**A Solution to Road and Sidewalk Icing for Iowa State University**

**Introduction:**

*Purpose:*

This document proposes a solution to the winter-time problem of icy roads and sidewalks at Iowa State University. This problem is nearly ever present on campus between the first snows and spring thaw, and can cause tardiness, injury, and general inconvenience for student/staff/faculty, and liability and maintenance costs for the university.

*Background:*

The icy and otherwise slick conditions of the roads (including parking lots) and sidewalks on the Iowa State University (ISU) campus during the winter months cause a plethora of problems for both ISU affiliated people and for the university itself, ranging from being late to classes to injury and the resulting potential for a lawsuit against the university. From 2016 to 2018, ISU employees reported 80 falls related to snow or ice, and 79 of those falls resulted in an injury, including broken bones and concussions. It is a problem that will not disappear without intervention, that needs a general and specific solution, and the longer it exists the more chance there is for it to cause other problems; it should be taken care of soon, and totally.

ISU does not use salt in any comprehensive way to combat icing, preferring to use plowing and sand. Containers of a salt and sand mixture are placed in buildings across campus for employee use, but often remain unused.

To solve this problem, Calcium Magnesium Acetate (CMA), a deicing agent, should be spread on roads and sidewalks on campus. It is the best choice in regards to deicing capability, the local environment, campus infrastructure, and potentially but not definitively cost.

*Scope:*

This proposal addresses icing on the ISU campus’s roads and sidewalks, the same areas regularly addressed by the ISU snow removal team during the winter months. It does not pertain to any areas other than ISU roads and sidewalks, or anywhere off the ISU campus, meaning it does not account for grassy areas or the inside of buildings, beyond secondary effects from changes to the target areas listed.

This problem is an annual occurrence, and thus so is the solution. Equipment and supplies may be reused from year to year, but action will need to be taken yearly.

**Discussion:**

*Approach:*

This proposal suggests that ISU staff spread the CMA deicing agent on roads and sidewalks mixed with the sand that is already spread on these areas.

The trucks ISU uses to deice roads already have the equipment necessary to spread CMA, as it is the same equipment needed to spread sand or salt, the CMA need only be added to the sand that is currently spread.

ISU uses specialized snow removal machines to brush away snow from sidewalks, but does not have a comprehensive way to remove ice, instead relying on reactionary reporting and hand tools to remove ice from steps and sidewalks. Hand carts or attachments to the snow removal machines could be used to spread CMA on sidewalks.

*Result:*

If this proposal is adopted, ISU roads and sidewalks will be kept free of ice and snow, lowering the number of falls and related injuries, and the associated risk of lawsuits, decreasing tardiness of ISU students and employees, decreasing the amount of winter weather related maintenance ISU must perform.

*Statement of Work:*

To accomplish the result outlined above, the following tasks must be completed:

Task 1: Acquire the CMA deicing agent and desired spreading equipment; find desired seller(s), purchase, transport, and store. (5-10 days)

Task 2: When weather conditions demand, prepare CMA and sand mixture for use as needed; combine CMA and sand, distribute to trucks/spreaders. (Time may vary, 15 minutes per truck/spreader)

Task 3: Spread CMA and sand mixture. (6 hours)

**Resources:**

*Personnel:*

Short term: 1 or more ISU employees, up to an indeterminable amount; a desirable price and logistics scheme must be found for acquiring and preparing storage for the CMA. The ISU financial and acquisitions personnel will likely have to be notified of or involved in the purchasing of the CMA and equipment.

Long term: 59 ISU employees; 15 plow/CMA and sand distribution truck drivers, 22 sidewalk snow machine operators, 22 hand clearing and spreading staff.

All employees are already employed by ISU for snow removal; no additional personnel will be required.

*Facilities and Equipment:*

* A storage facility; the CMA must be kept dry and in a safe but truck accessible location. The same or a similar facility as is used for storing the sand is ideal.
* Trucks for clearing and spreading the CMA and sand mixture on roads; the same trucks currently used by ISU are ideal.
* Hand operated salt spreading equipment; for hand clearing and spreading staff to spread the CMA and sand mixture on sidewalks.

or

* Spreading equipment attached to the sidewalk snow machines; for the sidewalk snow machine operators to spread the CMA and sand mixture on sidewalks.

**Costs:**

*Fiscal:*

* Equipment (Spreaders for snow machines or hand spreaders); assuming all machines have spreaders attached, half of the hand clearing staff get spreaders, 22 machine spreaders at $350, 11 hand spreaders at $150 = $9350
* Supplies (CMA); 1 ton per spreading, 10 spreadings, $375 per ton = $3750 annually

One time purchase of estimated $9350, annual purchase of estimated $3750

*Time:*

The purchase of the CMA and spreading equipment can be done any time before the start of winter, though no more than two weeks, and as little as 5 days, should be sufficient to find a satisfactory seller(s). Preparation of equipment may take up to a half hour per snow machine, and an hour beforehand to learn how to attach, totaling 12 manhours. Training on how to spread should take no longer than a half hour for both snow machine operators and hand clearers, and can be done for each group and each staff member at once, totaling a half hour. All preparation and training can and should be done before winter starts.

Total time commitment: up to two weeks and 13 hours, non-consecutive.

**Conclusion:**

*Summary:*

This proposal will provide ISU with ice-free roads and sidewalks, by the best method available. By using a CMA and sand mixture, the most ‘pros’ of deicing products will be implemented and the most ‘cons’ avoided: CMA works are roughly the same rate as commercial road salts, does not wash away and so stays on applied surfaces longer, keeping them clear longer, does not harm plants or animals, and combined with salt provides added traction. Corrosive salt brine will be avoided, preserving infrastructure and decreasing the work needed to clean buildings. No extra infrastructure would be needed, beyond potentially a way to store CMA when not in use, and minimal equipment would be needed as most existing equipment would work with CMA. The time commitment, depending on time of adoption, is negligible at up to 2 weeks. The financial costs may reach up to $9350 at initiation, and $3750 annually. The risks to this proposal lie solely in the costs, as if it fails, the only negative effects would be the sunk costs, which would easily be absorbed by the university.

*Contact:*

For more information regarding this proposal, please contact Xander Cage, at [xXx@iastate.edu](mailto:xXx@iastate.edu), or 555-555-5555.