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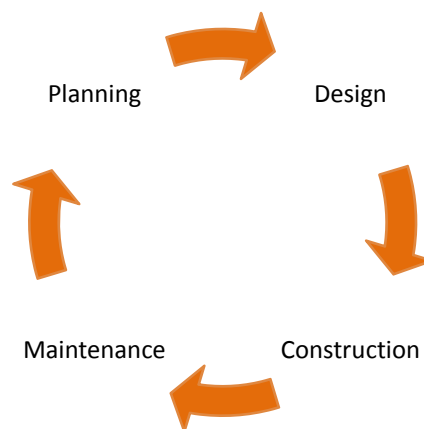
Questions

- How well do your drainage structures and drainage BMP's perform in the winter? Do they create icing problems?
- Do you have problems durability of road features related to winter maintenance operations?
- Do you have locations where designed features cause snow to accumulate on the road?
- Are there winter maintenance operational needs that could be provided for in the construction contract?



Goals of this Session

- Understand the design process and where the opportunities are for your input.
- How can you best communicate your needs to influence project design.
- Show the impact that design and construction of streets can have on the ability to perform winter maintenance
- Consider the impact that design details can have on safety and mobility during winter
- Discuss how design engineers and public works staff can work together to improve the maintainability of future designs





The highway rehabilitation process



Feasibility Study/Planning

Purpose – To establish a framework for bringing projects into a program.



Do you currently involve maintenance?



Phase 1 Preliminary Engineering

Purpose - To ensure that, as practical, highway locations and proposed designs are consistent with Federal, State, and local goals and objectives.



Phase 2 - Engineering/Design

Purpose – To prepare plans and specifications so that a contractor can bid a project.



ROW decisions, tree placements, grading, ditch slopes and set backs decisions can still be addressed.



Phase 3 - Construction

Purpose – Oversight of the contractor to assure that the project is built to the plans and specifications.



Typically this is where potential maintenance issues show up and it is too late to change them. Why?
Because typically this is the first time maintenance see the project!



(Phase 4) - Maintenance





What do you use to maintain your facilities???



Do the people designing/building your
roads know your needs???





How can you get involved in the design process???



Elements that improve winter maintainability of a design

- Give adequate clearance for winter maintenance equipment
- Design drainage systems that are maintainable in winter
- Provide dedicated, designed space for snow storage
- Specify winter durable and maintainable materials, fixtures and plantings
- Consider drift control in designs
- Consider operational needs



Clearances

- adequate pavement width
- adequate turning radius
- adequate lateral and vertical clearances
- keep fixed objects (signs, delineators, fire hydrants, control cabinets, utility pedestals, etc.) set back far enough to allow for winter maintenance operations







Winter 
Operations Conference

Designing Roadway Features to Simplify Winter Maintenance

Roundabout



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Wider Is Better



Curb damage on the left. Narrow and hard for equipment to navigate



Tapered Curbs – Larger Radius



Simplify Winter Maintenance

Courtesy; Regional Municipality of
Kitchener/Waterloo

Center for Technology & Training **MDOT** Michigan Tech

Designing Road

Photo Source:
Wisconsin DOT

Center for Technology & Training **MDOT** Michigan Tech



Split trail - Clearance for Equipment



- This bike trail is plowed with a jeep.
- Designers split the trail to avoid three leg power line tower
- Can't get the jeep through with a load of snow on the plow
- Have to return with a smaller piece to complete the job.



Clearance for Equipment



- right angled corner on urban bike trail
- impossible to maneuver the plow that is typically used on this two mile long trail
- Requires special equipment plus hand work

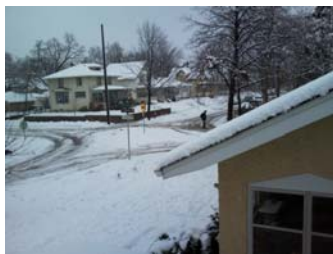


Clearance for Equipment

- Same trail -- exit point of the trail 50 yards after the 90 degree turn
- Designer required Bollards to be installed for “security reasons”
- Maintenance crews have to access the trail from a point much farther away in the other direction.
- Large snow events may cause expensive load-out operations due to lack of storage and poor access in the corridor.



Clearance for equipment



- cross streets was designated a “Bike Boulevard.”
- To accommodate bicyclists and neighborhood wishes, a “traffic diverter” was installed
- Designers asked maintenance about clearance for winter equipment
- Designed lanes for the bikes were not narrow enough to divert some drivers.
- Even a plow got stuck trying to sneak through!
- Intersection turned into an unintended roundabout



- Designers asked that the through lanes be reduced and posts be installed to mitigate the situation, photo shows the retrofit.
- Lesson?? –In this case the designer listened to the maintenance person to the extent that the design didn't function as intended. The correct answer is often a compromise between what the maintenance person wants and what the designer wants.



Drainage



Flooding/Icing/Closing/NIXLE



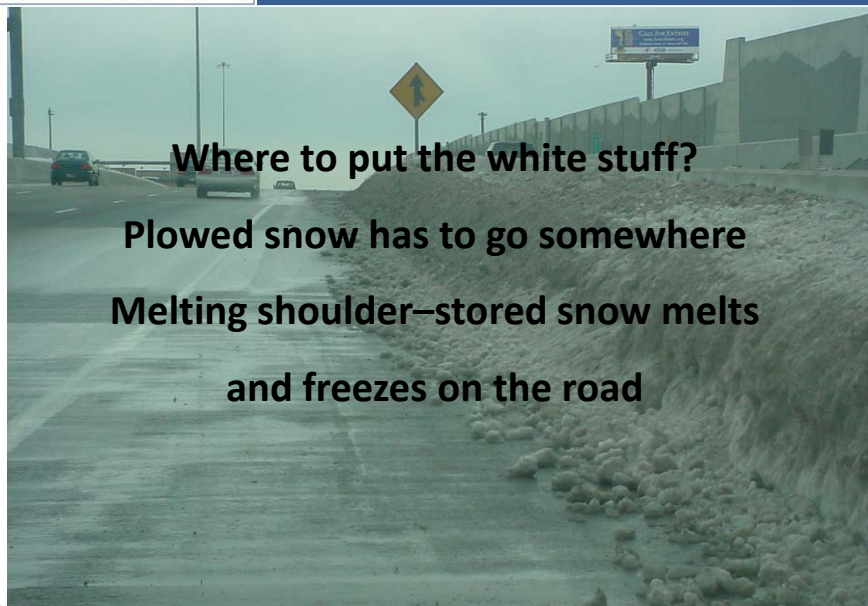
Storage





Storage

- Consider snow storage needs in planning the typical roadway cross section.
- Dedicate part of the pavement width or right of way width to snow storage
- Consider drainage and clearance issues in the design of snow storage





MICHIGAN **Winter** Operations Conference  *Designing Roadway Features to Simplify Winter Maintenance*

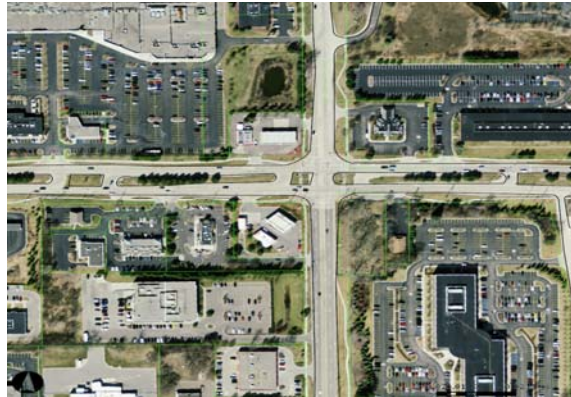
Where to put the white stuff?



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Michigan Left



Additional plow pass or equipment





Maneuverability - Narrow



Maneuverability – Additional Equip.





Impossible inside plow pass



½ mi Dead-end No Cul-de-sac





Efficiency & Snow Placement



Efficiency & Snow Placement





Large open Cul-de-sac



Materials







Recessed wet reflective pavement marking vs. conventional pavement marking



Asphalt Curb



Wind Problems

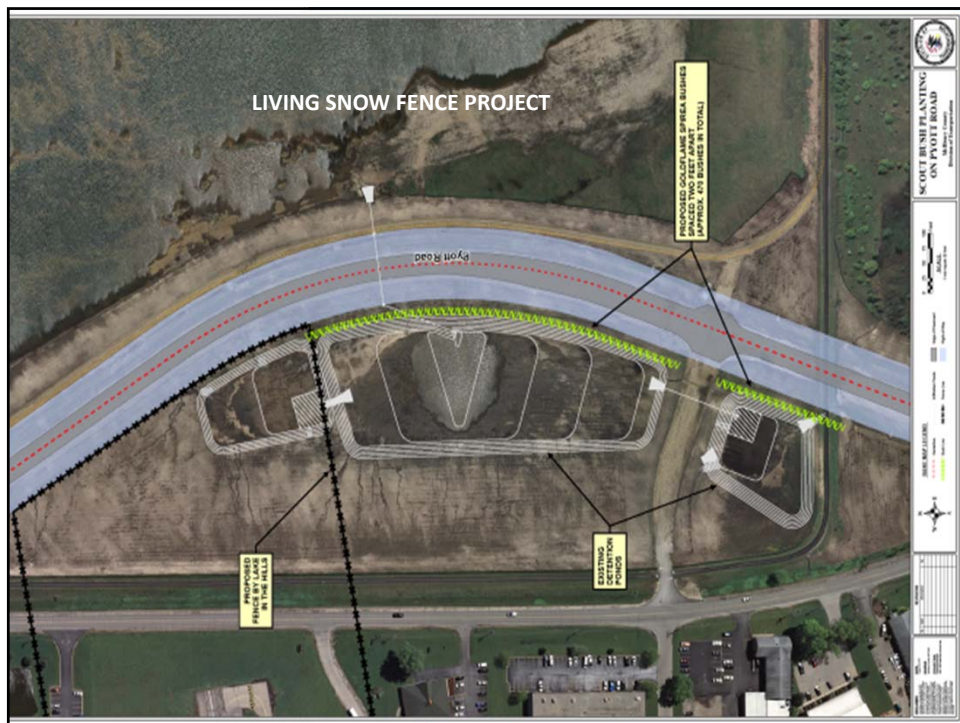
- Cut sections become drift traps
- Guardrail, sound walls and other structures can act like snow fences
- Transverse wind shear
- Stuck vehicles

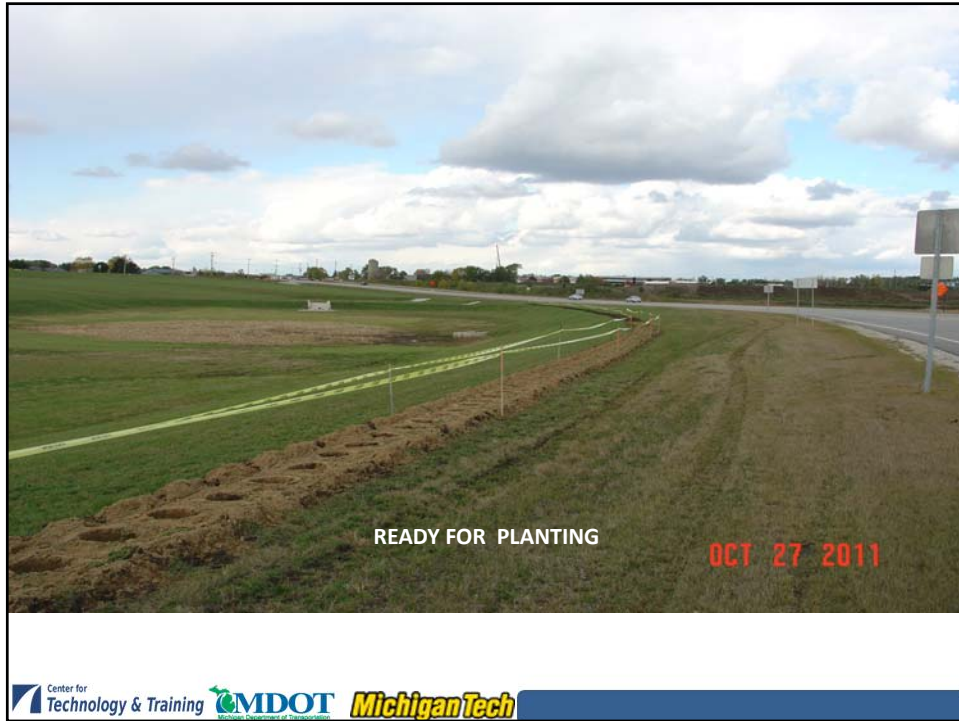
Countering Wind-blown Snow

- Raise grade above terrain
- Remove upwind obstructions
- Use snow fences, snow ridges, living snow fences trees,



South Dakota “Corn Row” snow fence

A wide-angle photograph of a snow fence in South Dakota. The fence is a long, straight line of snow-covered corn rows that stretches from the foreground into the distance. The snow is piled up on the left side of the rows, creating a series of small, repeating ridges. The corn plants are dry and brown, standing out against the white snow. The sky is a clear, pale blue with a few wispy clouds on the horizon. The overall scene is a typical winter landscape in a rural area.





Drifting and snow storage issues addressed in a project



From this to - this



Re-graded the entire intersection





Operations Considerations

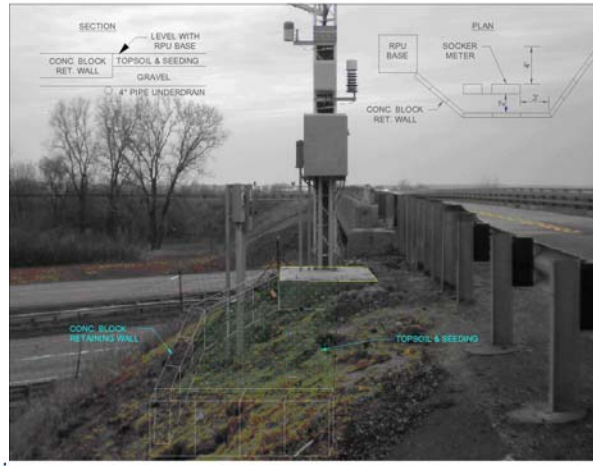
- **How can a facility be closed?**
- **Plow access around traffic jams**
- **Location of RWIS facilities**



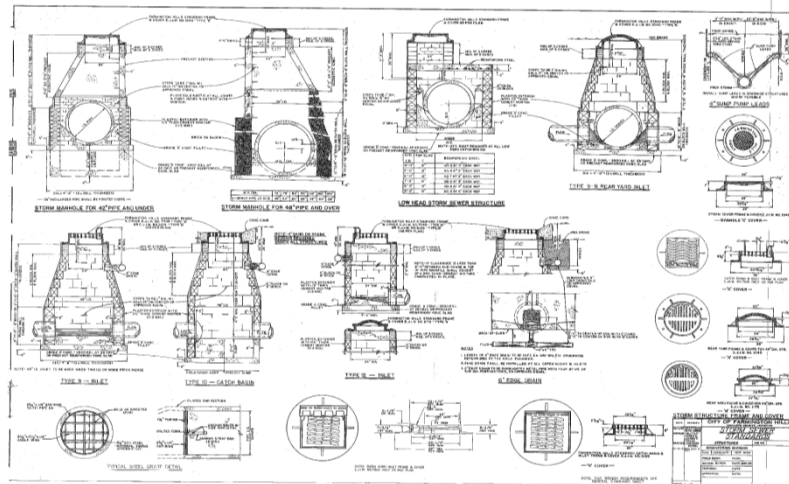
Tips to Consider

- Establish protocol to include maintenance staff with the very 1st discussions (feasibility study or EPE)
- Take the design engineers for a site visit/windshield survey.
- Put Directors, Engineers and Inspectors in plows
- Review and discuss standard details with the designers

Incorporation of RWIS units into design plans for projects



Standard Details that work





Summary

- Get involved in the process
- Know the decision makers and develop a relationship with them
- Identify opportunities for improvement
- COMMUNICATE!!!!!!



Questions and Discussion

