lighting
Parking

• The FG neighborhood easily accommodates the HDI elements:
  o Unbundled parking
  o Shared parking in commercial zones
    ✓ Paid parking with price increasing!
  o Maximum driveway width of 3 m
  o Residential parking accessed via rear alleys
Aesthetics and Human Scale

• The FG neighborhood easily accommodates the HDI elements:
  o Average building height to street width ratio of minimum 1:1
  o No setbacks from property lines
  o No blank walls longer than 40% of the facade facing the sidewalk
  o Trees planted every 10 m on street sidewalks
Sustainable safety Transport Vision

• **Goals:**
  1. Prevent road collisions
  2. Prevent fatalities and serious injuries

• **Principles:**
  o Functionality
  o Predictability
  o Homogeneity
  o Forgivingness
  o State Awareness
Functionality

STS Principles:
- In the sustainable safe road traffic system, each road satisfies just a single function

The Fused Grid design:
- Access function: By local roads
- Flow function: By perimeter arterial roads
- Collector roads connect arterial roads and local roads
Predictability

STS Principles:
- Create distinguishable environment for road users
- Satisfy correct expectations of road users’ required behaviour

The Fused Grid design:
- Each road class has its own characteristics
- Reduce conflict points by T-intersections
- Location of each type of road user is predictable
Homogeneity

**STS Principles:**
- Prevent sustaining injuries by minimizing mass, speed and direction among road users

**The Fused Grid design:**
- Dedicated separate paths for pedestrians and cyclists
- Local roads: Reducing posted speed limit to 15 km/h
Forgivingness

STS Principles:
- Forgiving surroundings restrict collision consequences leading to death or severe injuries

The Fused Grid design:
- Restrict physical consequences of drivers’ error by reducing the speeds:
  - 15km/h for local roads
  - 50 km/h for collector and arterial roads
State Awareness

**STS Principles:**
- User task capability must be greater than the demand that the driving task places on them

**The Fused Grid design:**
- Reduce task demand and traffic conflict by:
  - T-intersections
  - Separated AT paths
  - One-way perimeter roads
Conclusion

✓ Fused Grid is a successful model for building sustainably healthy communities:
  o Creates differential connectivity between AT and road networks
  o Provides close proximity to different services and transit
  o Accommodates all modes of transportation efficiently

✓ Fused Grid meets the requirements of a sustainably safer road system
  o Minimizes road task demand for road users
  o Separates different types of road users
References


• IBI Group. 2007. Assessment of the Transportation Impacts of Current and Fused Grid Layouts. Research Report - Canadian Mortgage and Housing Corporation, Ottawa, ON.