Live And Let Live: Finding Common Ground between Emergency Safety Needs and Effective Storm Water Management

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Data SIO, NOAA, U.S. Navy, NGA, GEBCO
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Ventura County California

Aligning Land Use and Water Quality Protection in Ventura County

(A watershed plan)

http://water.lgc.org/ventura

"Within Ventura County, street and driveway design is highly influenced by the Ventura County Fire Protection District's Codes Standards and Ordinances…These standards do not support and very often preclude narrow streets, traffic calming, alternative paving and other elements of a "green/complete" streets program."

"Ventura County Fire Protection District's Codes and Ordinances limit paving materials to asphalt and concrete in travel lanes… Alternate surface pavers are allowed on a limited case by case basis only. It must be approved by the Fire Prevention Bureau and comply with all the requirements of this standard. No vegetation is allowed between pavers in driveways and turnarounds, though gravel and non-vegetative filler can be used.

"Materials shall be tested in accordance with the test methods required by the 'Standard Land Development Specifications,' as well as those supplementary test methods required by the DPW. …The significance is that as new technologies come on line, communities in Ventura County may find that the "Standard Land Development Specifications" limit alternative/permeable pavement options if test methods are not updated."

Davis, California
Village Homes

Data Collection Process

- Focus Group Interviews
- Telephone Interviews
- Face-to-Face Interviews
  - Formal
  - Ride along
  - Informal
  - Email Contact with European Fire Experts

Focus Group Interviews

Fire Marshals

City Engineers/Planners

Fire Marshal's Concerns

General Lack of Confidence in Alternative Storm Water Management Systems -

- Maneuverability
- Structural Support
- Maintenance of Infiltration Areas

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Limitation to Access Areas

Planners and City Engineers

Fire Fighters Often Block “Smart Growth” and So Call “Low Impact Development” Designs

Street Widths Are Often Decided on a Myriad of Issues and Concerns Concerning Access, Maneuverability, and Use

Face-To-Face Interviews

- Formal interview with former Fire Marshal and current member of the Governor's Green Building Task Force -
  - Invitation to Attend Regional Fire Fighter Conference
  - Provided Access to Other Fire Fighters
  - Ride Alongs to View Situations From Fire Fighters Perspective

Telephone Interviews

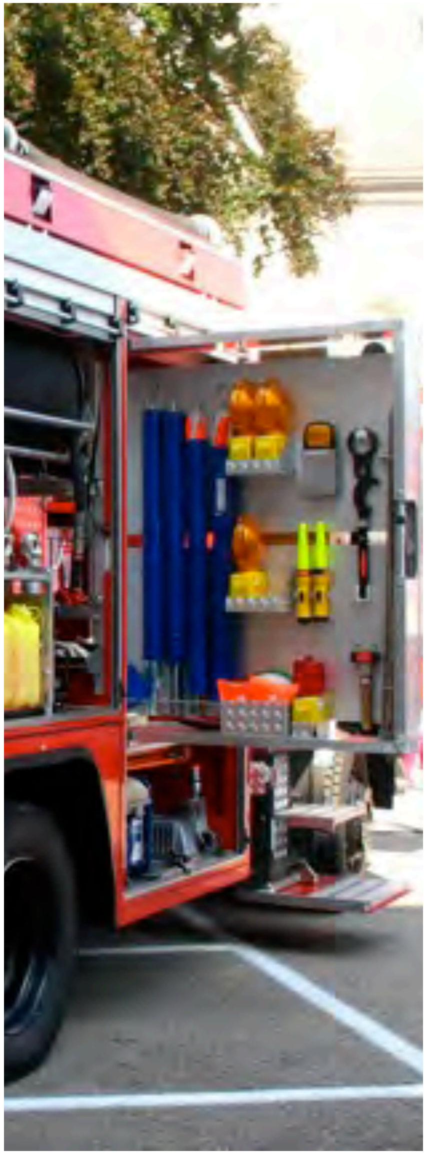
- GoodYear Tire Company
- American Concrete Pavement Association
- 7 Fire Apparatus Company's
- City Engineers & Planners

GoodYear Tire Company

- Most Common Tire Used on Fire Trucks/Engines
  - G286 12R22.5
  - Inflated to 90 psi
  - Average Surface Area of Tire Contact 95 in^2 (613 cm^2)
  - Maximum weight displacement for each is 357 psi

Pervious Concrete

- Can Develop Compressive Strength of 500-4,000 psi - Typical Values - 2,500 psi (7-Fold Safety Factor)
- General Rule - "6 in Pervious Pavement with 15-20% Void Space Can Handle Occasional Truck Traffic"



Fire Truck Size

Truck Size Dictated by Size of the Radiator - Clean Air Requirements

European Trucks Smaller to Accommodate Older Narrower Streets

Fire Truck Size

Location of the Pump is important - 30% reduction in energy from directly behind the engine to the rear of the truck - reduced pumping capacity.

European Fire Trucks typically pump 1600 liters/min (413 gal/min)

Minimum US Standard 1000 gal/min (3785 liters/min)

Conclusions

To address storm water runoff requirements and Emergency Services needs:

- Open and early dialog with ES providers
- Understand the issues and constraints other departments face
- Flexibly and an appreciation there is no one-size-fits-all solution

Deliverable - Six Page Factsheet

described as
“...the most equitable treatment of the topic I have seen to date."

- Davis CA Fire Chief

Emergency Services and Storm Water Management

Emergency Safety Needs

- Easy/quick access to buildings
- Maneuverability
- Structural integrity of access ways
- Quick access to hoses and equipment

Many communities are interested in

Environmental Impact of Storm Water and LID

Concerns of Emergency Service Professionals

http://www.csgc.ucsd.edu/BOOKSTORE/Resources/LID_FACTSHEET.pdf

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Narrow Streets

Reducing Fire Engine Size

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Narrow Streets

Reducing Fire Engine Size

Smaller Trucks

Innovative Neighborhood Design

Village Homes Community

To instill community character and minimize impervious cover, the streets are curvy, only 18–24 feet wide without on-street parking (off-street parking is allowed), and end in cul-de-sacs.

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Infiltration Systems

Benefits: Storm water infiltration, provides attractive green features.

Drawbacks: Maintenance requirement, need for structural support along the edges.

Landscape infiltration areas improve the aesthetics of a community and help slow traffic in residential areas. These areas usually are not a cause of major concern to ES providers as long as they are placed in areas away from the access lanes and intersections and conform to rules governing access way requirements. When located along street shoulders, they should be properly maintained and adequately marked with a defined edge, which allows inflow of storm water but provides a visual or structural traffic barrier. Some jurisdictions define the edge of the street with a mountable curb or concrete edge that clearly delineates the edge of the street. Installing easily recognizable demarcation or "access safe" signage, and incorporating this into ES training, may help lessen problems and win approval of these systems. Developing a universal standard that is incorporated into firefighter-training programs should be a part of alternative storm water implementation programs.

Weight Distribution of Emergency Vehicles on Porous Concrete

Porous concrete mixtures are suitable for a wide range of applications. Mixtures can develop compressive strength between 500–4,000 pounds per square inch (psi), with typical values of 2,500 psi. The general rule for porous pavement to handle occasional truck traffic is 6 inches of base (compacted to 95%) and 6 inches of concrete with an average pore space of 15–20%. Determining the support capability of any surface is based on the displacement of the weight over the surface area in direct contact with the vehicle tires. The contact surface area can vary by tire size, brand and inflation pressure. An example of the weight distribution of a fire engine in psi for a tire commonly found on fire engines is the Goodyear G286 12R22.5, inflated to 90 psi, the average surface area of tire contact is 95 in² (613 cm²)*. The weight displacement for each tire, if the maximum allowable load on a steering axle is 12,500 pounds or 357.14 psi, gives a 7-fold safety factor for a typical pervious concrete pavement rated at 2,500 psi.

Contact Information

Conclusions

Local jurisdictions face a difficult situation when addressing storm water runoff requirements and ES needs. The appropriate balance requires open and early dialog with local ES providers. It also requires all parties to have an understanding of the issues and concerns other departments face in meeting storm water reduction objectives. The information provided here may be helpful when finding resolution in roadway sizing, use of alternative surface materials and infiltration basins. There is no one-size-fits-all solution; it is up to each community to determine the best approach based on their individual circumstances.

References/Resources

Acknowledgements

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Think NEMO U ATE - Pacific Northwest* 2012

*Oregon is SOUTH of Washington