

Group 5 – Summary of Discussion

Permeable Pavement Workshop

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Planning



Planning

Question 70. Are there built in obstacles to permeable pavements in development codes or other policies and regulations? If yes, where? If yes, how can they be changed to get better results for their goals?



Planning

- There is institutional resistance, which is considered mostly due to lack of:
 - Knowledge of the technology
 - Prior experience
 - Information regarding field and long term performance
 - Design guides (that include design of ALL layers)
 - State or Agency policies for using permeable pavements
 - There is also the lack of guidance and initiatives on the federal side
- Other issues such as safety
- Permeable pavements are not included in the list of BMPs.



Planning

- There is no mandate or implementation plan for them. For example at Caltrans, the pavement engineer has the option of using them but is not the first choice as there is no mandate and other stormwater management options are more desirable as there is more experience with them and there is plenty of information for the maintenance phase.
- Even though developing maps seems like a attractive option, however, group members thought they are not very practical for this specific issue as green engineering challenges and solution are very site and context-sensitivie



Planning

- Maintenance team might also resist as there is not enough information available to them regarding the use stage and how their team will be affected. They have a say in the design process and that might also be an obstacle.
- Lack of knowledge can also result in misunderstanding and adopting open graded friction course (OGFC) design guide for designing permeable pavements



Planning

- Pilot study to show feasibility and better performance can help more adoption.
- “Every Day Counts” program at FHWA solicits inputs for BMP, permeable pavements could be promoted through that program as well.
- FHWA may also be to influence implementation through other routes; pushing for regulations similar to Clean Water Act.
- Need to get them in the standard list of treatments for local governments.



Education



Education and Training

Question 12. What is the best approach to get proper information into the hands of engineers (design, specifications, maintenance), owners (selection of contractors, maintenance, construction inspection, specifications), contractors (construction)? How to move a risk-averse engineer from no to yes?



Education and Training

- Who is avoiding use of permeable pavements? Owners or designers?
- In most cases, the owner is actually more risk-averse and avoids use of permeable pavements.
- Maintenance team and their concerns also play a role.
- The main goal is to address this risk-aversion.
- This requires information on performance and applicability.
- Again, lack of specifications and guidelines are also a major obstacle.



Education and Training

- In urban areas where design guides are available, higher management can be reason for vetoing projects.
- Furthermore, construction sequencing in urban areas is also a major issue.
- Having an implementation plan can be a significant help. Caltrans requires any specification to be accompanied with an implementation plan.
- Contractors training is also important.



Education and Training

- There are many entities and each have their own gaps. Need to have:
 - A governmental voice/push
 - Specifications
 - Implementation guidelines
 - Construction and maintenance training and guidelines, and more
- Help to identify all the industries involved and all the projects and knowledge materials available out there to put them in a clearing house for public access and sharing experience.
- A broader organization that provide the information on performance and background of projects is something that will be very helpful
- Add that to the training system of engineers (school curriculum)



Watershed and Flood Control Design



Watershed and Flood Control Design

Question 39. Are there good mechanistic watershed hydrological data/models/tools that can capture the effects of permeable pavements and multi-BMP systems including permeable pavements on flood control and groundwater replenishment? Are they well calibrated with field data?



Watershed and Flood Control Design

- No, there are no good models for every places.
- There are some specific models but even those are for small development and do not consider the impact on the watershed
- Nothing at federal level at this point



Watershed and Flood Control Design

- Multi BMP for site development is pretty rare
- There is a city wide hydraulic team is that is modeling the whole city. This is more common across other cities but the multi BMP is not that common:
 - SWIM, INFOWORKS are two models they use
 - Outfalls and discharge to the bay is what drive their goal



Watershed and Flood Control Design

- The hydraulic team is slowly putting information from site specific BMP information together to combine the data into a one holistic model for the city watershed modeling
- There is also this thing that hydraulic team goes with the conservative approach and disregarding the local BMPs and doing analysis



Watershed and Flood Control Design

- Ken's team have developed a spreadsheet based model: a multi bmp spreadsheet;
- With iterative design. Provides you with various performance data. Available to public.
- Specific to San Francisco and it is already in 5th edition and been calibrated.
- However, it is just for site modeling and does not include watershed modeling. For areas of 2-5 acres



Added Benefits



Added Benefits

- Aesthetics is the main issue in local areas that people care about
- Social aspect that is hard to quantify but will dramatically improve user experience
- Reducing urban heat island in a local scope not considering global issues
- Set a boundary that above that would reject the proposal; as the design details always get more complex



Added Benefits

- Need to reach out to actual users and follow up with them to see much benefit they have realized thru using the technology
- Downstream flood peaks
- Reduce size of infrastructure for stormwater,
- Enhanced ecosystems due to improved water quality,
- Free up land but not having to do ponds
- It will be project and local specific



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Added Benefits

- It will be project and local specific
- Will make the local environment richer
- Can improve public perception and urban feelings
- Ground water replenishment benefits
- Can be used as Irrigation water
- De-icing and safety benefits; specially for active transportation
- Enhanced vegetation and trees due to capturing storm water
- Enhanced local cooling effect



Free Topic – Implementation in Urban Areas



Free Topic – Implementation in Urban Areas

- Once you get passed 16 to 18 inch you will hit some sort of utilities.
- Storm water fee; waste water and storm water:
- In urban areas; the upper management is key
- What about a **hybrid design**; conventional design in the middle and permeable on the side.
- Cover the top with OGFC with slopes to the permeable sides.



Free Topic – Implementation in Urban Areas

- The other option might be to convey the water to somewhere else that can be infiltrated or an infiltration gallery.
- Put them in the list of standard treatments
- Unless you do centralized in urban areas, state domain have more potential for implementation.
- The issue for urban areas is that they are way more site specific that decisions made at Caltrans level.



Free Topic – Maintenance



Free Topic – Maintenance

- What are the maintenance requirements on porous pavements
- The biggest issue is clogging
- Caltrans experience the sweeping machine they used in Tahoe: were not very happy as sweeper needed more frequent maintenance
- Do we have to overdesign permeability to compensate for the maintenance efforts later on?



Free Topic – Maintenance

- That is why some believe that permeable concrete pavements are the best option. Especially porous concrete unit pavers in urban applications like in plazas.
- Utility repair and spot replacement is a big concern
- We do not have a universal maintenance guide



Free Topic – Maintenance

- There are concerns about maintenance:
 - costs
 - Uncertainties
 - the expertise needed to implement them
 - training of the maintenance unit
- Management will not initiate this process therefore it doesn't get implemented even though operators can figure it out in most cases of what the best practice is, if permission is given.
- Actual experience: about every 3 years we need to do maintenance; ponding water can be an indicator of the need for maintenance
- The set up of the instrumentation can be tricky and problematic
- How to determine if it is working or not; or for how long it will work?
- Every location is going to be different