AASHTO Innovation Initiative

[Proposed] Nomination of Innovation Ready for Implementation

Sponsor

Nominations must be submitted by an AASHTO member DOT willing to help promote the innovation. If selected, the sponsoring DOT will be asked to promote the innovation to other states by participating on a Lead States Team supported by the AASHTO Innovation Initiative.

1. Sponsoring DOT (State): Utah

2. Name and Title: Brandon Burrows, Stormwater Program Specialist

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State: Utah

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Innovation Description (10 points)

The term “innovation” may include processes, products, techniques, procedures, and practices.

3. Name of the innovation:

Thermal Evaporators for Environmental Protection and Cost Savings

4. Please describe the innovation.

The Utah Department of Transportation (UDOT) is challenged with how to best manage the salty water produced from washing their snow removal equipment. Currently, the Department has retention ponds at many of their maintenance stations where this water is stored until it can be used for making brine to spread on the roads, evaporated, or pumped and hauled to a disposal site. The issue facing UDOT is that ponds may be unable to handle the amount of salty water that is produced and the water doesn't naturally evaporate quickly enough. This means that the pond water has the potential to run off of the site. This situation causes an illicit discharge, non-compliance with stormwater regulatory permits, and negatively impacts the local waterways.

The solution to overtopping ponds is installing thermal evaporators at central locations in UDOT regions. Thermal evaporators use natural gas to heat up and evaporate the water contained in the retention ponds at our maintenance stations to prevent overtopping into the environment.

5. What is the existing baseline practice that the innovation intends to replace/improve?

When a pond is in danger of overflowing, maintenance staff or contractors pump the water out of ponds and transport it to other ponds with room or to an approved off-site waste facility.

Another practice is using sprinklers to spray water into the air and onto the pavement to facilitate quicker evaporation of the pond water.

6. What problems associated with the baseline practice does the innovation propose to solve?

While the sprinkler method is a low cost solution that does work well in the warmer months, this method is ineffective in the colder months.

The method of pumping and transporting water can be very costly and during peak season there may not be ponds with available room to receive the water from an overflowing pond.

For an example of costs, the cost of having a contractor haul away and dispose of excess wash water at the West Jordan maintenance shed is approximately 45 cents per gallon. Using an estimated number of 18,000 gallons from one storm, the cost to haul away and dispose of the water would be $8,100. Using an average number of 15 storms per season, the cost per season would be $121,500. The evaporator would pay for itself in just over two seasons. In two seasons, $243,000 ($121,500 X 2) would have been spent to pump and haul the wash water, and the evaporator in two seasons would cost $279,400 ($220,000 initial cost + 2 X $29,700 in natural gas).

The cost for UDOT to haul to an approved waste disposal site from the West Jordan maintenance shed using internal tanker trucks is 26 cents per gallon. The cost to dispose of the wash water is 19.5 cents per gallon. This totals 45.5 cents per gallon, which is the more expensive of the two options for UDOT and doesn't take into consideration the time that UDOT would be losing that could have been spent on other essential tasks like plowing the roads.

Additionally, UDOT is able to create brine from the residual water that is generated from the evaporation process which saves on some of the costs of brine making.

7. Briefly describe the history of its development.

Consultant engineering teams and UDOT staff researched methods for controlling water levels in retention ponds that eliminated the risk of discharging the pond water to the environment or storm drain system. Working with design engineers and evaporator suppliers, it was determined that there was significant opportunity for efficiencies and cost savings if the evaporators were pursued for UDOT maintenance stations.

8. What resources—such as technical specifications, training materials, and user guides—have you developed to assist with the deployment effort? If appropriate, please attach or provide web links to reports, videos, photographs, diagrams, or other images illustrating the appearance or functionality of the innovation (if electronic, please provide a separate file). Please list your attachments or web links here.

UDOT was provided a manual of instruction for our specific evaporator model, specifications from the manufacturer, and internal UDOT SOPs for the evaporators are being created. As part of the implementation process, training was received from the evaporator manufacturer and in turn the UDOT stormwater team trained UDOT staff on evaporator operations.

Attach photographs, diagrams, or other images here. If images are of larger resolution size, please provide them as separate files.

State of Development (40 points)

Innovations must be successfully deployed in at least one State DOT. The AII selection process will favor innovations that have advanced beyond the research stage, at least to the pilot deployment stage, and preferably into routine use.

9. How ready is this innovation for implementation in an operational environment? Please select from the following options. Please describe.

☐ Prototype is fully functional and yet to be piloted

☐ Prototype has been piloted successfully in an operational environment

X Technology has been deployed multiple times in an operational environment

X Technology is ready for full-scale implementation

Currently, two evaporators have been installed inside constructed buildings and are operational. Three other evaporators are on hand and waiting for their storage buildings to be constructed. Once the buildings are complete at these additional locations, those evaporators will come online and will significantly aid in keeping UDOT ponds from overflowing.

10. What additional development is necessary to enable implementation of the innovation for routine use?

Completion of storage buildings and evaporator projects at the remaining three locations, which have already been designed. Initial and ongoing staff training will be necessary for the operation of the evaporators.

11. Are other organizations using, currently developing, or have they shown interest in this innovation or of similar technology?? ☐ Yes X No

If so, please list organization names and contacts. Please identify the source of this information.

Organization	Name	Phone	Email
Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.

Potential Payoff (30 points)

Payoff is defined as the combination of broad applicability and significant benefit or advantage over baseline practice .

12. How does the innovation meet customer or stakeholder needs in your State DOT or other organizations that have used it?

UDOT is required to comply with a Utah Pollutant Discharge Elimination System (UPDES) Municipal Separate Storm Sewer System (MS4) permit. In addition to the long-term cost savings and process efficiencies, these evaporators will assist UDOT in compliance with its MS4 permit by preventing washwater retention ponds from overflowing and harming the environment, storm drain system, and local waterways.

13. Identify the top three benefit types your DOT has realized from using this innovation. Describe the type and scale of benefits of using this innovation over baseline practice. Provide additional information, if available, using quantitative metrics, to describe the benefits.

Benefit Types	Please describe:
Cost Savings	See question 6.
Permit Compliance	See question 12.
Protection of Environment and Local Waterways	See Below

Protection of Environment and Local Waterways: Water in the retention ponds have contaminants from washing vehicles and equipment that can be harmful to water quality, vegetation, and local habitats. Thermal evaporators are the quickest and most efficient way to ensure that this water is disposed of properly and in a way that does not harm the local environment.

14 How broadly might this innovation be deployed for other applications in the transportation industry (including other disciplines of a DOT, other transportation modes, and private industry)?

Thermal evaporators have a variety of uses that include:

- Evaporating wastewater of many types such as parts washing, coolant wastewater, ink/paint wastewater, and plating rinse wastewater.
- Locations in sensitive environments such as protected watersheds that have zero discharge requirements.

Market Readiness (20 points)

The AII selection process will favor innovations that can be adopted with a reasonable amount of effort and cost, commensurate with the payoff potential.

15. What specific actions would another organization need to take along each of the following dimensions to adopt this innovation?

Check boxes that apply	Dimensions	Please describe:
X	Gaining executive leadership support	Gaining executive leadership support facilitates the funding needs as well as organization changes that need to occur for continued operation.
X	Communicating benefits	Benefits of the evaporators should be understood by all staff involved so that they will support the project and buy-in to the purpose.
X	Overcoming funding constraints	Achieving funding is crucial to project success as start-up costs are high, but there will also be ongoing operational expenses.
X	Acquiring in-house capabilities	Staff at maintenance stations or other evaporator sites will need to be trained to operate and maintain the evaporators.

16. Please provide details of cost, effort, and length of time expended to deploy the innovation in your organization.

Cost: See question 6.

Level of Effort: These evaporators were installed as part of a construction project that involved staff at all levels and in several divisions of UDOT. The evaporator and its buildings require engineers to design the site plans and for staff to pursue and manage a full-scale construction process.

Time: The time period from initial research to completion of a fully operational evaporator was about 2 years.

17. To what extent might implementation of this innovation require the involvement of third parties, including vendors, contractors, and consultants? If so, please describe. List the type of expertise required for implementation.

Engineers assisted the project with:

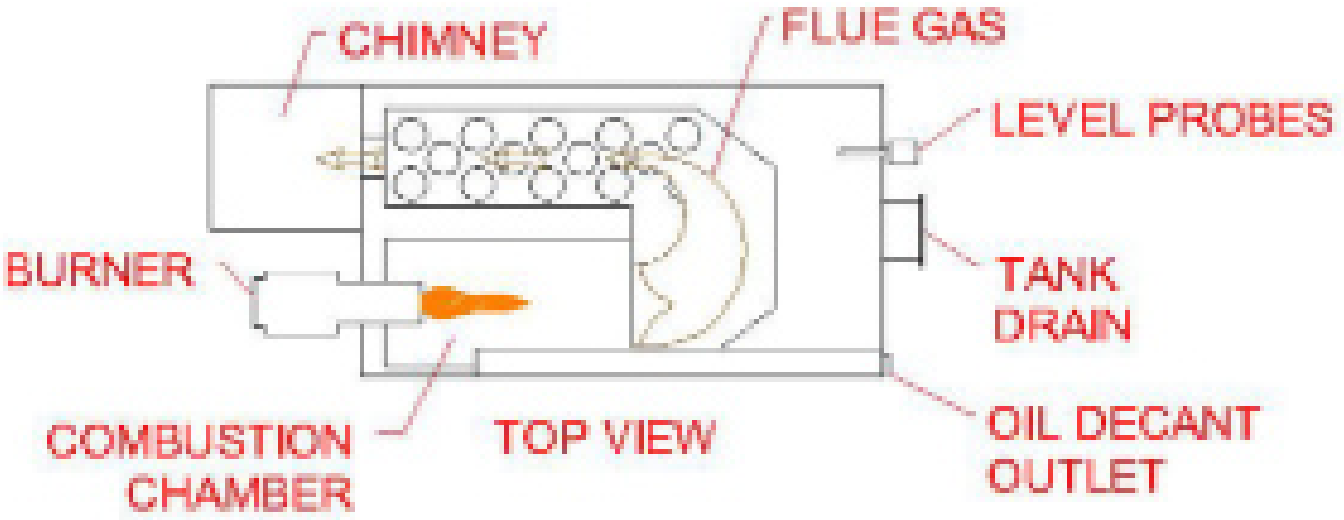
- Researching evaporators and preparing a proposal
- Designing evaporator building plans
- Providing construction management and installation oversight

Contractors:

- Built the evaporator building and installed the evaporator to manufacturer specifications

Evaporator manufacturer:

- Provided technical support
- Provided technical materials to support the operation of the evaporator
- Trained UDOT staff on evaporator operation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TOP VIEW
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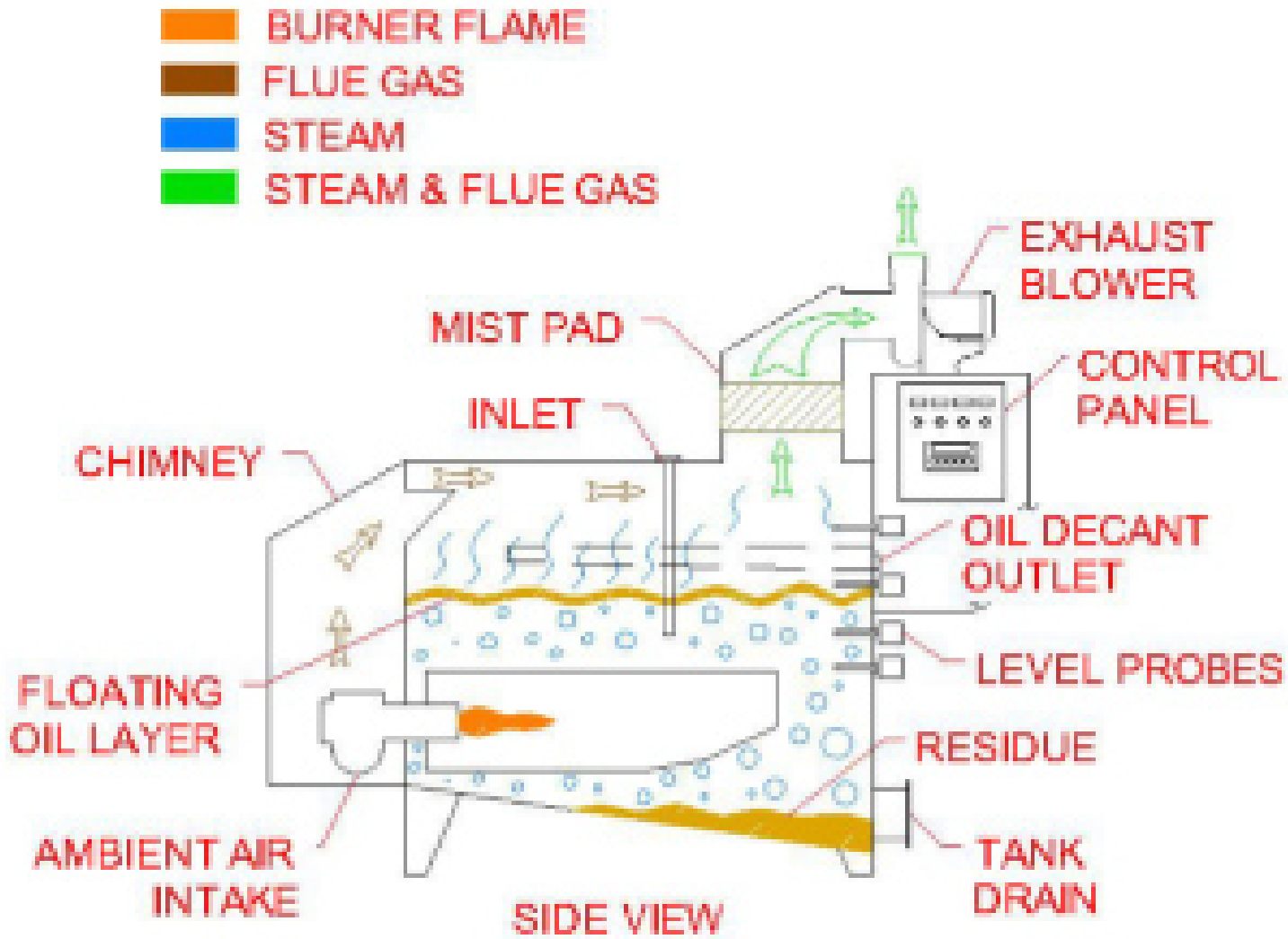
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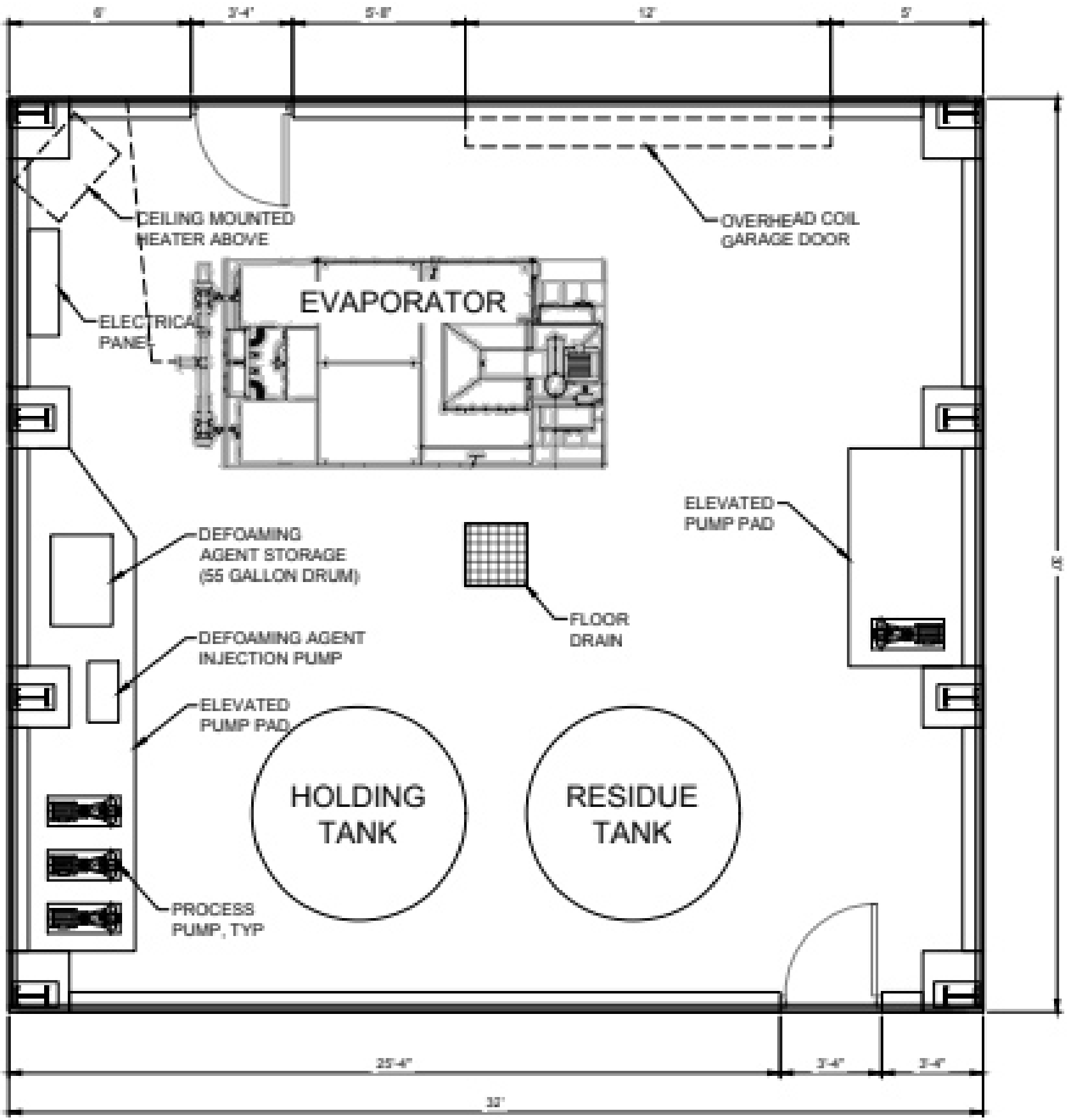

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EVAPORATOR BUILDING CONCEPTUAL PLAN

SCALE: 1" = 4'

Evaporation System
Exhausts Clean Water Vapor


Effinity


CORNELL
Innovative door solutions