Spaces

for

People

Spaces for cars

This book is about a new and different concept;
it's about how and why this concept should be implemented.

T.P.Farr

Preface

This book addresses several world-wide issues…

Cities around the world have run out of space – yet more and more people are migrating into the cities. There is overcrowding greatly aggravated by excessive numbers of cars and trucks.

The number of cars and trucks has grown beyond rational limits. Cities are suffering because of the excessive space consumed by roads and parking, the horrendous congestion of roadways, the accompanying noise and pollution, the high incidence of pedestrian death and injury and the general daily confrontation between people and the motor vehicles. There is a continuing deterioration in the quality of life.

The poor and disabled suffer from a lack of mobility. Mobility is required to find employment, to obtain medical care and to reach classrooms for an education.

There has evolved a continual conflict between cars and people – both want more space, but none exists. And, in addition to space, the motor vehicles consume vast quantities of many resourced. Traffic congestion is costing enormous amount in lost time.

In the US and other countries there is a growing obesity problem aggravated by a lack of exercise. The overcrowded, hostile and unpleasant road conditions make getting enough exercise difficult.

Just Imagine…

Just imagine there were sidewalks – always nearby - that were clean and so safe even young children and the elderly could safely walk alone, without fear, even after dark.

And, that they were well-lit and protected from the rain and snow;

And, you never had to watch for traffic, for they never crossed a street;

And, you could walk or ride a bike or a wheelchair – even use a Segway or an electric bicycle – for these sidewalks had separate lanes for walkers and riders;

And, they extended from your front door and continued into your company parking lot; and they continued into the schoolyard; and they continued to the library front door; and into the shopping mall; and you could walk or ride a bike directly to most restaurants and supermarkets and the movie theater;

And, just like the grocery store provides you a shopping cart, these sidewalks had public bikes just in case you didn't have your own;

And, the college students had an alternative way home after drinking, instead of having to drive;

And, disabled veterans who can't drive would suddenly have excellent mobility – they would be able to travel from home to nearly any destination without ever having to cross a street or combat foul weather or fear harassment or confront physical obstacles;

And, senior citizens could enjoy the same mobility – walking, riding a scooter or manual wheelchair or using another device, anything that enabled them to shuffle along;

And, the visually impaired could enjoy the same freedom of mobility;

Any, the young – and all others who cannot drive - could easily and safely walk or ride a bike to school or to a friend's house or to an eating place or to a meeting place. They could do this, safely, at any hour and in any weather;

And, the senior citizens – 50% of whom feel stranded because they fear crossing busy streets or walking on ice or that it may start to rain or they might be harassed or worse – would now feel free to travel to the library, meeting hall, shopping area or their favorite eating spot even though they don't drive a car, and even after dark, and even in bad weather;

And, in the evening you and your kids could take a bike ride – safely with no concern about traffic, comfortable with no concern about rain or darkness or snow;

And, many children could walk or ride a bike to school enabling the school district to save over $700 per child they now spend on school buses – and these fortunate children would grow fit and trim and avoid the statistics and health problems associated with the overweight epidemic;

And, parents could take walks with the toddlers in a buggy – even on a rainy or snowy day;

And, the schools could re-vitalize their physical education programs because these sidewalks have entrances right in the school yard; kids could ride a bike, roller-blade, jog or walk for a mile or ten miles without ever confronting traffic, inclement weather or someone looking to cause harm; and they could go on class trips without using a bus to pollute the air and contribute to congestion;

And, if you're into physical fitness, these sidewalks inter-connect with recreational loops having steep climbs, descents and special 'fun' areas – which may make your gym membership obsolete;

And, the roofs of these sidewalks contain solar cells that provide the power for the lighting, security systems, entertainment systems and other auxiliary functions;

And, rather than waste space directly beneath the sidewalks, you community can conceal the phone, cable and power lines in their internal conduits;

And, since your community sidewalk network connects to adjoining community networks and private networks (think – the university, the industrial park, the military base…) you can take longer bike trips. Heck, there are even 'cross-country' extensions – these follow electrical power lines, pipe lines, alongside railways… - allowing a group of

vacationers, perhaps your entire family or club, to travel from city to city. Since there are campgrounds every twenty miles or so, why not take a two-week vacation cycling around the country?

And, just imaging our communities had all of this and, at the same time, significantly reduced traffic congestion and consumption of fossil fuels and air pollution and traffic noise and the billions wasted on healthcare due to obesity and pedestrian injuries and MADD could rejoice because there would no longer be a “need” to drive while drunk because we would have a realistic alternative to always having to drive.

Setting the Scene

Introduction

The Car Bubble
The effect of motor vehicles.
They aren't bad, but there is a 'car-driving bubble'
What are the alternatives?
Car-free cities, car-free zones
Parks and bike paths
How about a complete Space for people
There are many examples – malls, Winnapeg, arcades, boardwalks, blocked-off streets (Goetingen)
Better Times – the world can be a better place for people, we want Better Times.

Chapter I: The Specifications

Failure Analysis:
Car hits support
Support sinks - non-critical position, orientation.
Adjustable heights, Uneven flooring not a problem

Creative ideas evolve. The initial vision is refined and updated as the thought process analyzes and realizes it can be improved.

The initial concept was: There should be roadways exclusively for bicycles; and, they should connect to spaces, exclusively for people. There should be spaces just for people and other spaces for cars and trucks.

What are the ideal characteristics of such a facility?

- **Functionality.** They must operate smoothly and efficiently
- **Sustainability.** They must be readily adjusted to meet changing conditions, be easily upgraded, be well maintained, be safe, be immune to degradation
- **Low cost.** "*Spaces for People*" can be erected at a cost that compares with the cost of a traditional walking/biking trail; this is about $1/30^{th}$ the cost of building a highway.
- **Fast, low-cost planning.** A community can design and plan a "*Spaces for People*" network very quickly, with minimal cost and little risk of design flaws. The pre-fabricated components will be shipped and assembled on-site by the manufacturer with no cost overruns or construction delays.
- **Non-intrusive during construction.** The network is assembled from small, lightweight sections. There is no need for excavation or heavy construction equipment. The assembly is carried out in a matter of days by small crane trucks similar to the electric company installing new power lines.
- **Non-intrusive after completion.** Since "*Spaces for People*" do not have to support heavy cars and trucks, they do not have massive concrete columns and steel beams. Instead, they are more like an airplane – very strong, sleek and lightweight.

- **Use of low-cost and green materials.** The travelways and floors are – would you believe – wood. Renewable and green wood. Below we will show you pictures and examples of wood walkways still in great condition after 150 or more years of use!
- **Suitable for all ages, all types of people and for all categories of use.** Bike trails are great for bikes, walkers and runners. Some are paved and serve handcycles and roller-bladers as well. And, they are great for children, seniors and everyone in between. "*Spaces for People*" travelways are just like that. But, there are two big differences: 1. "*Spaces for People*" are still great when it's raining, snowing or late at night. 2. "*Spaces for People*" travelways can lead you to where you want to go. When people bike for recreation they start – go – return to the starting point. The trail often run alongside a river, a converted rail line or through public lands. But for commuting to work or school or for going shopping we need a travelway that leads from our home to our work, school and shopping centers. That's what our travelways do – they provide mostly utility transportation during rush hours and they serve recreational uses evenings and weekends.
- **Require the minimum amount of land area.** A highway, a regional rail line or a bike trail require land. Land is a non-renewable and valuable resource. In urban areas it is often unavailable. When land is converted, that's it. The "*Spaces for People*" pass over existing streets, public parks, light industrial areas, along pipelines or along a riverbank. They are elevated; "*Spaces for People*" form a new layer, overtop of the cars and trucks and their roadways. When you are walking or riding a bike inside the "*Spaces for People*", you are "King-of-the-Road" riding on the balcony of your own penthouse looking down on those poor souls stuck in traffic, noise and diesel fumes on their streets below.
- **They must be comfortable, pleasant and 'cool' for the users.** A great deal of consideration has been given to making our "*Spaces for People*" functional, pleasant and a fun, 'cool' place to be. The design includes sophisticated computerized access control and security systems – so kids and women feel safe; entertainment systems; and, a world-wide social networking site – voice activated, so you can communicate with a 'friend' in Paris or Bangkok while you are both riding your bikes to/from school.
- **They must maximize usage.** "*Spaces for People*" incorporate many well-known attributes that will attract users. When it comes to cost justifying a public facility, the more people using it, the easier it is to justify and the more effort that will be expended to keep them well maintained and popular. These include: low fares, on-time performance, lots of entrance and exit points, being comfortable, etc.

Chapter II – Why Build Them

The *Raisons d'être* regarding "*Spaces for People*" are found within the mission statements of thousands of non-profit organizations, the stated goals of hundreds of government agencies and the official policies of nations around the globe. (see Chapter II)

Reason #1: Improve Quality-of-Life
I believe *"Spaces for People"* networks will significantly improve the quality-of-life for many millions of people.

They will do this by changing communities' mobility structure and by *'enabling and encouraging'* positive changes in daily activities.

Reason #2: Provide an Alternative Transportation System
Everyone likes to have options; we all have preferences and want to choose what is best. Especially within the USA, people often do not have a viable choice – there is no alternative for personal mobility. Many feel they must jump into their car to go to the store, to get to work or even to go to the gym. "*Spaces for People*", as proposed here, provides an alternative transportation system. Within the protected travelways you can safely pedal a bike, ride an electric bike or scooter or pleasantly walk regardless of the hour or the weather.

Reason #3: Reduce Traffic Congestion
Combat traffic congestion and its unimaginably high cost – wasted time, stress and anxiety and frustration, fuel and vehicle depreciation costs, public highway repair and construction costs (which further contribute to the congestion).

Reason #4: Provide An Extensive Recreational Facility
Provide a community-wide Recreational Facility that is safe, usable 24 hrs per day, every day, in all weather conditions, free and easily accessible from any point in the community.

Reason #5: Increase Real Estate Values
"55% of prospective homebuyers want a home with a mix of single-family and other higher density housing, sidewalks, shops, schools, and public transit within walking distance." 2004 National Community Preference Survey

Reason #6: Reduce Pedestrian Deaths and Injuries
People have the right and the desire for a safe, tranquil environment within their community. We should be free to move about our neighborhood without fear of being injured.

Reason #7: Enable and Encourage a Healthier Lifestyle
Childhood obesity, an ominous increase in the number of overweight adults and a widespread lack of regular aerobic exercise have reached epidemic proportions, according to many medical experts, in the USA and other societies. Our children are taught, by example, that jumping into a car for every trip to school or meeting with friends is the preferred way. Sedentary lifestyles have become the norm. Physical education programs in schools have waned. Children ride schoolbuses to school instead of a bike, which would make them trim and fit instead of fat.

The "Spaces for People" would enable and encourage many people to change their lifestyles - to fight their addiction to driving a car for every outing, get more exercise and improve their health.

Reason #8: Improve Social And Cultural Interaction
"Quality environments that encourage walking, cycling and the use of public transport help social and cultural interaction. This creates vibrant healthy communities and encourages social responsibility through increased human contact." UITP Sustainable mobility report
Also, a Social Networking website – CoolTuber.org

Reason #9: Generate Business Opportunities and Create Jobs
Advertising, solar cells, hydrogen distribution, concealed utility lines, package delivery system, concessions, links to commercial properties, bike tourist facilities along cross-country routes. required bikes and other vehicles, enable people to be more mobile, enable people to get to jobs and school,
Provide Opportunity through mobility – Particularly in 3rd world countries give women the ability to travel to find work and opportunity.

Reason #10: Enable and Encourage Reallocation of Economic Resources
By providing drivers with a viable alternative - such as "*Spaces for People*" - public sentiment may begin to favor diversion of public funding away from new road construction and more parking lots and into 'people friendly' projects.

The number of cars per capita would be stabilized or reduced. Enabling and encouraging urban dwellers to use an occasionally rented car instead of owning one; and affluent suburban families to maintain one car instead of two or three.

Improve the desirability of the city: Cities with poor public transport and poor mobility solutions are less attractive for living and working; they suffer economically. The "*Spaces for People*" add a new, more desirable mobility solution.

Reason #11: Reduce Usage of Fossil Fuels
Reduce the consumption of fossil fuel. Save money on gas and diesel fuel.
Reduce greenhouse gas emissions, global warming, air pollution and noise pollution;
And, make a contribution to reducing your country's dependency of foreign oil and the transfer of wealth to oil producing countries.

Reason #12: Reduce Healthcare Costs
There is well over $100 billion annually spent, in the USA alone, directly related to obesity, lack of regular aerobic exercise and a scarcity of popular, accessible, stress relieving daily physical activity. By promoting aerobic cardio-vascular exercise, promoting physical activity (burning calories thereby reducing obesity, reducing stress), reducing pedestrian deaths and injuries and by reducing air pollution (WHO estimates 700,000 deaths could be prevented by eliminating it).

Reason #13: Provide an Emergency Transportation System
Provide an Emergency Transportation System that is separate from traditional streets, functions independently from the power grid, is unaffected by flood or heavy snows, does not require 'drivers' thereby precluding labor strikes, is immune from roadway blockages due to disabled vehicles, does not depend on pumping gasoline nor on traffic signals.

Reason #14: Encourage Traffic Calming Regulations. Increase Cities' Revenues.
Legislation to combat traffic congestion and its urban blight has often been proposed, but such laws have been implemented in only a few cities. Legislation, in the form of congestion taxes, increased tolls, increased parking fees and more stringent enforcement of traffic laws, discourages driving private cars into the cities. By providing drivers with a viable alternative - such as "*Spaces for People*" - public sentiment and arguments against such center city traffic reduction and 'traffic calming' measures would be reduced.

Reason #15: Reduce Impact on Wildlife and Natural Resources
By employing non-intrusive construction, surface travelways can be provided that have minimal impact on wildlife, the environment and natural resources.

Chapter III –Who Else Believes?

The *Raisons d'être* regarding "*Spaces for People*" are found within the mission statements of thousands of non-profit organizations, the stated goals of hundreds of government agencies and the official policies of nations around the globe.

Below is a partial listing of these organizations and agencies.
Cooperating Organizations

The Concept

Chapter IV – Share The Vision

I want you to share my vision. I want you to feel the experience of having "*Spaces for People*" network in your community.

This is a short story about Tom and Sabine, beginning when Tom takes a new job and moves. His new community, Phoenixville, has a "Spaces for People" network. At first he is dubious and cynical, but as the weeks go by he starts to comprehend.

First you see them from below
Your first peek
Bringing your bike
Trying a public bike
Friends talking at work about their CoolTuber.org group
You join the group
Building your stamina
The passers, beautiful women passing you by
You have gotten fit
You meet others, and the woman
You join another group
The wedding

Chapter V: The Design

The specifications are in Chapter IV
Assembled from pre-fabricated components.
Why: For lowest cost. For quick and non-intrusive assembly. To best meet specifications
The components: The travelway and floors. The enclosures. The support structures.
How the components are assembled
Green materials. Why? Wonderful wood.
Why elevated?
Why this support design?
Standardization: Upgrades. Private spurs. Connecting networks.
Making them 'Cool'
Something for everyone: all ages, all types of people, all usage categories
Commercial connections
The result: "*Spaces for People*"

The network design process.

Examples of existing spaces for people

What about bike lanes, bike trails, bike-friendly cities?

Chapter VI: Auxiliary Systems

Access Control
Security
Usage Rules
Entertainment and Social Networking
Cross-Country expeditions
Enclosing utility wires
Solar panels
Hydrogen Distribution
Package Delivery

The Economics

Chapter VII: Economic Justification – Customers and Usage

Who are the customers (the network builders)
What constitutes a 'network' – schoolyard stations, private business center spurs, included universities and military facilities
Who are the users
What are the usage classifications (commuting to work,…)
Who are the users, the user categories
Project usage for a representative city (Philadelphia)

Chapter VIII: Economic Justification – Financial Benefits

The net benefits depend on who uses the networks and how many
Financial benefits from each of the raisons d'être, the reasons to build them
What are the benefits, for each user category
What are the benefits, for representative city government
What are the benefits, for the region's citizens
What are the benefits, for the global economy

Chapter IX: Economic Justification – Cost Estimates

What constitutes 'total cost'
Estimated cost per mile, per station, per social hub
Estimated cost for support systems

Chapter X: Economic Justification – Implementations

The costs per network fall with scale, the number of installations
Large projections will encourage more effort into design development
Large projections will encourage more efficient manufacturing facilities
What are the network classifications: Large, medium, small, auxiliary, cross-country (spurs, sports, aerobic exercise, walks, …)
Project number of networks world-wide
Project total roadway miles

Chapter X: Economic Justification – the top line, intangibles

Using projected number of networks and total miles and projected usage, for each benefit:
Revenues from usage fees
Project the net economic benefit, for representative city government
Project the net economic benefit, for the region's citizens
Project the net economic benefit, for the global economy

Chapter XI: Economic Justification – Revenue Generation

What are possible revenue sources for network operators

- Government subsidies
- Private spur fees
- Usage fees
- Equipment rentals
- Concessions
- Motor vehicle parking
- Hydrogen distribution system
- Package delivery system
- Solar panel electricity generation
- Entertainment system
- Social networking system
- Advertising sales

Chapter XII: Economic Justification – The Bottom Lline

Using the proposed design, estimate economic benefit and construction costs.
What is the cost/benefit ratio
What is the return on investment

Sustainability

Chapter XIII: Systems and management

Facility management
User safety
Auxiliary systems might be included
Network revenue generation
Facility upgrades and modifications
Maintenance
Rules of use
Usage promotion
User support services

Chapter XIV: Evolution

How the roadways will come into being around the world

Chapter XV: A business plan

The Water Cooler Company

Appendices

Bibliography

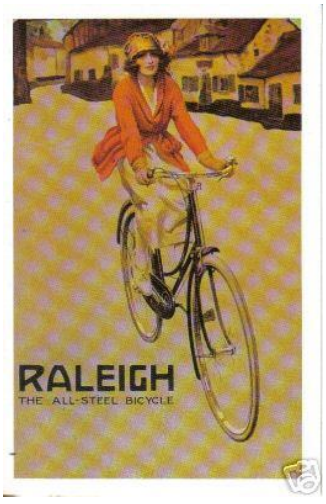
CoolTubes.org
BetterTimes.cc

"Spaces for People"

Introduction

This book is about a new and different concept I call *"Spaces for People"*. And, it's about how and why and they should be built. It's a big idea, a very big idea. When *"Spaces for People"* are erected in cities and towns around the world, and I am certain they will, they will change the world as much as the automobile, the personal computer or the cell phone.

"Spaces for People" are spaces without cars or trucks. To explain what I mean, think about other types of spaces for people that are all around us today – shopping arcades, passenger areas in airports, parks, bike trails and playgrounds are examples. But, we need lots more of them; because, over the last 100 years the automobile has taken over and displaced people on our streets and within urban areas. Our streets, roads and highways have been turned into hostile environments for people[1] walking or riding bicycles.



So, we are stuck. We have become dependent on our cars and trucks.

We find ourselves, in a way, like the short-sighted person who adopts a cute little lion as a pet; but, when it becomes an adult realizes it is dangerous and not suited to live in a home. Cars and trucks were 'Cool' in the '50s - there was no traffic congestion, there were infinite supplies of cheap gas, China and India couldn't afford them, global warming didn't exist and the concept of an Interstate Highway System was exciting and would drive the economy of the USA.

But, today their numbers have grown too large. Not just in the USA, but in communities around the world. They have

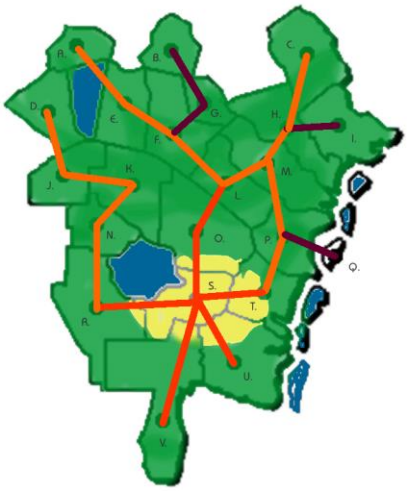
[1] Safe Routes to School http://www.saferoutesinfo.org/

contributed to congested cities[2] and unsustainable solutions for mobility needs[3]; and, there are tens of millions, across many societies, who recognize these problems and are taking action to address them.

This concept, *"Spaces for People"*, is not anti-car. It is about the same problems and the same solutions advocated by many millions around the world. Many of these forward-thinking people support organizations whose mission statements include terms such as car-free cities[4], complete streets, walkable cities, transportation alternatives, smart growth, livable cities, traffic calming, road ecology and new mobility. There are movements promoting riding bicycles to work[5] and movements to keep cars from city centers. Whereas I love bikes and support these movements, I don't believe they work as well as we would hope and I don't think their approaches can effectively solve the societal problems we need to address within the few years available.

Chapter II discusses the societal problems associated with excessive numbers of cars and Chapter III details numerous organizations addressing them. Though the goals of these organizations and the goals of *"Spaces for People"* are identical, the methods for achieving the goals are quite different.

One key component of *"Spaces for People"* is a network of travelways[6] connecting all sections of a community together. These travelways are exclusively for pedestrians, bicycles and very small electric or hydrogen powered vehicles – the Segway®, as an example. They are enclosed for protection from the weather and usually elevated. In essence, the travelways, the rest areas, the food courts, the recreational tracks and the social meeting areas form an upper level – mostly overtop existing streets and parking lots.



In essence, this design doubles the '*effective area*' within a community dedicated to mobility and people-space. Because this is achieved with no additional land use, the economic payoff – one of several economic benefits - is enormous. Without increasing '*effective area*', a city trying to allocate space for people is forced to take it away from existing uses – that is, to 'reclaim' space used by cars and trucks. Since cities need truck deliveries, emergency vehicles, taxies, buses and vehicles for many who need to drive, a potentially adversarial situation is created.

Consider some successful examples that have also increased the '*effective area*' within a city. RÉSO aka "la Ville Souterraine" (Underground City) in Montréal and "The Gallery" in

[2] Making Cities Livable, http://www.livablecities.org/ plus many others
[3] The International Association of Public Transport UITP – The ADVOCATE for sustainable mobility, http://www.uitp.org/about/The-ADVOCATE-for-public-transport-and-sustainable-mobility.cfm
[4] A book and website, http://www.carfree.com/ includes links to many others
[5] "*vi* cykler til arbejde" (We bicycle to work), http://www.vcta.dk plus hundreds of others in cities around the world.
[6] "travelways" (as in roadways, bikeways, walkways…) has been coined to refer to the bicycle and pedestrian roadways disclosed in this book.

Philadelphia have extensive walkways and shopping areas beneath the city. Related concepts having enclosed, elevated walkways include Winnipeg's "SKYWALK" and Toronto's "PATH". Also, I should point out that the idea of enclosed, elevated roadways for bicycles has also been proposed numerous times[7] over the years.

"Spaces for People", however, is different in major ways:

1. They are very low cost (about the same cost per mile as a municipal bike path[8]) and rapidly assembled. Unlike virtually every existing public facility, these travelways, rest areas, concession areas, etc. require no heavy construction (no massive concrete footers, for example). They are assembled from pre-fab components in days – not years. They can be erected with virtually no construction noise, dirt or intrusion into ongoing community activities.

2. They are extensive. The enclosed and elevated travelways extend into all corners of the community. Being 'accessible' is key for high usage; it is essential for having children ride their bikes to school, safely. There is an entrance not far from their home; there is an exit inside their schoolyard. Similarly, commuters can access the network and, in many cases, there will be a private spur directly into the company parking area.

3. They are usable in all weather conditions and all hours. Other than driving to the gym, what other options are there for physical recreation in the rain, the cold; especially if you have kids? What options does the college student have to get home at 3AM after drinking at a party? The sophisticated computerized access control system and security systems (also security cameras and police on Segways®) make the roadway network as safe as the airport securitized area, even at 3AM.

4. They are flexible, expandable, maintainable and they are 'Cool'. I often refer to them as 'The Cool Tubes'; they include sophisticated access control, security, entertainment and social networking systems. The pre-fab, modular design allows a community to add an extra lane or an entrance and allows a corporation to add a private spur into their parking garage at very little cost and even less construction delays or interference.

[7] Two examples are, Bicycle Transportation Systems, http://www.biketrans.com/index.html and Velo City, http://www.velo-city.ca/MainFrameset.html

5. Though there are 'mall walkers' - folks going to the mall to get some exercise in the winter - public facilities typically serve only one function. Public transport is not suitable for recreation; bike trails are not suitable for utility transportation. *"Spaces for People"* is designed to provide both an alternative transportation system for commuters and a fantastic, community-wide recreational facility evenings and weekends. And, an alternative emergency transport network during floods, heavy snows, massive power outages, transit shutdowns or, possibly, terrorist acts.

6. They serve nearly every population group. Bike lanes and trails serve bikers. Sidewalks serve walkers. Parks serve joggers. *"Spaces for People"* serve disabled veterans headed to the pub for dinner and a beer in a handcycle; incorporating small electric trams, senior citizens can be chauffeured into town; children can get strong and trim riding their bike to school instead of getting fat riding a schoolbus; the school's Physical Education program can incorporate bike trips or walking excursions; serious cyclists and those seeking aerobic exercise can toughen-up on the one-way recreational track lanes that include rigorous helical climbs and exciting, steep descents; commuters can save themselves a few hundred dollars each month by riding a bike to work – those concerned about sweat or wearing fancy clothes take an electric scooter; a Sunday family outing, with baby in a trailer coach, can include dinner, a rendezvous with friends from across town, a stop to pick-up milk, exchanging waves and salutations with neighbors; then, returning home with an endorphin-high instead of a stressed-out low from the hassles of traffic congestion.

This idea has, just like Henry Ford's idea had, mostly skeptics and pooh-poohers. But, he succeeded. And, I intend to copy some extremely important concepts he developed:

1. His successful idea wasn't the car – cars had been around for 30 years before he introduced the model T. His idea was the world's 'First Affordable Car'. Should you choose to read on, I will demonstrate how these travelways are very affordable – they cost about the same as a municipal bike trail[8]. That's the difference between this concept and, for example, widening a road – it is affordable and can be planned, delivered and installed within a few weeks.

2. Ford's model T was affordable ($360 in 1916) because it was 'mass produced' and 'standardized'. Has there ever been a public works project, even a simple bridge

[8] "10'-12' Shared-Use Path $10,000,000 for 50,000 ft.", taken from: Forsyth County, Georgia, "Bicycle Transportation and Pedestrian Walkways 2025 Plan", http://**forsyth**co.org/pdf/files/FC_**BikePed-2025**.pdf

along a bike trail, that has not gone through the traditional construction project phases - architects, engineers, design drawings and specifications, request for bids, construction estimates, project managers and heavy construction equipment required because of massive concrete footers and steel beams? That's why it costs $1 million per mile for a 10ft wide bike path[8].

The *"Spaces for People"* are designed like a model train layout. Think about a ten-year-old with his model trains: he can select sections of straight and curved track, crossings and switches to assemble any layout he wishes. Likewise, your community planner, using a CAD program, can select from a database of thousands of standardized, pre-manufactured components – various roadway widths, curves, inclines, turn-offs, rest-stops, passing lanes, bridge styles, bridge spans… Then, he can see the resulting roadway network superimposed on a map of his community. The components are delivered, assembled and installed by the manufacturer. Since most components weigh less than 500 lbs, erection can be completed with a small 'cherry-picker' like truck – like the electric company uses. A unique (patent pending) soil-anchor/footer eliminates the need for concrete footers or site excavation – but, the footer will withstand category 4 hurricane force winds and, since cars and trucks cannot access the roadway, massive steel or concrete beams are replaced with an aircraft body type of structure, light but strong and relatively non-intrusive.

3. Ford's road to success included another concept. His model T would not be very successful if he didn't have extensive support systems. So, he introduced the idea of dealerships to sell and service the cars. Because they were standardized, he could provide spare parts and accessories that were relatively cheap and would fit.

   Just as Ford did around 1910, I intend to do around 2010. For the pre-fab, modular travelways to be successful we need auxiliary systems and services. We need to incorporate added functionality to maximize the economic benefits – solar cells on the roofs, hydrogen fuel distribution lines tucked inside, a package delivery system and cross-country trails are included. They must be clean, cool, safe, pleasant and fun. They must offer conveniences – who would lug their own shopping cart to the grocery store? At every entrance ramp public bikes are available, waiting for spontaneous users or those who choose not to bring their own bike.

So, why do we want to build them? If there are no legitimate *raisons d'être*, the resources will not be allocated. But, I promise you there are many very good reasons. I promise you there are legitimate, predictable and quantifiable economic benefits. I promise you the cost/benefit ratio is extremely attractive. And, I promise you I will demonstrate and substantiate these statements beginning in Chapter VII.

This book describes a new concept I call *"Spaces for People"*. They are pleasant areas interconnected through a network of travelways[9].

1. It sets the scene by summarizing some of today's urban area problems/issues from various perspectives. Specifically, it examines the mission statements of several

[9] "travelways" (as in roadways, bikeways, walkways…) has been coined to refer to the bicycle and pedestrian roadways disclosed in this book.

prominent non-profit organizations and government agencies as well as official remarks/policies of national governments. These are used to illustrate and emphasize how this concept is consistent with and will make a significant contribution toward the solution of the stated societal problems.

2. It details a working, detailed design using readily available, inexpensive and green materials.

3. It describes a system and a process for constructing these spaces and travelways that is very low-cost and non-intrusive for the community.

4. It outlines how and why they will provide sustainable mobility and more livable cities.

5. It details economic and personal benefits they will provide to the residents of communities and enormous benefits they will provide to societies around the world.

6. And, it outlines a plan for introducing these facilities in a controlled, low-risk and affordable manner.

Chapter I

The Specifications

Creative ideas evolve. Your initial vision is refined and updated as you think about it and analyze it – your great concept can always be improved.

The initial concept was:

"There should be roadways just for bicycles!"

And, they should be enclosed, so people can ride even if it's raining, or if it's snowing; and lit, so they can be used after dark.

Too many drivers hate bikers – we go too slow, and sometimes they have to slow down. After all, the roads really belong to – they were built for – them.

So, our roadways have to be separate. On our new roads, we will be King. Just like on our bike trails, "No Motor Vehicles Allowed!". Except, our new roads won't just follow an abandoned railroad track along the river, they will lead to anywhere and everywhere we want to go.

They should extend into all corners of the neighborhood. They should lead to wonderful spaces – coffee shops, candy stores, libraries, nice eating places and parks – and, they should lead to where we go on errands - convenience stores, the post office, hardware stores and the mall – and, they should be good for getting exercise, with hills, but only when you want hills.

Hey, we have to work. Our roadways would make it much easier to ride to work, too. Schoolbuses cost so much, kids are getting fat, the buses clog the roads and they burn an awful lot of diesel fuel. OK, our new roadways should have exits at the school. Why, can you imagine it, kids will be able to ride bikes to school just like we did when we were kids. They will get trim and fit instead of getting fat.

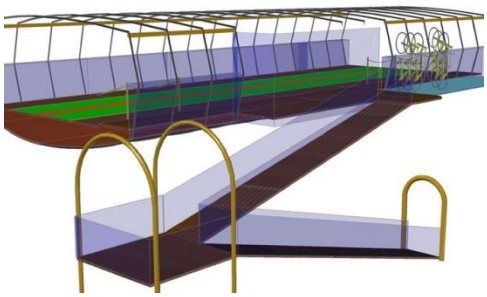
That means: our roadways have to be very safe!! How could we send kids off to school if a pervert might be hiding in the shadows? And, too, the same for the women – especially after dark. Being safe from getting hit by a car isn't enough. They have to be safe from strangers, too.

What will they cost? Who's going to pay for them?

Shucks, don't you ever have dreams? Can't you just imaging how neat they would be?

But, OK, I'll prove they won't cost anything! In fact, they will earn us money! Yes! Yes, they will provide facilities our society needs; they will reduce some of our societal

problems; they will provide opportunities; they will be fun and cool. Everyone will love them…



Everyone? Uh Oh, not everyone rides a bike. Some people are very sophisticated, they like to be driven. Some people are old, some are handicapped, some are simply not into sweating. Really now, how can you ride a bike when you have to wear a dress to work? "My idea of relaxing is to take a walk." "I like inline skating." "Me, I'm a runner." "My wife and I always go out together." "And, I have two little kids – what about me?" "I'm supposed to carry two bags of groceries home on a bike? – give me a break."

The roadways have to be roadways 'for people'. For all the people. Young and old, jocks and the intellectuals, healthy and physically challenged, strong and the not-so-strong.

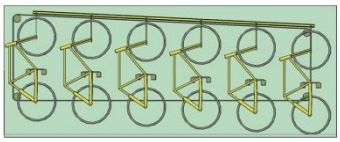
"I can just imagine, several young hoodlums running me off the road
– and, I won't be able to escape!", she said with fear in her eyes.

How much did you say they would cost? And, who's going to pay? Now tell me, after we build them and no one uses them except vagrants and druggies, and they start to smell, and they are covered with vulgar graffiti, and vandals take the lights and the windows, and they become an eyesore – so tell me, how much will it cost to remove them and clean up the whole mess?

"You're nothing but a car-hating, overeducated
hippy and do-gooder liberal!"

The network of roadways requires a state-of-the-art access control system so, we know who is inside. And, a security system. And, this is for certain, they have to be used, appreciated and valued by the majority of people within the community. Then, and only then, will they be protected and maintained and kept relevant.

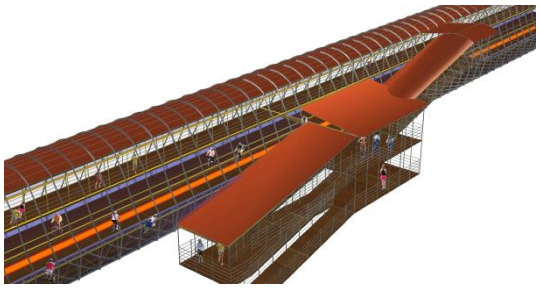
I went to the supermarket and grabbed my shopping cart. Wait! Who would lug a shopping cart to the grocery store? That's why the store has them, just waiting for the customer to stop in.



That's just what we need – bicycles just waiting at every entrance. Then, people can use them without lugging their bikes to the entrance point. And, for those on-the-fence folks… When they happen to be near an exit, and they have been wondering what it's like, and they've been tempted but their only bike is dusty, stuck behind stuff in the garage. Now, no problem. They can walk in, pick a bike from the bike-rack, and off they ride. "This is like the days when I went bowling. They had balls there, just waiting for me."

As I began writing the specifications, the objectives and requirements for "Spaces for People", I went through a thought process:

- If elevated roadways for bikes connecting spaces for people is such a good idea, why don't they already exist?
- First, of course, every idea has its time. Since the early '50s up until 1974 – nobody cared about bikes. This was when the OPEC oil embargo hit[Error! Bookmark not defined.]; transportation engineers suddenly went nuts over bikes, bike trails, bike lanes, bike facilities. But, two years later that was history and everyone went back to big cars. Today, there is a lot of buzz about alternative energy, complete streets, global warming, walkable cities and oil dependency. This is good – this may be the time.



- Today, though, everyone is worried about excessive government spending, pork projects buried in legislation and roads or bridges to nowhere – i.e. wasteful spending, wasteful projects. If I proposed this idea, most people would immediately think: "Never! Another nut. Another fiasco that will cost us $billions then, in a few years, we'll be spending $billions more to tear them down." Clearly, the only way they would have a chance would be if millions of people could be convinced they were needed and were cost effective – very much needed – have a very good cost/benefit ratio and are sustainable.
- There are two sides to having a good cost/benefit ratio: 1) They have to be low in cost 2) They have to provide meaningful benefits. The cost isn't too hard to calculate. The 'meaningful benefits', however, will be very difficult. They have to be based on lots of assumptions and projections. In other words, even if the benefits are explained and calculated, most people will be very skeptical. I have to paint a vision. I have to get people to share that vision.
- I was confident there is a need, lots of needs that *"Spaces for People"* could help satisfy. If one need, say reduce traffic congestion, could be helped and this would save X-dollars; and, another need, say reduce the amount schools have to spend on school buses, would save Y-dollars; and, a third need, like reducing healthcare costs, would save Z-dollars; then, couldn't the total savings, X+Y+Z , be added together to calculate the 'total benefit'?
- And, there are lots of different costs related to a project; we need to consider '*total cost*' that includes more than just labor and materials. '*Total cost*' must include the intangible costs due to construction mess and neighborhood disruption during construction and project delays and cost overruns. When we compare the '*total cost*' of changing a street into a '*complete street*' with the '*total cost*' of building one of these travelways, the cost must be lower or at least comparable. Then, if the usability and economic benefits are higher…
- Regardless of the benefits, the lower the cost, the better the cost/benefit ratio would be. They have to be as inexpensive as possible, even if they were not super elegant.

Then the specifications began to take shape.

1. **Functionality.** They must operate smoothly and efficiently.

2. **Sustainability.** They must be readily adjusted to meet changing conditions, be easily upgraded, be well maintained, be safe, be immune to degradation. They must serve our generation but still be there, in good condition, for the next and the next.

3. **Low cost.** "*Spaces for People*" need to be erected at a cost that compares with the cost of a traditional walking/biking trail; this is about 1/30th the cost of building a highway.

4. **Fast, low-cost planning.** A community should be able to design and plan a "*Spaces for People*" network very quickly, with minimal cost and little risk of design flaws. The pre-fabricated components should be shipped and assembled on-site by the manufacturer with no cost overruns or construction delays.

5. **Non-intrusive during construction.** The network should be assembled from small, lightweight sections. Have no need for excavation or heavy construction equipment. The assembly could be carried out in a matter of days by small crane trucks similar to the electric company installing new power lines.

6. **Non-intrusive after completion.** Since "*Spaces for People*" do not have to support heavy cars and trucks, they do not need massive concrete columns and steel beams. Instead, they can be more like an airplane – very strong, sleek and lightweight.

7. **Use of low-cost and green materials.** The travelways and floors will be – would you believe – wood. Renewable and green wood. Below I will show you pictures and examples of wood walkways still in great condition after 100 or more years of use!

8. **Suitable for all ages, all types of people and for all categories of use.** Bike trails are great for bikes, walkers and runners. Some are paved and serve handcycles and roller-bladers as well. And, they are great for children, seniors and everyone in between. "*Spaces for People*" travelways are just like that. But, there are two big differences: 1. "*Spaces for People*" are still great when it's raining, snowing or late at night. 2. "*Spaces for People*" travelways can lead you to where you want to go. When people bike for recreation they start – go – return to the starting point. The trail often run alongside a river, a converted rail line or through public lands. But for commuting to work or school or for going shopping we need a travelway that leads from our home to our work, school and shopping centers. That's what our travelways do – they provide mostly utility transportation during rush hours and they serve recreational uses evenings and weekends.

9. **Require the minimum amount of land area.** A highway, a regional rail line or a bike trail require land. Land is a non-renewable and valuable resource. In urban areas it is often unavailable. When land is converted, that's it. The "*Spaces for People*" pass over existing streets, public parks, light industrial areas, along pipelines or along a riverbank. They are elevated; "*Spaces for People*" form a new layer, overtop of the cars and trucks and their roadways. When you are walking or riding a bike inside the

"*Spaces for People*", you are "King-of-the-Road" riding on the balcony of your own penthouse looking down on those poor souls stuck in traffic, noise and diesel fumes on their streets below.

10. **They must be comfortable, pleasant and 'cool' for the users.** A great deal of consideration has been given to making our "*Spaces for People*" functional, pleasant and a fun, 'cool' place to be. The design includes sophisticated computerized access control and security systems – so kids and women feel safe; entertainment systems; and, a world-wide social networking site – voice activated, so you can communicate with a 'friend' in Paris or Bangkok while you are both riding your bikes to/from school.

11. **They must maximize usage.** "*Spaces for People*" incorporate many well-known attributes that will attract users. When it comes to cost justifying a public facility, the more people using it, the easier it is to justify and the more effort that will be expended to keep them well maintained and popular. These include: low fares, on-time performance, lots of entrance and exit points, being comfortable, etc.

Chapter III

Who Else Believes?

Chapter IV

Share The Vision

I want you to share my vision. I want you to feel the experience of having "*Spaces for People*" network in your community.

This is a short story about Tom and Sabine, beginning when Tom takes a new job and moves. His new community, Phoenixville, has a "Spaces for People" network. At first he is dubious and cynical, but as the weeks go by he starts to comprehend.

First you see them from below
Your first peek
Bringing your bike
Trying a public bike
Friends talking at work about their CoolTuber.org group
You join the group
Building your stamina
The passers, beautiful women passing you by
You have gotten fit
You meet others, and the woman
You join another group
The wedding

Chapter V

The Design of "*Spaces for People*"

What are Spaces for People?

Many examples of great spaces for people are found around the world. One example, to illustrate what we mean, is the train station in Madrid, Spain (*Estación de Atocha),* shown on the right.

This book is about our concept of "*Spaces for People*" which, just like Madrid's train station, consists of pleasant areas where people can sit, walk, shop, eat and converse connected together with a network of travelways[6].

The travelways connecting Madrid's train station to the city and beyond are the train tracks, sidewalks, ramps and stairs. Similarly, "*Spaces for People*" include travel lanes for bicycles and other small vehicles and walkways for people walking and jogging. There are also entrance/exit ramps, rest areas, inclines, descents and even 'runaway bike' pull-offs near the bottom of long descents.

Another aspect shared by Milan's train station, another great space for people – the underground city in Montréal, Canada (*Ville souterraine de Montréal)* – shown on the right, and our "*Spaces for People*" design is they all take advantage of <u>multiple levels</u>.

Ever since man built the first two-story house, societies have benefited from the cost savings and the land area savings of elevated multi-level spaces.

In fact, elevated space, like a penthouse apartment, is generally considered to be preferable. From the balcony of a New York City luxury apartment you can look down and sympathize with the poor folks stuck in traffic, noise and bus fumes on the streets

below.

And so it is with "*Spaces for People*". They are attractive, elevated spaces, walkways and travel lanes that float overtop the cars and trucks below.

Included in a community's "*Spaces for People*" network are travelways having entrances within residential areas, inside the school yards and with spur-connections directly into company parking lots and shopping centers. And, they are connected directly into an upper floor of participating libraries, restaurants, malls, shops, airports and department stores.

"*Spaces for People*" are assembled from mass-produced, standardized modular components. The University can have one network on their campus and it will connect, seamlessly, with another network owned by the surrounding city. The same is the case for military bases or private facilities, many of which will have spurs seamlessly flowing into their parking facilities from a nearby city-owned travelway. Perhaps they will also incorporate a locker room for employees to change into comfortable clothes for their bike ride home. They, after all, are not dumb. By encouraging daily aerobic exercise they will receive a nice discount on employee health insurance premiums.

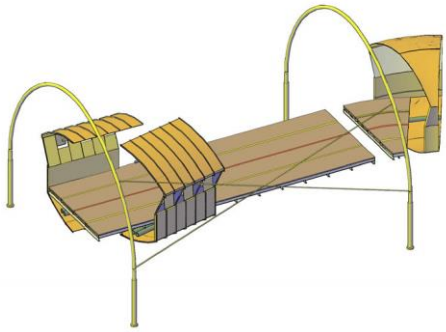
The design specifications:
This chapter is about the current design of "*Spaces for People*". Here you will see what the resulting product looks like and why it looks like it does. This product design meets many goals and requirements that we believe are necessary for it to be viable. The actual design specifications, precise statements defining the goals and requirements, are found in Chapter I.

Some of the important design goals and requirements found in the specifications, which are implemented in this design, are:

- **Low cost.** "*Spaces for People*" can be erected at a cost that compares with the cost of a traditional walking/biking trail; this is about 1/30th the cost of building a highway.
- **Fast, low-cost planning.** A community can design and plan a "*Spaces for People*" network very quickly, with minimal cost and little risk of design flaws. The pre-fabricated components will be shipped and assembled on-site by the manufacturer with no cost overruns or construction delays.
- **Non-intrusive during construction.** The network is assembled from small, lightweight sections. There is no need for excavation or heavy construction equipment. The assembly is carried out in a matter of days by small crane trucks similar to the electric company installing new power lines.
- **Non-intrusive after completion.** Since "*Spaces for People*" do not have to support heavy cars and trucks, they do not have massive concrete columns and steel beams. Instead, they are more like an airplane – very strong, sleek and lightweight.
- **Use of low-cost and green materials.** The travelways and floors are – would you believe – wood. Renewable and green wood. Below we will show you pictures and examples of wood walkways still in great condition after 150 or more years of use!
- **Suitable for all ages, all types of people and for all categories of use.** Bike trails are great for bikes, walkers and runners. Some are paved and serve handcycles and roller-bladers as well. And, they are great for children, seniors and everyone in between. "*Spaces for People*" travelways are just like that. But, there are two big differences: 1. "*Spaces for People*" are still great when it's raining, snowing or late at night. 2. "*Spaces for People*" travelways can lead you to where you want to go. When people bike for recreation they start – go – return to the starting point. The trail often run alongside a river, a converted rail line or through public lands. But for commuting to work or school or for going shopping we need a travelway that leads from our home to our work, school and shopping centers. That's what our travelways do – they provide mostly utility transportation during rush hours and they serve recreational uses evenings and weekends.
- **Require the minimum amount of land area.** A highway, a regional rail line or a bike trail require land. Land is a non-renewable and valuable resource. In urban areas it is often unavailable. When land is converted, that's it. The "*Spaces for People*" pass over existing streets, public parks, light industrial areas, along pipelines or along a riverbank. They are elevated; "*Spaces for People*" form a new layer, overtop of the cars and trucks and their roadways. When you are walking or riding a bike inside the "*Spaces for People*", you are "King-of-the-Road" riding on the balcony of your own penthouse looking down on those poor souls stuck in traffic, noise and diesel fumes on their streets below.
- **They must be comfortable, pleasant and 'cool' for the users.** A great deal of consideration has been given to making our "*Spaces for People*" functional, pleasant and a fun, 'cool' place to be. The design includes sophisticated computerized access control and security systems – so kids and women feel safe; entertainment systems; and, a world-wide social networking site – voice activated, so you can communicate with a 'friend' in Paris or Bangkok while you are both riding your bikes to/from school.
- **They must maximize usage.** "*Spaces for People*" incorporate many well-known attributes that will attract users. When it comes to cost justifying a public facility, the more people using it, the easier it is to justify and the more effort that will be expended to keep them well maintained and popular. These include: low fares, on-time performance, lots of entrance and exit points, being comfortable, etc.

Assembled from pre-fabricated components.

A "*Spaces for People*" network is assembled from an extensive set of pre-fabricated components.

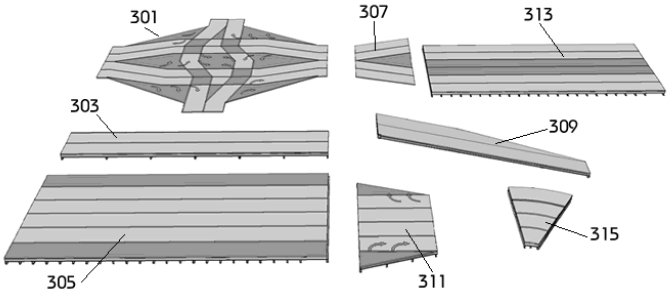


There are compelling reasons for this pre-fab aspect of the overall design:

- Pre-fab components results in the lowest costs.
- They require a minimum amount of time for assembly and construction.
- Pre-fab components are mass-produced and standardized. This allows them to be shipped and assembled on-site. It also allows upgrades or changes to be made quickly and easily – undo a few bolts and insert a replacement component.
- There is minimal construction intrusion into the community. Because each component is small and lightweight – typically about 12 ft long weighing under 500 pounds – they can be assembled without the need of big, heavy construction equipment. Generally, a small crane truck, like the ones used by the electric company, is the only equipment needed to install, repair or upgrade a section of the travelway.

Several types of components.

A network is configured in a manner similar to a model train layout, where a child selects sections of straight track, curves, switches and crossovers to get a layout of any size and any shape. Likewise, planning a "*Spaces for People*" network, the planner selects sections of track – in this case, the floors of the space areas and the travel lanes. These sections are available in different widths, width transitions, curves, inclines, descents, wyes, turn-offs, etc. Components are selected to configure the desired trajectory (straight, curved, up, down…) and the desired functionalities (passing lanes, turn-offs, rest stops…) for each location along each of the travelway routes.



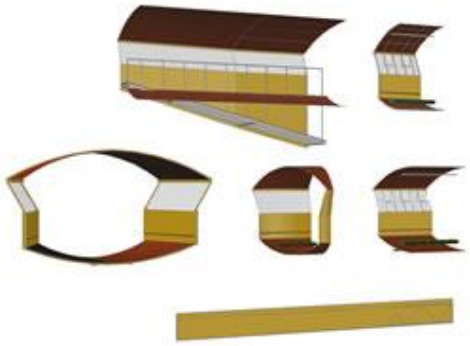
As an example, in residential neighborhoods, the travelway may be two lanes wide – one lane in each direction with occasional passing lanes. This might lead to an intersection component where the two-lane travelway joins up with four-lane travelway leading to the town center. Entrance and exit ramps, passing lanes, rest stops and other functions are inserted where desired.

In addition to the floor components, there are side-wall sections that enclose them, there are structural supports that hold the travelways and people spaces at the desired height

and orientation (these might be arches as shown in the picture) and there are interface components that connect a travelway or a people space to existing structures such as a library, a mall, a department store or an office building.

A Set of components.

There are many examples of "sets of components" used in construction. Two examples – to illustrate the concept of a set - are "the set of standard copper tubing and fittings" and "a manufacturer's set of kitchen cabinets".



The first set allows a plumber to quickly select components he needs for any plumbing job using copper tubing. He doesn't have to design, engineer, test or analyze the fittings – he simply plucks one from his truck and solders it into place.

The second set allows a kitchen planner to systematically select cabinets from a catalog of all available cabinet types and sizes. For example, if he needs a base cabinet with 4 drawers, he refers to the catalog and sees they come in widths of 12", 15"… etc. The kitchen, then, is pieced together with various base and wall cabinets. Accessories – handles, trim and molding are also in the catalog as are special considerations he must take into account.

Such "sets of components" allow a designer or a builder to select the particular components he needs for the job at hand, purchase them off the shelf from a supplier and simply screw, solder or bolt them together at the construction site. Custom made items, say, kitchen cabinets, typically require much more design time, take several weeks to manufacture and cost much more.

Despite an abundance of "pre-designed, pre-engineered and pre-manufactured sets of components" being used millions of times each day within the construction industry; there have never been such sets for travelways serving people – people riding bikes, people walking, people jogging, people socializing.

There are pre-fabricated and modular pedestrian crosswalks, skywalks, small bridges, boardwalks and simple spaces like offices and classrooms available on the market. But, as far as an extensive network of travelways – an interconnected network of bikeways, bridges and rest stops extending for several miles – they have never existed.

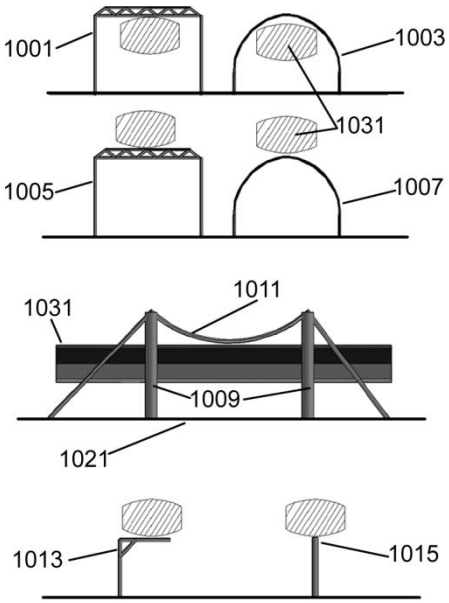
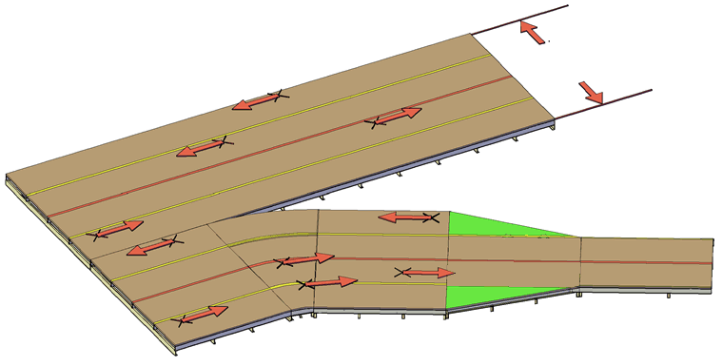


Fig. 10

Has there ever been a public works project, even a simple bridge along a bike trail, that has not gone through the traditional public construction project phases: architects, engineers, design drawings and specifications, request for bids, construction estimates, project managers and heavy construction equipment required because of massive concrete footers and steel beams? That's why it costs $1 million per mile for a 10ft wide bike path[8].

A Process for Configuring a "Spaces for People" Network

As with the kitchen cabinets, all components needed for a "*Spaces for People*" network are contained in a catalog; more specifically, a computer data base, which is compatible with a CAD software program. The planner places a map of his community on the computer screen, selects a component from the database and positions it on his map. This process is repeated until he has his preferred configuration overlaid on the map. [Obviously, there are special considerations with certain components, only certain side-wall enclosures match with certain floor shapes, etc. Nonetheless, the process is not much more difficult than the kitchen planning analogy.]



We believe this process will enable communities around the world to plan and order a "*Spaces for People*" network from a manufacturer. The components will be shipped, assembled and erected by an experienced construction crew with applicable tools and equipment and properly trained by the manufacturer.

The 'Total Cost'[10] of the new facility will be a small fraction that of a custom designed, custom engineered and custom constructed facility.

How the components are assembled

Generally speaking, the components are bolted together. This is fast, easy, requires only simple tools and no heavy equipment.

But, one of the biggest benefits is that bolts work both ways – a component can be unbolted as well. [OK, you skeptics and cynics. Pranksters or

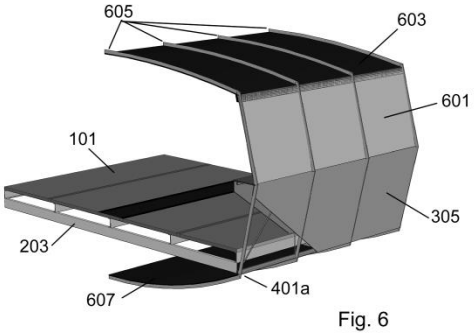
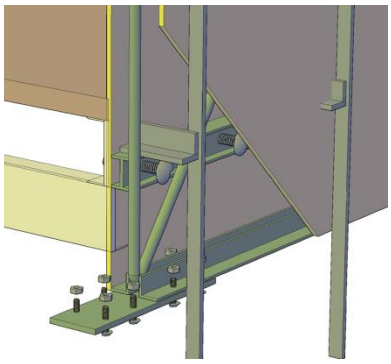


Fig. 6

[10] Refer to Chapter VIII for an explanation of what constitutes 'Total Cost'. It includes, among other things, materials and labor costs, planning, design, land acquisition, cost of risks and cost of possible delays and overruns.

saboteurs could also unbolt them, right? Well, before jumping to conclusions you are invited to read about the computerized access control and security systems. And, we have much more on this topic… below.]



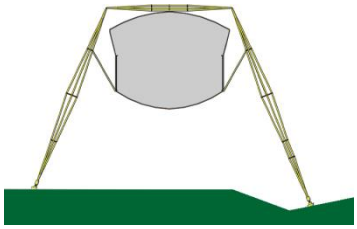
Have you ever sat in a traffic jam caused by road construction? Of course. Any plan – roads, bridges or airports – is subject to requiring adjustments after a few years of use. They need to be widened, repaired or have a new exit inserted.

With this design, the components can be unbolted and new ones inserted. To add an exit, for example, would require removing a couple of side-wall components and a couple of the track/floor components by unbolting them using a cherry-picker truck. The new turn-off section of floor is bolted into place and a new, matching, side-wall section encloses it.

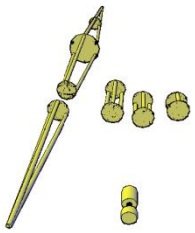
This process is very similar to the electric company replacing a transformer or broken line atop a utility pole – it can be done in a few hours with little or no disruption to traffic within the travelway, motor vehicle activity on the street below or disturbance to the nearby neighborhood.

Then, a new travelway is connected to the turn-off section and run to wherever it is intended to serve – perhaps, a nearby parking garage or a neighborhood playground.

Reducing risk of oversights and omissions



Accountants, engineers and other professionals are always concerned about being sued for making an mistake or forgetting some details. So, your community planners might be concerned that they make a mistake – they could build a 'road to nowhere' and be the target of public anger.



So, the design of "*Spaces for People*" is very flexible and forgiving. Say, for example, you run a travelway along 7th street; but, after it is in place, it becomes evident it should have been wider; and, 7th street is pretty small and it would be better along 8th street. No problem. Because it is simply bolted together, it can be unbolted, moved, then reassembled along 8th street. The track floor that was three lanes wide can have extra one-lane-wide track components bolted alongside, thereby having a four-lane wide track running overtop of 8th street.

And, because the structural supports are also light weight, are also modular sections, are also bolted together and because they have a novel (patent pending) footer that requires no excavation and no

concrete, they can be moved to 8th street as well. And, they work equally well for a four-lane travelway as they did for the three-lane travelway.

A community considering the acquisition of a "*Spaces for People*" network can start with a small sample run. Perhaps from one schoolyard to a nearby neighborhood where a good number of students live. If they like the results, they can add a little more and a little more a little later.

This is how roads and highways grew over the last century. One difference between roads for cars and trucks and our travelways for people is that roads are much more difficult to change – consider "The Big Dig" in Boston, MA[11] that cost $11 billion - above the original estimate of $2.8 billion – to move a few miles of I-93 underground and create a nice space for people – the Rose Kennedy Greenway - above. The pictures show the $14 billion Space for Cars and Trucks, now underneath the city, and the Greenway for people, above .

Why are they elevated?

The primary reasons for using elevated spaces for our travelways and general use areas are:

1. Reduce land acquisition costs
2. Reduce site preparation costs
3. Create more routing flexibility
4. Reduce the effect of hills
5. Get away from streets used by cars and trucks
6. Promote the feel of being king-of-the-road
7. Accommodate the pre-fab, modular

[11] "The Big Dig" rerouted the Interstate 93, passing through the heart of Boston, into a 3.5 mile tunnel under the city. The project also included a nice space for people, the Rose Kennedy Greenway, in the space vacated by the previous I-93 elevated roadway. The Big Dig was the most expensive highway project in the U.S. The project was estimated in 1985 at $2.8 billion. Over $14.6 billion had been spent in federal and state tax dollars as of 2006. "In all, the project will cost an additional $7 billion in interest, bringing the total to a staggering $22 billion", according to *The Boston Globe*. "It will not be paid off until 2038." http://en.wikipedia.org/wiki/Big_Dig_(Boston,_Massachusetts)

design concept

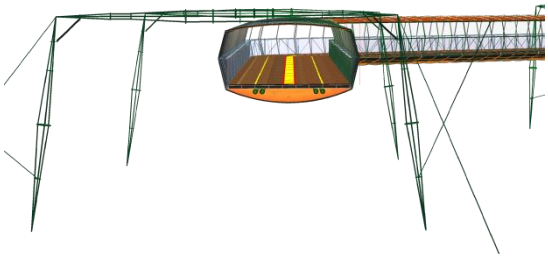
#1 - Reduce land acquisition costs

Usually, elevated travelways waste the land area underneath them. This is because elevated highways or elevated trains require massive concrete columns; this, in turn, is because they must support the weight and vibration of very heavy trucks or trains.

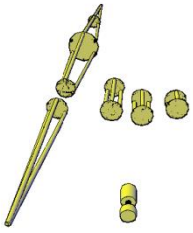
"Spaces for People" are restricted to people walking and people riding small vehicles, especially bicycles. Thus, they can be supported by non-massive supporting structures.

Another reason the traditional elevated trains or highways ruin, more or less, the land area beneath them is caused by the use of columns, which infiltrate the space below, as shown in this picture taken in Jacksonville, FL.

The support structures used in "*Spaces for People*" are, typically, arches or two-legged goal-post like supports. This design provides several great advantages:



- The supports, themselves, are modular and can be assembled into any desired height and any desired width (within their design limits, of course, which is about 60 ft high and up to about 100 ft wide.)



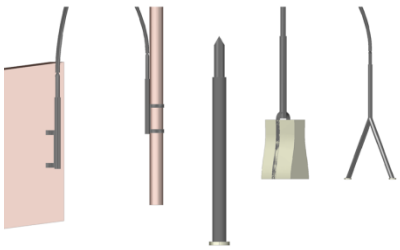
- A column has a tendency to topple over. It has to be anchored deep and firmly into the ground. They need big, concrete footers, which, in turn, require excavation equipment, concrete forms, concrete trucks and the construction intrusion that accompanies them. Furthermore, concrete has to set - often 24 days - before it acquires sufficient strength to support its load.

  But, any football player knows a wide stance provides more stability. The widely spaced two-leg design is inherently stable. It will not topple over – just as a stool doesn't topple even with no anchor into the floor. [We do, in fact, have anchors for other reasons. These anchors are described below in the section titled "Structural Analysis".]

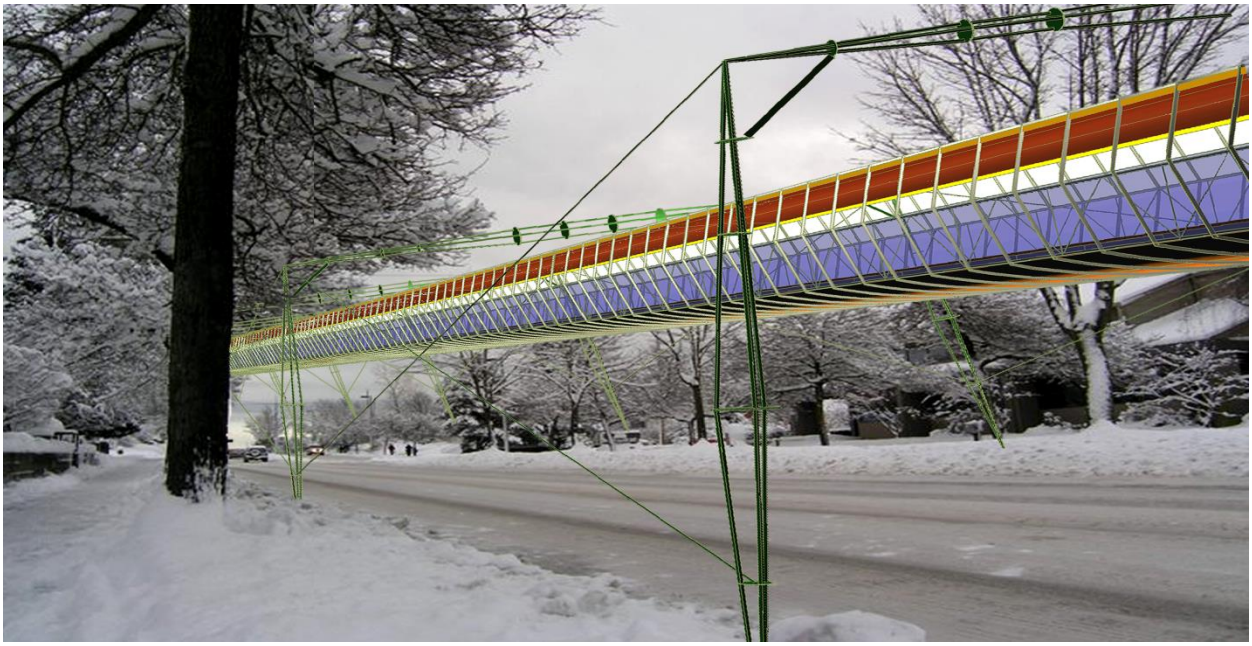
- The two-legged supports naturally straddle a roadway, pathway or stream. Accordingly, they are a natural for supporting the travelway running over existing streets, sidewalks or pipelines.

- Because there are two legs, and two (or more) 'feet', the weight is distributed. That is, each leg and each foot only needs to support one-half the weight. [This is not exactly correct unless the travelway is perfectly centered, but the concept still applies.] Structural analysis shows that each foot has to support only about 45,000 lbs. Compared to most civil engineering projects – highways, bridges, etc. – these are very small numbers. Thus, the supports are light weight and non-intrusive.

- The feet, on each of the two legs, can rest on soil, on a sidewalk, on a roadway median, or a roadway shoulder or be attached to an existing structure. Some options are shown here.



The fact that the travelways themselves are relatively small, have tempered glass sides and are fairly attractive; and, because the structural supports are lightweight and can straddle a public right-of-way; and, because the travelway position, with respect to the support structure, is quite flexible; and, because the height of the travelway can be anywhere from ground level to about 60 feet in height; the travelway can, in many cases, pass overhead with no disruption of the existing land use.



Because the area beneath the travelways is not obstructed; and the travelway itself is relatively non-intrusive; and they can pass over public land (roads, parks, bike trails, along riverbanks…) land acquisition costs will be minimal.

But, they can also pass over suitable private land, just as pipelines and data lines presently run underground. In these cases, a right-of-way is purchased; but, since the right-of-way

would be only about 20 ft. in width and the land beneath can continue to be used as before, these costs would be considerably less than, say, acquiring land for a highway or regional rail line.

Suitable private property could include passing over office and light industrial parks, running over or alongside railroad tracks, over any of the millions of miles of existing pipelines and beneath or alongside electrical power line corridors.

There are, however, stations at selected points along the travelways. These would include entrance and exit ramps, bicycle racks, storage lockers, restrooms, etc. The station areas would require land.

In addition, there may be a need or preference for motor-vehicle parking lots to accommodate a 'park-and-ride' capability.

#2 - Reduce site preparation costs

The two-legged structural support design requires minimal site preparation costs.

First, there are no utilities (water, electric, gas) required along the typical travelways, so ground clearing and digging for this is not required. [These are supplied to the network at station points where there would also be exit/entrance ramps and other facilities.]

Second, because the support legs are modular and adjustable in both height and footprint, there is no requirement for cut-and-fill, ground leveling or bolder removal work.

Third, because of the (patent pending) footer design, the footers can rest on soil, rocks, concrete or most other terrains. They can also be connected to existing structures – attached to the side of an existing bridge, for example. Accordingly, since there is no need for poured concrete footers or pilings driven into unstable soils, there is no need for digging or excavating for footers. [Although the typical span between supports is about 40 ft, alternative suspension methods allow spans of 300 ft or more. That is, the travelways can have long spans to cross ravines, gullies, rivers, existing structures or unfavorable soil conditions.]

Because the existing terrain is not disturbed, and heavy equipment is not used, there is no need for storm sewers, drainage or flood control devices to be installed. Similarly, since the existing terrain is not disturbed, there should be no EPA regulations – say, providing wildlife crossings or erosion control during construction. [Below we will demonstrate a technique using the installed structural supports with a temporary conveyor cable system to bring flooring, side wall and other components from a staging area to the installation point so as to preclude the need for truck transport.]

#3 - Create more routing flexibility

Planning a route for a highway or train line is extremely complex; planning routes for a bike trail or bike lanes is simpler, but still quite difficult.

The problem is competition for land area – car drivers feel bike lanes take up 'their' space (even though many will abuse the lane or use it for parking). As for a bike trails, though we are fortunate to have the 'Rails to Trails' program that converts abandoned train lines into great trails, there is little space available other than public parks and woodlands. (Picture shows the Chestnut St. "Bicycles and Buses Only Lane" in Philadelphia, PA – The police officers, when asked about the bike lane, smiled politely.)

The elevated design and un-intrusive nature of "Spaces for People" travelways does not compete for land. The area beneath can continue to be used as it always has been.

Clearly, there will be public opposition to running a travelway down a narrow residential street; however, when residents consider the advantages for their neighborhood some may reconsider:

- Their children will have a safe pathway, isolated from motor-vehicle traffic, to travel to school, to local events and to visit friends – even during rain or snow.
- They can easily use their bike, a public bike, an electric powered bike, a Segway®, walk, jog or even roller-blade to and from work – thereby saving, on average, about $2,000 annually.
- They will be able to get by without that extra car.
- The travelways are available for recreational use at all hours, every day of the year. They can walk, jog, roller-blade or ride bicycles from an entrance near their home, travel to most areas of the extended community and return home – even on cold, rainy days or dark evenings. This will enable them to get more aerobic exercise and lose weight, go on pleasant family outings and teach their children there are alternatives to sedentary lifestyles.
- Their children will be safe from strangers while traveling around the neighborhood. The sophisticated access-control and security systems inside the travelways will make them nearly as safe as the 'security zone' at the airports. That is, it will be safer for women and children, especially after dark, to travel inside than to be walking on many urban streets.
- Their neighborhood can be improved by removing unsightly telephone and electric wires. These can run, hidden from view, inside the travelways. Utility poles can be eliminated along the street and the cost of doing so will be considerably less than putting them underground, the only option today.
- Property values will increase. Studies have shown that communities with more mobility options are more attractive and command pricing premiums. [This, of course, doesn't apply to homes adjacent to a busy, noisy highway or train track.]

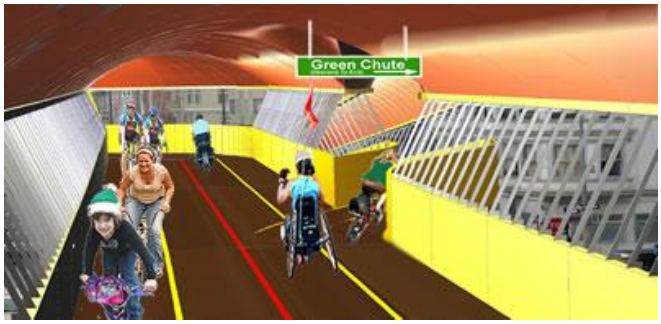
- Those few, irresponsible drivers who drive under the influence will at least have an alternative way to get home – they and their kids will be less likely to be run over by a drunk driver.

The travelways follow a three-dimensional trajectory. That is, they don't lay on the ground (two-dimensional) like a road – they go "as the crow flies". They are free to go any direction and up or down. They can go over streets, over rivers, over an office park or light industrial area. Certainly there are limits. They are not practical going higher than about 60 ft (as high as a six story building) except to cross a deep ravine.

The pink lines in this photo illustrate how routing can be much more efficient when a 3-dimensional trajectory can be followed. It also emphasis how frequently land area is wasted in urban areas. Elevating highways is extremely expensive; elevating our travelways is, well, they're always elevated.

During a community debate about routing: a) The fact that the travelway can be installed in a few days with no construction mess, no major intrusion into ongoing activities; and, b) if, after installation and a trial period the neighborhood citizens elect to remove it, it can be removed as easily and un-intrusively as it was installed, may dull opposition. [This is how the city of Stockholm enacted a congestion tax to reduce downtown traffic after considerable opposition. The tax law was enacted for a trial period. After the test and the positive impact on reducing congestion and improved livability of the city, it was voted to become permanent.]

#4 - Reduce the effect of hills



Strong bike riders love hills – it gets the heart pumping on the way up; it's exhilarating on the way down. "*Spaces for People*" actually incorporate steep hills and descents on specified 'aerobic exercise tracks'. These are one-way sections of travelways that start and end at the same point. In between, bike riders (and, when provided for, runners) can select calibrated inclines to test and strengthen their endurance. Some inclines are helical climbs which, at the top, have steep descents back to the bottom.

However, for most people and for utility transport – commuting to work or going to the store – hills are a negative, especially steep ones. The three-dimensional trajectory aspect of the travelways reduces the height of hills. "As the crow flies" includes no hills; they fly over hills and valleys. While we cannot avoid a high hill like the crow does, by making the travelway

height greater over the low spots and lower over the hill tops, the net result, the differential between the two, will be reduced.

Another thing our design includes is terraced climbs. That is, for the same reasons long flights of stairs have landings every so often (so you get a break from climbing), the travelways have terraced climbs. There is a section of flat roadway every 50 ft. or so.

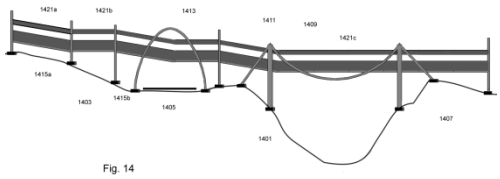


Fig. 14

And, for the other guys – those coming down the hill that you are going up – an option is provided. At the top of a long, steep descent the bike rider has a choice: he can take the turn-off to the right, which we call "The Green Chute" or he can continue straight and go down the terraced travelway, passing you while climbing the hill. "The Green Chute" – a separate one-way pathway - is a straight shot down the incline. Kids, seniors, we all love the thrill of speeding down a hill on a bike.

And, then, there are the REALLY steep hills. For these, a bike rider that is not into building stamina and has not selected an electric or hydrogen powered bike can opt to use a mechanical assist device. One design for these, I have pursued, resembles a rope-lift on the ski slope except instead of grabbing the rope with your hands, a paddle-like arm is positioned behind your back and pushes you up the hill.

Another, very clever design, can be seen in Trondheim, Norway – home of the "Bicycle Lift Trampe", where the bike rider places his foot on a conveyor belt which pushes him up the hill[12].

#5 - Get away from streets used by cars and trucks

Transportation engineers, city planners and biking enthusiasts around the work plan 'Bike-Friendly Cities'. The combination of urban planning with wide and segregated bike lanes, ample bike parking facilities, public bike rentals, laws favoring the bicyclist, taxes on gas and bringing cars into city centers produce remarkable results: Amsterdam, the bike capital of the world, has 40% of all traffic movements by bicycle. Copenhagen, he city with the sixth-highest quality of life in the world, is also home to the world's most successful community bicycle program. Boulder, Colorado, Safe Routes to School pilot program boasts one school reported that 75 percent of their students walked or biked to school[13].

These efforts are nothing short of fantastic. I applaud them and support several such programs.

However, it is important to note that virtually every effort in this direction includes the concept of segregating bicycles from motor-vehicles.

[12] http://www.trampe.no/english/
[13] *"The 11 most accessible and bike friendly cities"*, http://www.virgin-vacations.com/site_vv/11-most-bike-friendly-cities.asp

"*Spaces for People*", by its very definition, are spaces where cars and trucks are prohibited. Unlike the bike-friendly efforts, however, our "*Spaces for People*" are not only bike-friendly, they are also walker-friendly, jogger-friendly, Segway®-rider-friendly, handicapped-veteran-in-a-handcycle-friendly and old-folks-walking-their-dog-friendly. [Ops, did we forget to mention that the travelway pedestrian lanes have 'doggie-spaces' every so often. And, inconsiderate owners who don't clean-up a misplaced poop will be detected by the access-control system and fined.]

Also, one must ask, "Just how bike-friendly is bike-friendly?" Though the laws and taxing systems may favor the cyclist, mother nature does not. It still rains, gets very windy, can snow and becomes difficult to see obstacles after dark. The "*Spaces for People*" are enclosed, well lit, have top-notch security and other features to deal with these issues, as discussed below.

And, consider this quote taken from the municipal website:

"Münster, Germany has been voted "Germany's most bicycle-friendly city" several times, both by the ADAC (German Automobile Association) and the ADFC (German Cyclists' Federation)… However, caution is required: this popular means of transport is a favourite target for thieves. On average, more bicycles are stolen in Münster than in other cities.[14]"

"*Spaces for People*" ensures users their bicycle will not be stolen within the system. [See: Access Control and Security Systems, below]. Furthermore, within the "*Spaces for People*" network there are an ample supply of 'public bicycles'. These, just as shopping carts are provided for visitors to the supermarket, bicycles are available so users are not required to lug their own bike to the nearest exit, or be concerned where to park it, or forgo an opportunity to make use of the facility because they don't happen to have their bike with them.

#6 - Promote the feel of being "King-of-the-Road"

Unless a cyclist is fortunate enough to live in Amsterdam or one of the other truly bike-friendly cities, automobile and truck drivers seem to consider him as being inferior. Though many drivers are considerate, one often feels as if he is disliked and doesn't have an equal right to be on the road.

This photo[15] is far too typical in representing the reality of bike lanes – they are definitely not intended for VIPs. Technically speaking, from an engineering perspective, one might say they are a joke[16].

[14] Welcome to Stadt Münster, http://www.muenster.de/en/cycling_capital.php
[15] Photo taken from website, http://nyc.mybikelane.com/
[16] John Forester is a well known and respected expert on bicycle engineering, his report http://www.johnforester.com/Articles/Facilities/BLvsWCL.htm

Although over the last 15 years, I have probably ridden my bike 1,000 miles in 'bike lanes' and several thousand more on non-marked roads around Southeastern Pennsylvania. Yet, today, at 68, I do not feel comfortable riding in traffic.

The fact is, in today's world, streets and highways are intended to serve cars and trucks. Thought many cycling advocates and well-meaning transportation engineers endorse the concept of "Shared-Use Facilities For Bicycles and Motor Vehicles", it is, at best, a desperate attempt to find workable solutions and appease bicycle advocates.

It is different, I am told, in Copenhagen, Denmark. One website's description[13]:

"The city of Copenhagen plans to double its spending on biking infrastructure over the next three years. Currently 32% of workers bicycle to work and 50% say they cycle to work because it is fast and easy. The city's bicycle paths are extensive and well-used. Bicycle paths are often separated from the main traffic lanes and sometimes have their own signal systems. Already one city neighborhood, the notorious commune Christiania, is completely car-free."

As a biking enthusiast, this sounds great. But, consider the following facts:

- Bicycles are given priority over motor-vehicles in city planning.
- Buses block cars when stopping; they do not block bicycles.
- Laws favor cyclists; they deter private car ownership.
- There is a 200% tax on private cars.
- Gasoline is heavily taxed; it costs about $6 per gallon

Is this not an adversarial situation – automobile drivers vs. cyclists? We are not compelled to have an 'us vs. them' confrontation.

Yes, I love cycling, but I drive my car a great deal as well. [Of course, until my community installs "*Spaces for People*" I often have no viable choice.]

"*Spaces for People*" are not anti-car; they are elevated above, and do not interfere with the spaces for cars. They do not infringe on those who choose to drive or on those who must drive. We all need delivery trucks and police cars. Contractors, service providers and outside sales people must drive. Sometimes people do have to go shopping for large, heavy items. People do attend formal events requiring fancy clothes. Sometimes we need to get somewhere fast.

"*Spaces for People, spaces for cars*". That is, after all, the title of this book.

When you ride a bike in this people-space, you will indeed be "King-of-the-Road".

#7 - Accommodate the pre-fab, modular design concept

The elevated design is pretty-much necessary to have a pre-fabricated, modular construction method.

Every structure has to be supported and held in the proper orientation with respect to the earth's surface. A house rests on its foundation. A bridge rests on its footings. In these cases, the construction site has to be prepared and concrete poured to construct these supports. There are exceptions – a telephone pole, for example, sits in a deep hole and may have angled support wires attached to soil anchor devices – but, generally speaking, building a structure requires an invasion of the site by heavy excavation equipment and large trucks delivering concrete, fill-dirt and other supplies.

The design aspect enabling "Spaces for People" to be erected without disturbing the nearby community is the two-legged supports resting on unique support feet. These support feet do not require excavation at the site, nor do they require concrete.

Accordingly: the travelways and the other people-spaces are elevated because we know of no other way to meet my design requirement of non-invasive construction.

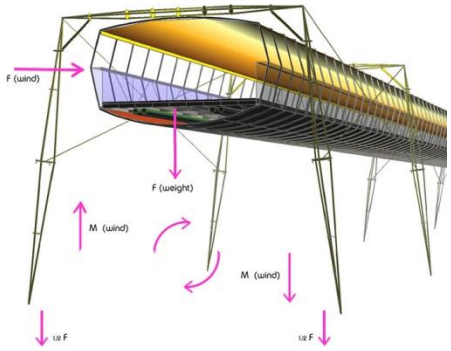
The 'height' they must be elevated is another question. They could be elevated just 1 foot, but a height of about 15 ft. is ample to avoid interference with motor-vehicle traffic. When crossing over an elevated highway or elevated train track which might be 15 ft high themselves, our travelways would have to be at least 30 ft high.

An interesting picture, shown here, is a bicycle and pedestrian walkway rising up about 30 ft. to connect to the bridge from where I took this shot. This is in Philadelphia, PA.

As you can see, this travelway is supported by costly, intrusive concrete columns.

Structural Design

First, although I am a graduate engineer and a member of ASCE, the society of civil engineers, I don't want to imply that I'm an expert in Structural Analysis. However, to impart credibility to the designs shown, I will explain in layman's terms the primary structural properties that must be considered.



I simply want to convince you that these "*Spaces for People*" are strong, safe, very inexpensive and can be erected in your community quickly and with minimal intrusion during the construction or when making enhancements.

LOADS.
Loads is the term engineers use when talking about the forces acting on the structure. Here, the common loads are:
Dead Load. The weight of the structure itself. This force tends to push the feet into the ground.
Live Load. This is the weight of the pedestrians, bicycle riders and anything else inside and adds to the force pushing down on the legs and feet.
Snow Load. Of course, this is the added weight of any snow and ice.
Wind Load. This force mostly pushes sideward on the structure. In strong winds, like during a hurricane, these forces can be very strong. Here, the wind load will try to topple the structure over.
Other Loads. There are several other loads that could be important such as Impact Loads caused by moving vehicles and Earthquake Loads.

In this case, the 'other loads' must consider the effect of a motor-vehicle striking one of the legs! This is certain to happen, sooner or later, because we are straddling roads and highways. This will be analyzed a little later and you will also be introduced to our (patent pending) breakaway leg design that keeps the travelway standing strong and straight even if a speeding truck takes out one of the legs.

The structure itself, in a spot where it is four traffic lanes wide, weighs about 300 lbs per ft. So, a section 50 ft. long, it would weigh about 15,000 lbs. The picture shows support structures with a cross-truss, two legs, two feet and bracing to make it stiff and rigid. These support structures are positioned every 50 ft. or so along the travelway to support this weight.

The other downward direction loads, the snow and the occupants, come from data collected by engineers over many years. The "*Minimum Design Loads for Buildings and Other Structures*" says, for example, the floors in your home must support 40 lbs. per sq. ft., a 2nd story school corridor must be strong enough to support 80 lbs. per sq. ft. and a dance hall or ballroom must support 100 lbs. per sq. ft.

In our case, bicycle riders are very light because they are spread out. People packed in, like the dance hall, are much heavier. So, to be extra careful, we'll use 85 lbs. per sq. ft. The snow load could add up to about 12 lbs. per sq. ft. on our curved roof.

So, the downward direction loads are the total of the structure itself, the design load for occupants and vehicles and the snow load. These are shown in the picture as a downward arrow representing this force, F (weight), and is about 83,000 lbs. Each leg and each foot must support half of this, shown in the picture as ½ F near each foot, or 42,000 lbs.

The wind loads are more interesting, and they are more challenging. We've all see the destruction caused by tornados and hurricanes. One big factor is how fast the wind is blowing. Again, engineers have charts that show what they must plan for depending on where the structure is located. Over most of the USA this speed is 85 to 90 mph. But, in Florida and along the coast where hurricanes occur, they must plan on wind speeds of 130 to 150 miles per hour. [The 150 mph speed is only for South Florida, below Miami.]

Of course, the faster the wind, the stronger the force. But, what makes it so bad is the wind speed is squared! In other words, a 30 mph wind = (30 x 30) = 90 when it is squared. If the wind speed is doubled, to 60 mph, the force is (60 x 60) = 360 = FOUR times as much .

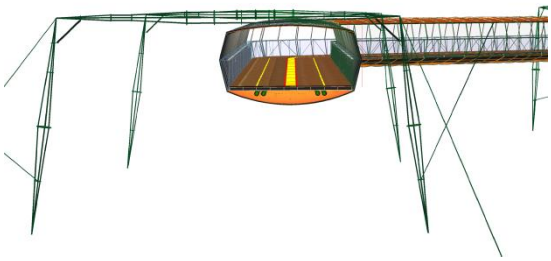
So, to withstand a Category 4 hurricane, you have to withstand wind speeds of 131-155 mph. This is what we want for *"Spaces for People"*. Even though there are very few places in the world that require withstanding wind speed of 150 mph, the idea is:

"Spaces for People" are pre-designed, pre-engineered and pre-manufactured components that can be installed on any terrain, in any climate and at any location in the world.

Did you notice the shape of the travelways? The first picture is the shape they used to be – before we did wind-loading tests.

But, airplanes and race cars are streamlined. They are shaped to minimize the forces of high speed wind. So, we changed the shape of the travelway sections of *"Spaces for People"* to this shape:

Notice that the side walls bulge out and are more streamlined? Also, we changed the design of the windows on each side to swing open when there is a lot of wind force on them – this relieves the wind pressure on the structure and reduces the possibility of the tempered glass breaking.



And, we invented a new foot design to deal with the topple over effect, called the winds 'moment' - in the picture showing the forces, the winds moment gives an upward force on one leg and a downward force on the other leg.

The legs and feet on one side have to be stronger, but on the other side a strong wind will try to pull them up and off the ground; it will try to tip over the structure.

The wind's force also tries to push the structure sideways and there are lift forces as it passes over the rounded roof and base. [The base is shaped to create more lift, negative lift, than the roof so the net effect tries to push the structure down instead of lift it up. This, as all NASCAR buffs know, is the same idea of the airfoil on racecars.] The wind force also tries to push-in the wall facing the wind and suck-out the backside wall, and the windows in the wall. Finally, there can be dynamic, oscillating type loads like the "aeroelastic flutter" that destroyed the famous Tacoma Narrows Bridge in 1940.

Remember those massive, intrusive concrete columns illustrated when we were talking about the 'intrusive construction' usually associated with elevated highways or walkways? This wind force is one reason they have to be so big – wind tries to blow them over and the columns have to go deep into the ground to remain stable.

Now, look at our design – two feet, spaced wide apart. This is hard to blow over. The main things engineers have to consider in a design, as regards wind loads, are:

- The higher the structure, the more force there is on the feet or the footer – this is called a 'bending moment' in the case of a column.
- The more streamlined the structure is, the less the forces will be. A billboard, for example, requires much stronger footers than a rounded tube, like our travelways.
- The higher the ceiling is, the bigger the wind force will be on the side walls. We keep the interior ceiling height about 8 ft for components that may be installed in hurricane or tornado prone areas.
- The wider the feet are, the less force there will be trying to pull the one foot out of the ground or trying to push the other into the ground.

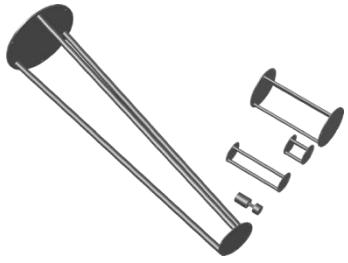
Figure 1 - Supports

Strength of Materials.

So, what will it take to hold this much weight?

Normal structural steel will support about 36,000 lbs per sq. in. of cross-sectional area. High strength steels and other materials can be much stronger, but we want to use only "low-cost, readily available, green materials." I excluded plastics or exotic materials from consideration, as of now. Common steel, like they use to make beams and steel tubes is OK. So each leg would require about 1.2 sq. in. of steel.

The pictures you have seen of the structural supports have three pipes for each leg, spread wider in the middle to prevent bending. If they were made of 1 ½ inch schedule 40 pipe, this is cheap and available in your typical construction supply store, they would have about 2 sq. in. of steel. They could support about 75,000 pounds – much more than we need.



An eight foot long section of this 3-pipe leg weighs about 60 lbs. The legs and cross beams are bolted together from

sections, each about 4 ft. long, so the height of the legs and the width of the top can be whatever works best at the site.

The Foot

I've stated several times that the travelways do not require concrete footers or any heavy equipment during construction. The (patent pending) foot is a key element to allow this.

Let's look again at the picture with the forces on the feet. The foot on the left has one force, ½ F, pushing down with the total weight, and another force, M (wind), pulling up when there is a strong wind. The wind will also try to push the structure and the feet sidewards.

Construction designers have the following traditional tools at their disposal:

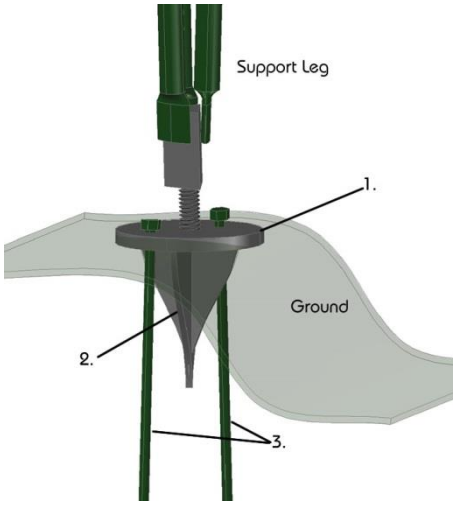
Part 1 - pulling out of the ground. There are devices called soil anchors. You often see them near telephone poles with a cable connecting them to the pole. They cannot be easily pulled out of the ground, so they keep the pole from bending or falling over.

Part 2 – sinking into the ground. For keeping things from sinking into the ground, a foot or a plate is often used – like a car jack has a base to spread the weight out over a bigger area. This small crane truck has its 'feet' extended for the same reason.

Part 3 – adjustments. After a foot has been positioned, the leg height often needs to be adjusted. This may also be required from time to time as routine maintenance since all foundations are subject to settling. The required precision is very important. The floor of a building, for example, must be very level or objects will roll off tables. Here, the roadways simulate the natural terrain and can, and are expected to, have slopes up and down so we have very lenient precision requirements.

Part 4 – sliding around. To keep a foot from sliding, cleats are often used; a football player has cleats on his shoes.

Part 5 – doubling up to pro-rate the load. When one beam, column or footer is not enough to do the job, more are added to share the load among several.



Now, when you combine parts 1, 2, 3, 4 and 5, you arrive at our design for the foot. The round plate, number 1, prevents the support leg from sinking into the ground; it is available in various diameters for different ground conditions. The cleat, number 2, prevents the foot from sliding sideways. The soil anchors, number 3, are driven into the ground and prevent the foot from being pulled up. Between the foot and the leg is a screw adjustment. Finally, if the ground is soft or sandy, there is a fork-like component that can be added to the support leg that spreads out to accommodate 2, 3 or 4 feet. Finally, since the ground usually is firmer as you go deeper, alternative

foot models have a longer and a different design for the cleat that effectively doubles or triples the plate area.

Some technical info:
A soil anchor, depending on the type of soil (sand, loam, clay, rocky…) and the size, will hold 20,000 pounds of pulling force, considerably more than we need even during a hurricane.

Soil load bearing capacity is the term for how much weight per sq. foot the ground will support. For our travelways, the ground under the foot will often be a sidewalk or road shoulder that has been compacted and quite strong. However, if we are running along a stream, or soft dirt, the foot will be larger or a multi-foot leg design is used.

The span

Span means the distance between two adjacent supports.

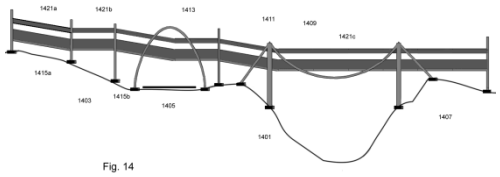


Fig. 14

So far we have discussed the structural design of just one support – having two feet, two legs, a cross-beam and diagonal braces to make it rigid.

This picture show a section of the travelway that goes down a hill, crosses a road then crosses over a ravine. As you can see, there are several supports and some of them are quite different.

To repeat one of the design requirements:

"Spaces for People" are assembled from components selected from an extensive set of pre-designed, pre-engineered and pre-manufactured components such that a section of travelway can be configured which is suitable for any terrain and any climate.

Any *"Spaces for People"* network that spreads out over a large region, like a city, will have different conditions at different points. There are likely to be several bridges, some long, some short, some over a river, some extending from hill-top to hill-top. Some places the travelway will be straight and flat, other places it will climb a hill or require a curve or a cul-de-sac.

This is why there are many different types, sizes and shapes of supports.

A Truss.

You see trusses lots of places, especially on bridges. This is a picture of a walkway with concrete supports. The zig-zag tubes along the side-wall are all welded to another tube just beneath the wall and one near the top of the wall. This arrangement

is called a truss. Trusses are very strong and can span fairly long distances. This, of course, is why you see them in bridges.

The travelway modular side-wall components also have trusses inside them to support the roadway between the structural supports.

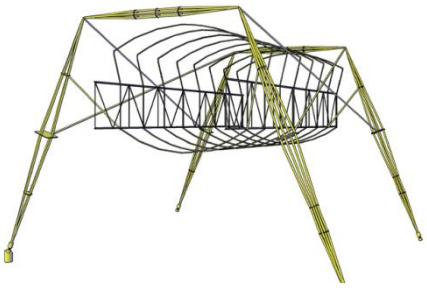
But, when the span has to be longer, like where the travelway crosses the ravine in the picture, the built-in truss is not enough. Here, you can see a hanging cable draped between the two supports on each side of the ravine. This, just like the Golden Gate Bridge, is a 'suspension cable' structure. This technique can support a bridge or our travelways when they have to span a river or a large interstate.

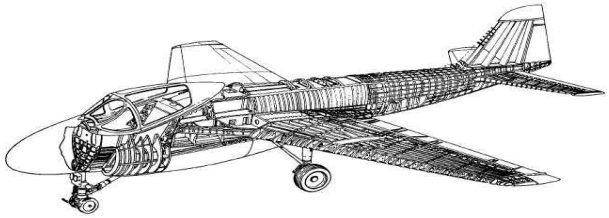
We use wood - good old-fashion, replenishable, readily available, inexpensive wood – for our travelways and most floor areas (although alternatives are available where needed, for traction or wet conditions, for example). So, I love these pictures of wooden bridges and their wooded trusses.

Notes:
1. Trusses come in many shapes and sizes. They don't have to be like the zig-zag frame.
2. Wooden roadways, like inside these covered bridges, will last many, many years – would you believe 100 yrs or more?

This shows an arch shaped wooden truss that is suitable for a 60,000 truck to cross.

The structural skeleton of our travelways includes a truss running down each side of the roadway and ribs tying the components together. This type of framework is similar to the semi-monocoque principal used in aircraft design – it is very strong, but lightweight.





The Materials

Too often, in my opinion, architects and engineers focus on designing a great facility or device without placing sufficient importance on boring subjects like 'Total Cost[10]', impact on the surrounding community, analysis of economic viability and potential problems.

Doesn't it seem to be the case that most techies want to use the best and most expensive materials for their projects? I used to work in computers; the computer guy always wanted the newest, fastest, largest…

I like very simple, low-cost, readily available and as green as possible materials. Wood flooring is perfect. It provides a fairly smooth surface, inexpensive, readily attainable in most places, is replenishable, easily repaired or replaced and – it will last 100 years or more.

This picture shows a wood walkway in Jacksonville, FL that is 25 years old. The top picture shows the wood exposed to the weather; the bottom picture is the same walkway under a bridge (covered).

When wood is covered, as it will be within the travelways, it will last much longer and does not have to be treated as in this covered bridge in Valley Forge, PA.

As of now, the basic materials are:

Material	Used For
Structural Steel Angles Steel Pipe Steel Plates , galvanized or painted	Inner skeleton, outer structural ribs, floor board support frame, structural supports and support feet
Wood, 2 x 6, rough sawn	Flooring
Sheet metal (steel), galvanized or painted	Roof, base and side walls
Tempered Glass	Windows Optionally for some side walls, colored
Steel Cable	Cross bracing, suspension cables on bridges
Nuts and bolts, steel	Framework fasteners
Special design screws, steel	Flooring fasteners

HVAC (Heating, Ventilation, Air Conditioning):

It may be appropriate to have heat and air conditioning in some of the people-spaces such as locker rooms and eating places; however, the operating costs , power consumption and general contradiction to the green and low-cost theme of "*Spaces for People*" precludes having climate control inside the travelways.

And, of course, where walkways connect to existing public or commercial buildings, there are doors or curtains since they are temperature controlled.

But, this is not a negative at all.

This picture is the main train station in Philadelphia, PA. As you can see, people wait on a platform that is wide open – open in summer, open in winter. I never found anyone that objected – after all, it is much better than being on the street.

As long as there is a roof to protect you from rain, and side walls to protect you from wind – and the 'wind chill' effect in winter, we are all just fine, with appropriate clothing, in the heat and in the cold.

So let's examine the different scenarios:

As regards ventilation and fresh air – no problem. Both sidewalls are lined with windows that open wide in warm weather but mostly closed in cold weather. [More about the windows below.] There are also vents for air circulation when the windows are closed. The windows and vents will provide plenty of fresh air, especially when you consider that the travelways are high – about 20 ft. on average which is like the upstairs of a home.

Now, let's consider heat. For those climates where it gets cold in winter, everyone now knows it's the 'wind chill' that is the worst. Inside the travelways, with the side windows closed, there is no wind; so, there is no 'wind chill' effect; except, from riding along on your bike.

However, when you expend energy you generate heat. Granted, you will have to wear gloves when it's really cold; but, with a jacket on you won't be cold while pedaling your bike.

There are infra-red heaters mounted on the ceiling at the rest stops. So, if you are commuting to work, for example, and you are riding an electric bike so you're not expending and energy and not generating any heat, you can pull into a rest stop and warm up – and, perhaps, make a new friend. This restaurant in Montreal, Canada uses infra-red heaters.

Now, let's consider air conditioning. For those climates where it gets hot, everyone knows about a fan. Moving air causes evaporation that cools. Evaporation, after all, is the principal that enables air conditioning to work.

And, whether you're riding an electric powered bike or pedaling a normal bike you are moving at 10 miles per hour or more. This usually keeps you relatively cool.

But, if it's really hot or you have been burning calories big-time or you just want to have some fun, there are misting stations every so often along the travelway. Just watch for the sign, pull over into the 'misting lane' and get misted. How easy is that? And, it puts just enough water on your skin and clothes to keep you cool as it evaporates while you ride on.

Windows

Run-away bike lane
The green chutes
Helical climbs
Recreational tracks

Shear Pin

Design Style:
art deco, contemporary, old fashioned, time-tested tasteful
Wooden Bridges

German article – voluntary sharing…?

Public vehicles

Other functions

Green materials. Why? Wonderful wood.
Windows
Framework

Making them ‘Cool’
Something for everyone: all ages, all types of people, all usage categories
Commercial connections

What about bike lanes, bike trails, bike-friendly cities?

The Specifications

Creative ideas evolve. Your initial vision is refined and updated as you think about it and analyze it – you great concept can be improved.

The initial concept was:

"There should be roadways exclusively for bicycles!"

And, they should be enclosed, so people can ride even if it's raining, or if it's snowing; and lit, so they can be used after dark.

Too many drivers hate bikers – we go too slow, and sometimes they have to slow down. After all, the roads really belong to – they were built for – them.

So, our roadways have to be separate. On our new roads, we will be King. Just like on our bike trails, "No Motor Vehicles Allowed!". Except, our new roads won't just follow an abandoned railroad track along the river, they will lead to anywhere and everywhere we want to go.

They should extend into all corners of the neighborhood. Then, people can use them without lugging their bikes to the entrance point – just like we have for our cars.

They should lead to wonderful spaces – coffee shops, candy stores, libraries, nice eating places and parks – and, they should lead to where we go on errands - convenience stores, the post office, hardware stores and the mall – and, they should be good for getting exercise, with hills, but only when you want hills.

Hey, we have to work. Our roadways would make it much easier to ride to work, too. Schoolbuses cost so much, kids are getting fat, the buses clog the roads and they burn an awful lot of diesel fuel. OK, our new roadways should have exits at the school. Why, can you imagine it, kids will be able to ride bikes to school just like we did when we were kids. They will get trim and fit instead of getting fat.

That means: our roadways have to be very safe!! How could we send kids off to school if a pervert might be hiding in the shadows? And, too, the same for the women – especially after dark. Being safe from getting hit by a car isn't enough. They have to be safe from strangers, too.

What will the cost? Who's going to pay for them?

Shucks, don't you ever have dreams? Can't you just imaging how neat they would be?

OK, I'll prove they won't cost anything! In fact, they will earn us money! Yes! Yes, they will provide what our society needs; they will reduce some of our societal problems; they will provide opportunities; they will be fun and cool. Everyone will love them…

Everyone? Uh Oh, not everyone rides a bike. Some people are very sophisticated, they like to be driven. Some people are old, some are handicapped, some are simply not into sweating. Really now, how can you ride a bike when you have to wear a dress to work? My idea of relaxing is to take a walk. I like roller-blading. Me, I'm a runner. My wife and I always go out together. And, I have two little kids – what about me? I'm supposed to carry two bags of groceries home on a bike? – give me a break.

The roadways have to be roadways 'for people'. For all the people. Young and old, jocks and the intellectuals, healthy and challenged, strong and the not-so-strong.

"I can just imagine, several young hoodlums running me off the road
– and, I won't be able to escape!"

How much did you say they would cost? And, who's going to pay? Now tell me, after we build them and no one uses them except vagrants and druggies, and they start to smell, and they are covered with vulgar graffiti, and vandals take the lights and the windows, and they become an eyesore – so tell me, how much will it cost to remove them and clean up the whole mess? "You're nothing but a do-gooder liberal!"

The network of roadways requires a state-of-the-art access control system. And, a security system. And, this is for certain, they have to be used, appreciated and valued by the majority of people within the community. Then, and only then, will they be protected and maintained and kept relevant.

When the specifications – the goals and requirements – for "Spaces for People" were drafted, I went through a thought process like this:

- If elevated roadways for bikes connecting spaces for people is such a good idea, why don't they already exist?
- First, of course, every idea has its time. Since the early '50s up until 1974 – nobody cared about bikes. This was when the OPEC oil embargo hit[Error! Bookmark not defined.]; transportation engineers suddenly went nuts over bikes, bike trails, bike lanes, bike facilities. But, two years later that was history and everyone went back to big cars. Today, there is a lot of buzz about alternative energy, global warming and oil dependency. This is good – this may be the time.
- Today, though, everyone is worried about excessive government spending, pork projects buried in legislation and roads or bridges to nowhere – i.e. wasteful spending, wasteful projects. If I proposed this idea, most people would immediately think: "Never! Another nut. Another fiasco that will cost us $billions then, if a few years, we'll be spending $billions more to tear them down." Clearly, the only way they would have a chance would be if millions of people could be convinced they were

needed and were cost effective – very must needed – have a very good cost/benefit ratio.

- There are two sides to having a good cost/benefit ratio: 1) They have to be low in cost 2) They have to provide a large benefit. The cost isn't too hard to calculate. The 'benefit', however, is very difficult. And, it has to be based on lots of assumptions and projections. In other words, even if the benefits are explained and calculated, most people will be very skeptical.
- I was confident there is a need, lots of needs that my *"Spaces for People"* could help satisfy. If one need, say reduce traffic congestion, could be helped and this would save X-dollars; and, another need, say reduce the amount schools have to spend on school buses would save Y-dollars; and, a third need like reducing healthcare costs would save Z-dollars; then, couldn't the total savings, X+Y+Z , be added together to calculate the 'total benefit'? And, there are lots of different costs; we need to consider 'total costs' that include the construction mess and disruption during construction and project delays and cost overruns.
- Maybe, but regardless of the benefits, the lower the cost, the higher the cost/benefit ratio would be. I have to make them as inexpensive as possible, even if they were not super elegant.

Evolution of the concept:

I like riding a bike, but our streets have become hostile environments for anyone riding a bike. And, it's not practical to ride a bike in bad weather, in winter or after dark.

Face it, our roads and highways are for cars and trucks. Riding a bike there makes you an undesirable; and, besides, you can get killed.

What we need are special roads just for bikes; bike trails are great! No cars allowed.

Problem is, how do you get to the bike trail? And, once you're there, where can you go?

There should be spaces just for people and other spaces for cars and trucks.

What are the ideal characteristics of such a facility?

- **Functionality.** They must operate smoothly and efficiently
- **Sustainability.** They must be readily adjusted to meet changing conditions, be easily upgraded, be well maintained, be safe, be immune to degradation
- **Low cost.** "*Spaces for People*" can be erected at a cost that compares with the cost of a traditional walking/biking trail; this is about $1/30^{th}$ the cost of building a highway.
- **Fast, low-cost planning.** A community can design and plan a "*Spaces for People*" network very quickly, with minimal cost and little risk of design flaws. The pre-

fabricated components will be shipped and assembled on-site by the manufacturer with no cost overruns or construction delays.

- **Non-intrusive during construction.** The network is assembled from small, lightweight sections. There is no need for excavation or heavy construction equipment. The assembly is carried out in a matter of days by small crane trucks similar to the electric company installing new power lines.
- **Non-intrusive after completion.** Since "*Spaces for People*" do not have to support heavy cars and trucks, they do not have massive concrete columns and steel beams. Instead, they are more like an airplane – very strong, sleek and lightweight.
- **Use of low-cost and green materials.** The travelways and floors are – would you believe – wood. Renewable and green wood. Below we will show you pictures and examples of wood walkways still in great condition after 150 or more years of use!
- **Suitable for all ages, all types of people and for all categories of use.** Bike trails are great for bikes, walkers and runners. Some are paved and serve handcycles and roller-bladers as well. And, they are great for children, seniors and everyone in between. "*Spaces for People*" travelways are just like that. But, there are two big differences: 1. "*Spaces for People*" are still great when it's raining, snowing or late at night. 2. "*Spaces for People*" travelways can lead you to where you want to go. When people bike for recreation they start – go – return to the starting point. The trail often run alongside a river, a converted rail line or through public lands. But for commuting to work or school or for going shopping we need a travelway that leads from our home to our work, school and shopping centers. That's what our travelways do – they provide mostly utility transportation during rush hours and they serve recreational uses evenings and weekends.
- **Require the minimum amount of land area.** A highway, a regional rail line or a bike trail require land. Land is a non-renewable and valuable resource. In urban areas it is often unavailable. When land is converted, that's it. The "*Spaces for People*" pass over existing streets, public parks, light industrial areas, along pipelines or along a riverbank. They are elevated; "*Spaces for People*" form a new layer, overtop of the cars and trucks and their roadways. When you are walking or riding a bike inside the "*Spaces for People*", you are "King-of-the-Road" riding on the balcony of your own penthouse looking down on those poor souls stuck in traffic, noise and diesel fumes on their streets below.
- **They must be comfortable, pleasant and 'cool' for the users.** A great deal of consideration has been given to making our "*Spaces for People*" functional, pleasant and a fun, 'cool' place to be. The design includes sophisticated computerized access control and security systems – so kids and women feel safe; entertainment systems; and, a world-wide social networking site – voice activated, so you can communicate with a 'friend' in Paris or Bangkok while you are both riding your bikes to/from school.
- **They must maximize usage.** "*Spaces for People*" incorporate many well-known attributes that will attract users. When it comes to cost justifying a public facility, the more people using it, the easier it is to justify and the more effort that will be expended to keep them well maintained and popular. These include: low fares, on-time performance, lots of entrance and exit points, being comfortable, etc.

This concept is, primarily, a public works facility – as big as the inter-state highway system. The political-will to make this happen can come only if it is seen as a cost-effective solution to current, widely-discussed and personally relevant societal problems.

Nonetheless, its *raisons d'être* are well known societal problems being addressed daily in the media; they are emphasized in the mission statements of many million-member non-profit organizations and they are stated goals of numerous government agencies in the U.S.A. and around the globe.

These *raisons d'être* include several significant societal problems – oil dependency, childhood obesity, rising healthcare costs, traffic congestion, pedestrian deaths and injuries and global warming are examples – which can be significantly improved by implementing the concept presented here.

In the pages that follow, we will demonstrate precisely which societal problems will be helped, illustrate exactly how this will occur; and, we will quantify the impact vs. various projected usage levels. In addition to combating societal problems, there are other benefits which will be addressed as well. Providing an alternative, safe route to school for children that will encourage them to become trim and fit instead of fat is one example. Providing an alternative personal transportation system for those who choose to use it is another. And, providing a community-wide recreational facility; one that is open 24 hours each day, 365 days per year is a third example.

We will show how each benefit – very disparate benefits – contributes to the total justification for moving forward. We will calculate the economic benefit of the projected reduction in traffic congestion, the economic benefit of reducing fossil fuel consumption, the economic benefit of enabling and encouraging many people to get more aerobic exercise, the economic benefit of reducing pedestrian death and injury, the economic benefit to commuters by enabling millions of them to ride a bike or an electric scooter or a Segway to work…

Clearly, the quantitative economic benefit is very dependent of the number of users – what percentage of people will actually use them and how often. Much of the disclosed designs are directed at maximizing usage.

As an example, they serve bicyclists, walkers, joggers as well as seniors and others choosing small electric or hydrogen powered vehicles. Safety has been a primary consideration – young children can safely ride a bike to school where the exit ramp is inside the school yard. Hand powered chairs are accommodated; and, small electric trams enable a driver to carry 4 to 6 elderly persons.

Most importantly, the travelways are 'Cool'! We refer to them as 'The Cool Tubes'; there are sophisticated access control, security and entertainment systems. Through the website, CoolTuber.org, users participate in a world-wide social networking system.

By keeping construction and operating costs very low, usage fees can be very low or even eliminated. By accommodating many different user profiles, the potential user pool is maximized. By having the facility open all hours and all weather conditions, users have more opportunity to use the facilities. By maximizing usage, the economic benefits are maximized. By providing several disparate benefits the total benefit value is maximized. By minimizing design, construction and operating costs, the cost/benefit ratio is optimized.

The concept of providing Spaces for People and a network of very safe, enclosed and elevated roadways connecting them is not new. The 'new' aspect of this concept is an extensive set of components and a route planning and assembly system which effect several critical advantages:

1. The spaces and travelways are very strong and lightweight – more like the body of an aircraft. They are not 'traditional construction' using steel and concrete which disrupts the nearby community for months or years during construction.
2. A section of roadway, suspended above an existing highway or along a railroad track or over a river bank, can be erected in a few days.
3. The cost is about $1/30^{th}$ the cost of constructing a highway.
4. The non-intrusive aspect of the design, as well as the low-cost aspects of the design enable and encourage a community to extend the roadway network into all corners of its territory.
5. Repairs, modifications and enhancements are extremely simple, quick and low in cost. For example, adding a spur into a corporate parking facility could be completed in two days with no disruption of routine traffic – either the bikes, handcycles and joggers using the elevated roadway or the motor vehicle traffic on the streets below.

The Spaces for People and interconnecting roadway networks are a bargain, they provide numerous benefits to a broad range of users as well as significantly combat several major societal problems.

Bibliography

CoolTubes.org
BetterTimes.cc

objectives

Must present 'The Case':

- To engineers representing government departments
- To general public
- To non-profit organizations
- To government agencies having related missions.
- To business partners
- To prospective customers

presentation

Write documents. Use as basis for presentations, leave as handouts:

A book – Complete and thorough analysis – parallel the website.
Audience #1 – For transportation engineers – technical, special jargon
Audience #2 – For potential investors – emphasize the economic possibilities
Audience #3 – For potential partners – emphasize technical details and world-wide potential
Audience #4 – For non-profits - Compile a list and slant each one to the particular interest

SLOGANS & QUOTES:

Disperse slogans and quotes (Susan Anthony) throughout the book.

PHOTOS:

Great photos would always be a plus.

NOVEL CONCEPTS:

To add spice, show 'Trams for Seniors', 'Package Carriers' and 'Taxis'.
Solar cells on roof, recharging electric bikes
Public bikes, bike parking facility

CoolTube.org website (screen shots at home, voice command while riding)

CYNICS & SKEPTICS:

FAQ. Present the most common negative comments and responses to them.

SUMMARY:

1. What are they.
   Exactly, what are Roadways for People?
   a. Summary.
   b. Your 'Experience' inside the tubes
   c. Environmentally friendly.
   d. Low tech is high tech. New materials, push buttons, screens… are new, nifty but not necessarily the best. Consider: sex, walking, biking… in the end, the wisest people, the wealthiest people often choose 'back to basics' concepts.
   e. The Concept Evolves – Roadways for People (This may personalize the book, people like to look behind the scenes. A history of how we got to where we are today)
   f. Kids. Kids are The Future of our Planet. How do they relate to kids? Give them a option – an option to be physically active, an option to save their planet, an option to always having to waste their lives sitting in traffic, an option to free their era from oil dependency, an option to save the planet…
   g. Social network – CoolTubes.org. Programs and projects. Lose weight programs, get fit programs, competition, meeting people…
   h. The ambience. The 'difficult to explain' general feeling when inside. The colors, lighting, sounds, smells, other people, activities… A coffee shop. A rest stop. A group meeting room…
   i. Your experience. People must imagine, visualize, anticipate their experience. Like planning a vacation or retirement or a new love…

      The experience is a combo of many factors.

      Consider the roads: rough roads, potholes, red lights, passing lanes, roadside litter, broken down vehicles, beautiful scenery, blinding sun, urban blight, bad neighborhoods, speed traps, fuel stops, flat tires, breakdowns, oncoming high beams,

      Consider the driving conditions: fog, rain, smeared wipers, ice on roads, snow, flooding, surface planning, debris on road, detours, construction, narrow lanes, cross winds, icy slopes, salting, dark stormy nights

      Consider the others on the road: school buses, rude drivers, gapers slowing traffic, ambulance sirens, animals darting out, children playing, bike riders on the shoulder, slow drivers, drivers on cell phones, drunk drivers, big rigs, salt spray, diesel fumes, lane drifters and weavers, aggressive or angry drivers, road rage,

Inside your domain, your 'casket of comfort', your 'shell of survival', your car: drink holders, sound system, windshield wipers, good brakes, fast acceleration, bright headlights, lights

Traffic rules: Stop signs, red lights, merging lanes, left lanes, pulling into traffic, speed traps, traffic tickets,

The objectives: Move fast, excitement of the race (passing, cutting in, choosing the fast lane, how fast, avoiding tickets, radar detectors, fastest route, shortest route, most scenic route, passing favorite stops (fuel, coffee, lunch), criticizing other drivers, criticizing roads, cops, big/little/slow/smoky cars, bitching about buses, big rigs, schoolbuses, trash collection, Sunday drivers…

Death and injury: Here are 25,000 kids (photo of concert, game) – this many die each year. Here are 500,000 people – this is how many are seriously injured.

The costs:

j. Reputation. What is said and thought about the tubes. The press, celebrities, web blogs, TV depictions…
k. Security.
l. Maintenance and cleanliness.
m. Regulations: The usage, ambience, experience, security and reputation all are dramatically affected by the rules and regulations.

2. Why build them? Summary of obvious and immediate benefits: People want options, people want recreation, people want to save money, people want to solve societal problems,
   a. Why use it? Why would people use it – consider different types of users
      - Commuters
      - School Children
      - Social (teens, young adults)
      - Family outings
      - Physical fitness
      - Evening and weekend recreation
      - Alternative transport – shopping, errands, visiting
      - Outings for fun. Coffee shop, sightseeing, socializing, being seen…
   b. Benefits for all layers of society
      - For people living in the community
      - For the community
      - For the country, when many communities have them
      - For the world, when many countries have them
   c. Benefits across several governmental departments. Thus, cost justification is shared by several mission.
   d. Consider non-profits – many have goals in line with the benefits provided.

3. What do they costs?

a. Summary – why costs are very low
b. Building the Tubes – This may get people's attention, this is something different, something quite creative!
c. Who will use them – how many will use them (heavy usage reduces costs per trip, increases benefits)
d. Summary – cost vs benefits

4. Summary conclusions
   a. Benefits are great
   b. Costs are low
   c. They are cool
   d. Need is strong
   e. Usage will be widespread

ROADWAYS FOR PEOPLE:

5. Complete description of Roadways for People.
   n. Physical description of the roadways
   o. Overcome deterrents to walking, biking, small vehicle use
   p. As relates to children
   q. As relates to utility transportation (commuting, shopping)
   r. As relates to recreation
   s. As relates to emergency transport

6. The concept of a set of components, as relates to:
   a. Cost
   b. Design and Implementation time
   c. Non-intrusive construction
   d. Flexibility – phased in construction, modifications, enhancements, maintenance
   e. Project delays and cost overruns

7. Usage projections:
   a. User types
   b. Usage frequency
   c. Numbers of trips

SOCIETAL BENEFITS:

8. Communities and nations have ongoing analysis, goals, objectives and plans for improvement – improving the quality of life, public health, public safety, public security… How do Roadways for People fit into such goals?
   - [Reduce the social problems, discussed below]
   - Provide more, easily accessible, safe, pleasant walkways through the community
   - Provide more, easily accessible recreational facilities – for pleasure
   - Provide more, easily accessible, low cost means for regular aerobic exercise, adults
   - Provide more, easily accessible, low cost means for regular aerobic exercise, school children
   - Children – safe routes to schools

- Have emergency transport alternatives available.
- Increase options for local, personal transport
- Reduce costs for local, personal transport
- Provide congestion free roads (faster, less stress, lower cost, reduced expense for commercial traffic)

REDUCE SOCIETAL PROBLEMS:

9. Communities and nations have ongoing analysis, goals, objectives and plans for reducing and preventing social problems which – detract from the quality of life, compromise public health, reduce public safety or security… How do Roadways for People fit into such goals?
   - Oil dependency
   - Cost of fossil fuel
   - Air pollution
   - Urban blight
   - Traffic congestion,
   - Sustainable mobility
   - Global Warming
   - Lack of aerobic exercise
   - Healthcare costs [overweight, lack of aerobic exercise, pedestrian injury]
   - Security [walking on dark, isolated roads, exposure to motor vehicles]

COST ANALYSIS:

10. Detailed cost analysis
    a. Pre fabricated modules
    b. Materials
    c. Construction
    d. Operation
    e. Upgrades
    f. Maintenance

COST VS BENEFIT ANALYSIS:

11. Given the costs. Given the benefits. Given the usage projections.
    a. Economic value to the individual users
    b. Economic value to the community
    c. Economic value to the schools
    d. Economic value to the non-profit organizations and their causes
    e. Economic value to the nation
    f. Economic value to the planet
    g.

VEHICLES:

- bikes
- electric bikes
- Segway
- electric scooters

- hydrogen scooters
- package taxis
- trams for seniors
- roller blades, in-line skates,

OTHER ITEMS:

12. Other considerations and possibilities
    a. Package delivery
    b. Solar Energy
    c. Employment, construction
    d. Employment, operation
    e. Employment, concessions
    f. Vehicle manufacturing
    g. Social networks
    h. Sustainable cities
    i. Sustainable mobility
    j. Global conflict
    k. Emergency Transport
    l. Carfree cities
    m. Runaway bike lane, at bottom of Green Chute, with sand-filled mat.

Bibliography:

- BikeTube/Documents/Walkways
- Winnipeg's *skywalk*, a network of enclosed pedestrian bridges and tunnels.
- Ville souterraine de Montréal
- Toronto PATH (underground)