



A Walk in the Park(*ing*)

Lessons in Parking
Structure
Sustainable Design

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INTERNATIONAL PARKING DESIGN
Architects | Engineering | Consulting

IPD



Agenda



- Parking Structure Design: Past and Present
- Motor Vehicles vs. "Green Philosophy"
- Integration of "Green Philosophy"
- Passive & Active strategies to create more "eco-friendly" parking facilities
- LEED & Parking Structures

Ultimate Goal: Design & Construction practices that significantly reduce negative impact on the environment



Parking Structures of the Past

- Inefficient forming systems
- High cement content in mix design (increase production)
- Inefficient use of energy (lighting/ventilation)
- Confusing circulation
- Oversized
- Utilitarian



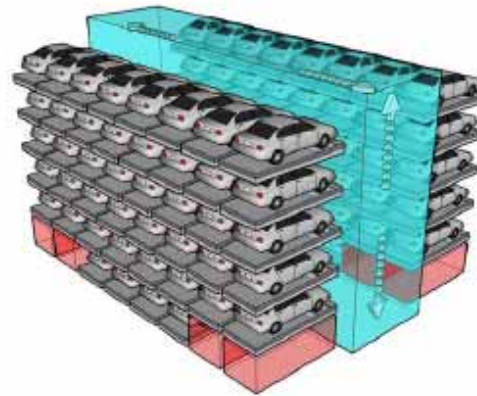
Modern Parking Structures

- Reusable forming systems
- Use of supplementary cementitious materials (Decrease cement content)
- More efficient use of energy (Lighting/Day lighting, natural ventilation)
- Clear Circulation, Status Boards (limit vehicles search)
- Minimize size
- User oriented, pleasant environment



Modern Parking Structures

- Mechanical Parking Systems
 - Less area/Small footprint
 - Preserves open space
 - Expedited construction
 - Can be relocated
 - Reduced lighting/HVAC



Motor Vehicles vs. "Green Philosophy"

- Sustainable philosophy promotes use of alternative transportation methods (public, bike, walk, etc.)



Motor Vehicles vs. "Green Philosophy"

- Personal vehicles remain a necessary evil for the foreseeable future



Integration of "Green Philosophy"

- Limit the need for use of personal vehicles and maximize availability and use of more eco-friendly methods of transport
- Current means of public transportation are often under utilized due to lack of parking



Integration of "Green Philosophy"

- Integration of other uses within parking structure (retail, related services, etc.)
 - Infrastructure
 - Location
 - Patrons
 - Parking





Integration of “Green Philosophy”

- Balance parking supply, don't build more than you need!
- Careful analysis of parking demand to include:
 - Proximity to public transport
 - Potential shared use
 - Carpooling incentives
 - Alternative period of use
 - User demographics



Passive & Active Strategies



Site Issues

- Previously Developed Sites
- Maximize Open Space
- Brownfield vs. Greenfield
- Heat Island Effect
- Light Pollution
- Opportunities with water

Previously Developed Sites

- Preferential consideration should be given to previously developed sites
- Make use of existing infrastructure
- Reduce Environmental Impact on:
 - Natural Resources
 - Natural Habitats



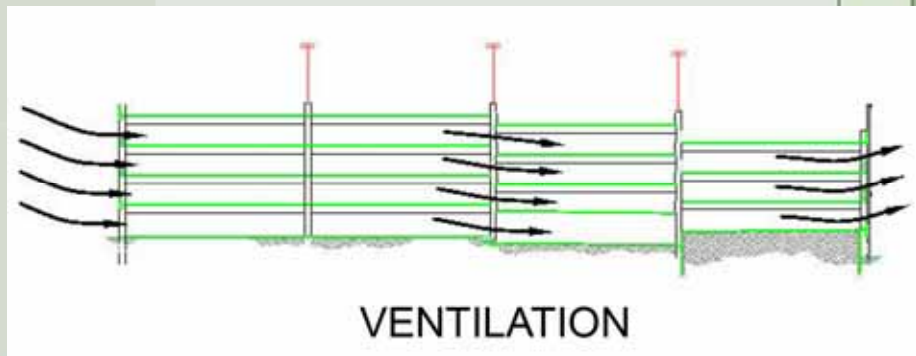
Maximize Open Space

- Minimize footprint of structure onsite
- Reduced footprint typically more resource efficient (can conflict with functional requirements of use)
- Provides more permeable area onsite
- Conservation of outdoor areas promoting biodiversity



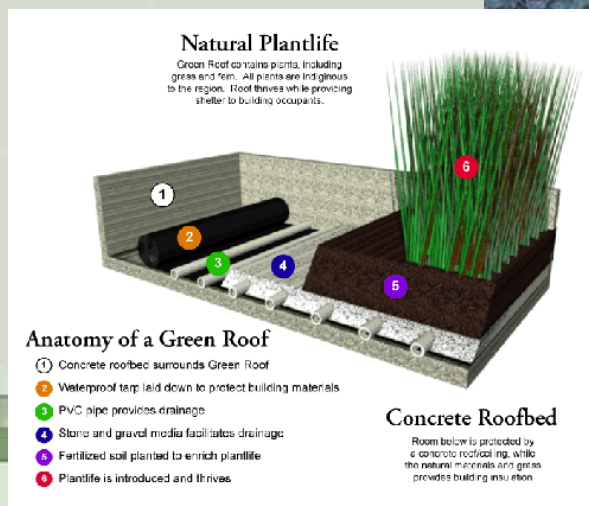
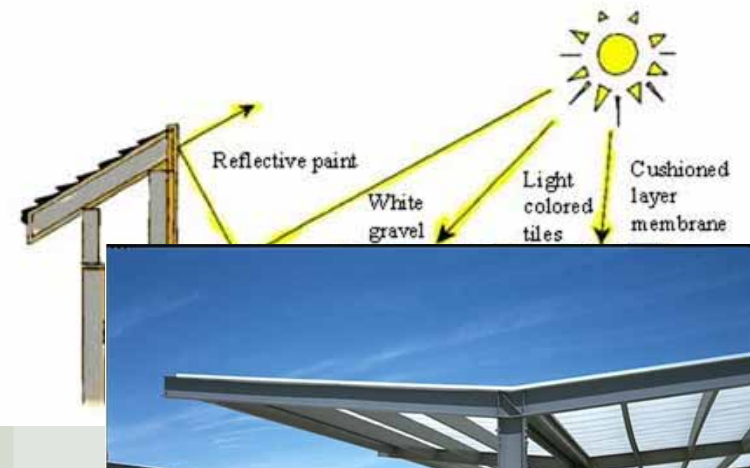
Brownfield vs. Greenfield

- Consideration should be given to Brownfield sites
- Rehabilitation of contaminated sites reduces pressure on undeveloped land
- Naturally open building type/less potential for build-up of contaminants
- Possibilities for less costly methods of site treatment



Heat Island Effect

- Dark surfaces absorb and radiate heat (including vehicles)
- Lighter surfaces reflect solar radiation
- Shade structures/trellises
- Planted roof deck



Light Pollution

- Address over-illumination
 - Improper design
 - Incorrect fixtures
- Detailed photometrics early in design
- Shield fixtures
- Minimize lighting levels during off hours



Opportunities with Water

- Limit disruption of natural hydrology
- Recycling Potential (Deck facilitates collection)
- Maximize Infiltration (Recharge ground water)
- Natural Filtration Methods (bio-swale, rain garden)
- Planted Roof Decks (filtration, collection)
- Minimize Water use
 - Implement dry sweep procedures
 - Low flow/No flow fixture
 - Indigenous plant material
 - Reclaimed water system, smart irrigation



Passive & Active Strategies



Energy Efficiency

- Lighting
- Ventilation
- On-site Renewable Energy
- Green Power

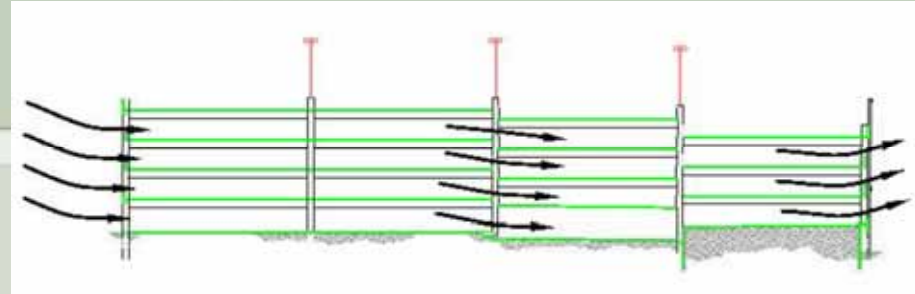
Lighting

- Analyze options for high performance lighting
- Maximize use of daylight
- Light dimming sensors and zoning



| LAMP TYPE | LAMP WATTS | TOTAL WATTS | LUMENS | EFFICACY LUMENS/WATTS | LIFETIME (HOURS) | MAINTAINED COLOR RENDITION INDEX (CRI) | COLOR TEMPERATURE IN KELVIN |
|----------------------|------------|-------------|--------|-----------------------|------------------|--|-----------------------------|
| Metal Halide | 100 | 130 | 6,500 | 50.0 | 17,000 | 40-70 (Fair) | 3,700 (Cold) |
| High Pressure Sodium | 100 | 130 | 7,500 | 57.7 | 24,000 | 20-30 (Poor) | 2,100 (Warm) |
| Induction | 85 | 85 | 4,800 | 56.5 | 60,000-100,000 | 70 | 4,100 |
| LED | 79 | 79 | 5,100 | 60.7 | 60,000-100,000 | 80 | 5,000 |
| T-8 Fluorescent | 32 x 3 | 90 | 3,050 | 101.7 | 30,000-48,000 | 85 | 3,000-5,000 |

Ventilation

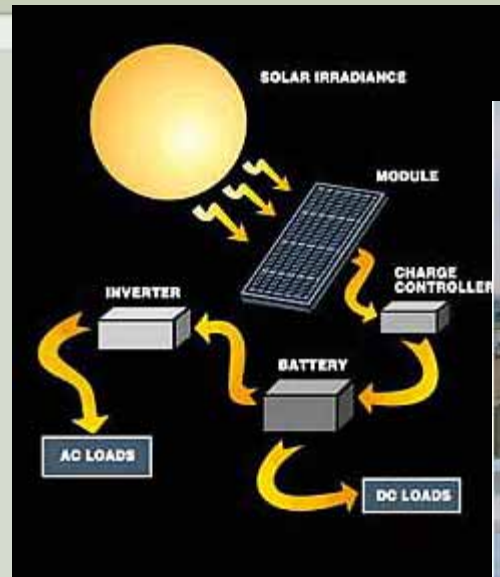


- Minimize / Eliminate Dependence on Mechanical Systems
 - Build above grade
 - Minimize perimeter obstructions
 - Use of area ways
 - Mechanically assisted



Onsite Renewable Energy

- Photovoltaics
- Wind Turbines



Green Power

- Use of renewable energy from utility companies
- Power Purchase Agreements



Passive & Active Strategies



Construction

- Recycled Material
- Material Re-Use
- Regional Material
- Finish Material
- Construction Waste Management
- Site Protection

Recycling

- Recycled Content
 - Supplementary Cementitious Material
 - Slag
 - Fly Ash
 - Silica Fume
 - Rebar / Steel
 - Concrete Aggregate
 - Glazing
 - Aluminum



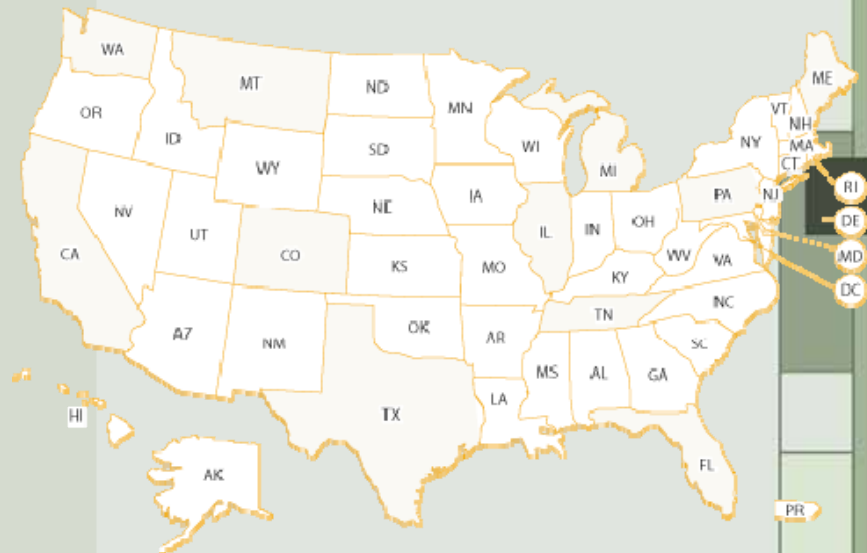
Material Re-Use

- Re-use of Materials / Components
 - Precast Panels
 - Glazing
 - Railing
 - Doors
 - Fixtures



Regional Materials


- Materials extracted, processed & manufactured locally
- Support local economy
- Reduce environmental impact
- Reduce transportation costs





Finish Material



- Non-Toxic Paints
 - Zero or low VOC (Volatile organic compounds)
 - Durable, cost effective and less harmful
 - Little or no hazardous fumes during application
 - Low VOC caulks, sealants, & adhesives
 - Product performance, adhesion & strength are equivalent to solvent based products
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Construction Waste Management



- Divert Construction Waste from landfill sites to Recycling facilities
 - Reducing contamination of groundwater
 - Reducing the need for new resources



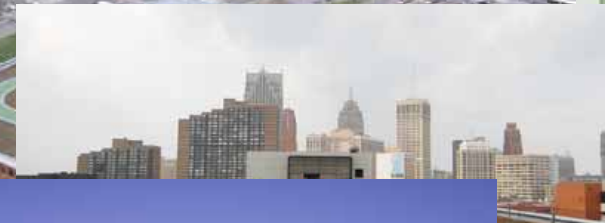
Site Protection

- Erosion Control
 - Prevents sedimentation of rivers, lakes & bodies of water
- Preserve native plant species & vegetation as much as possible beyond the footprint of the structure
- Minimize amount of particulate, chemical & biological contaminants on site during construction



LEED-Green Building Rating System

- LEED certification of stand alone parking structures currently not available
- Excellent guideline for design teams
- Adopted by many public agencies and educational facilities
- Becoming a standard in the design and construction industry



Conclusion

- Parking can co-exist successfully in a sustainable future
- Careful planning can provide parking facilities much more eco-friendly than in the past
- Questions

