

ASSESSING THE EFFECTIVENESS OF THE FUSED GRID

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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

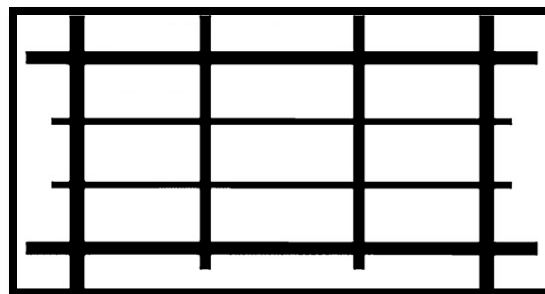
Economic

- The financial losses associated with road collisions as high as 6.6% of a country's GDP
- In Canada, losses totaled 5% of GDP

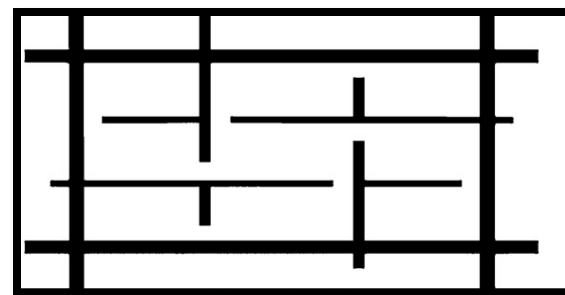
Origins of the Fused Grid

Two most common street patterns in North America:

- 1) Traditional Grid



- 2) Cul-de-sac or Loops & Lolly-pop

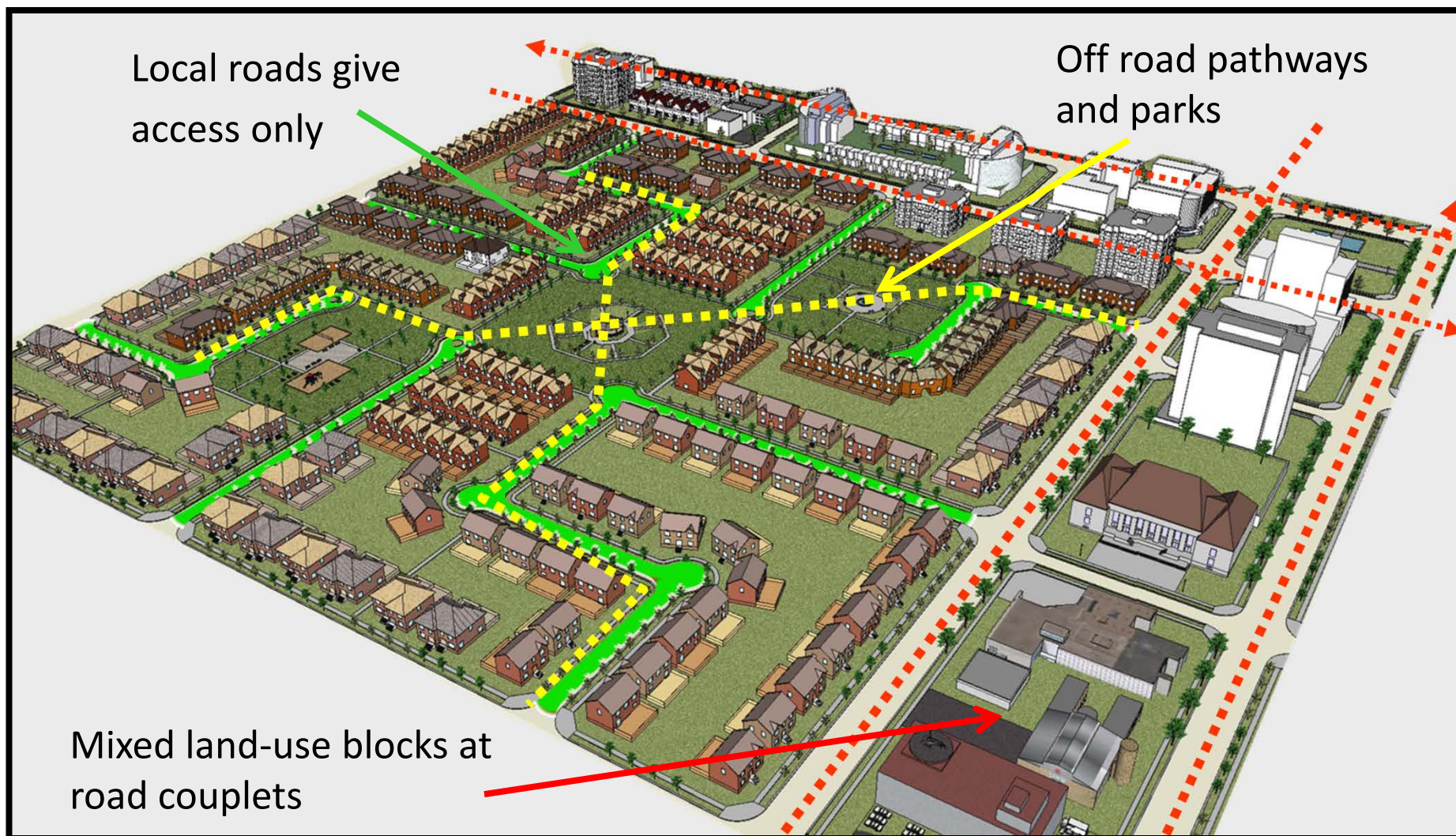


What does it look like?

- 400 m square neighborhood units
- 400 m spaced minor collectors
- 800 m spaced major collectors
- 1600 m spaced arterials



What does it look like?



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:
 - Density
 - Service proximity
 - Land use mix
 - Street connectivity
 - Road network and sidewalk characteristics
 - Aesthetics

Density

HDI Requirements

- Minimum residential density of 85units/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 off, 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

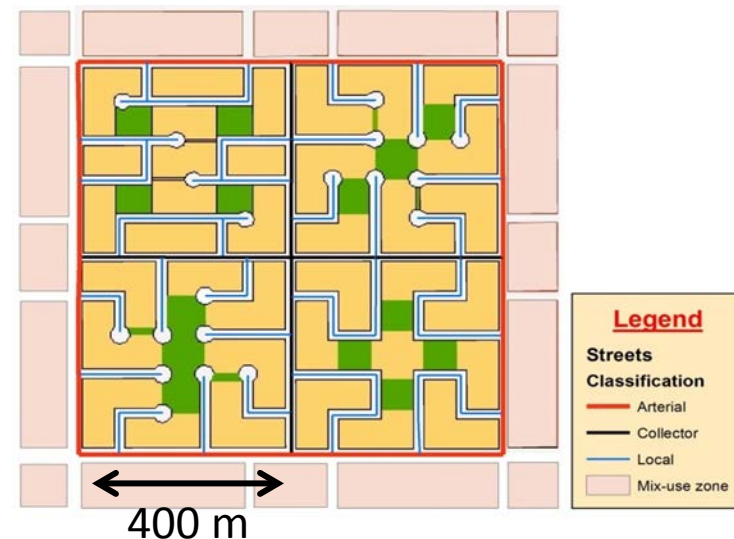
Proximity to Services

HDI Requirements

- 100% of the residential units within a maximum of 800 m of at least 20 neighbourhood services
- $\geq 70\%$ of the residential units within 400 m of a transit stop
- $\geq 75\%$ 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:
 - Unbundled parking
 - Shared parking in commercial zones
 - ✓ Paid parking with price increasing!
 - Maximum driveway width of 3 m
 - Residential parking accessed via rear alleys

Aesthetics and Human Scale

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

Sustainable safety Transport Vision

- Goals:
 1. Prevent road collisions
 2. Prevent fatalities and serious injuries
- Principles:
 - Functionality
 - Predictability
 - Homogeneity
 - Forgivingness
 - 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:
 - Creates differential connectivity between AT and road networks
 - Provides close proximity to different services and transit
 - Accommodates all modes of transportation efficiently

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

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