

# **CLOUD ARBOR**

**By Ned Kahn**

Revisiting the steam vortex concept that I originally floated, I tried to think of a way to use fog/steam/mist without creating something solid like the glass building I originally proposed. There is already so much solid-looking architecture surrounding the site. I started thinking about the opposite, something that would maybe suggest the ghost of a building but would dematerialize and dissolve into the landscape and the atmosphere. The result of this thought process was the following concept:

A grid of 64 tall slender metal poles (3" diameter tubes, 32' tall, on 4' centers). The poles have fog nozzles located to trace out the volume of a sphere embedded inside the cube formed by the grid of poles. The nozzles would be aimed in a spiral pattern to create the impression that the embedded sphere of fog was slowly spinning. We can use heat trace to prevent freezing of the lines. People will be able to enter this forest of poles and have a rewarding experience, with a dramatic visual, olfactory and acoustic experience (the mist smells like rain and makes a gentle hissing sound that covers traffic noise). Sunlight passing through the forest of poles would get broken into an ever-changing array of parallel planes of light and shadow whose volumes will be revealed by the fog. An array of LED spotlights in the paving below the fog will illuminate the fog at night and on dark days.

When the wind conditions are calm, the fog nozzles will sculpt a perfect spherical cloud, spinning and rising in the winter and spinning and falling in the summer. As the wind picks up, the spherical shape will be distorted. Our intent is to create a porous environment that merges with the atmosphere in the same way that the Articulated Cloud building facade art work blurs the boundary between atmosphere and architecture.

## **Objective:**

- To generate a fog cloud in the shape of a 22 foot diameter ball. See attached drawings.
- The fog cloud should be made in as many weather conditions as possible. Ideally for all four seasons.
- The fog cloud should be generated for approximately 3 to 5 minutes and paused for 10 to 12 minutes. There will be a means of controlling these durations (control system on pumps accessible via the internet).
- The fog nozzles set 6 inches apart will be housed in 24 of 64 stainless steel poles.
- The stainless steel poles are to be:
  - 3 inches in diameter (as small as possible and have enough strength to withstand strong winds and still be large enough to contain the fog/mist piping, heat trace and insulation.)
  - 32 feet tall
  - Set 48 inches on center.
  - Form a grid 28 feet by 28 feet.
- The system wants to be as low maintenance as possible.

## **Site parameters:**

- Allegheny Square Park in front of the Children's Museum of Pittsburgh PA
- Weather      Ambient Temp. 0 F to 90 F degrees
- Humidity 10% to 95%

### **Conceptual Construction Details:**

- A small storage / maintenance room is required for the pumps with water and electrical service for the system. The building can be above or below ground. If below ground, the building requires a regular door, so stairs would be required.
- City of Pittsburgh water is available nearby.
- Electrical is available nearby.
- The fog pipe with tees for the nozzles will be tightly bundled together with heat trace.
- The fog pipe and heat trace will be inserted into the stainless steel poles.
- The fog nozzle tees will be aligned with holes in the stainless steel poles. This should hold the pipe and heat trace away from the stainless steel pole walls.
- The void will then be filled with insulating foam.
- A stainless steel cap will be fixed to the top of the pole. This should appear as minimal as possible.
- The pole will have a hole in its side at the base to allow the fog pipe and heat trace connections outside the pole. These connections will be below ground once installed.
- The pole will have a setting/leveling mounting collar at its base. This mounting collar will have curved slots to allow for fine tuning the leveling and orientation (rotation) of each pole.
- A pole receptacle and leveling bolts will be set in concrete to receive the assembled poles. (see the attached Base of Column Detail – Ned Kahn 9/10/08)
- The pumps and other equipment will be located in a Mechanical/Storage Building - somewhere in the park.
- Two underground pipes carrying water from the pump room will be extended to a “manifold” located in a small manhole near the Cloud Arbor. This small manhole can be located under a removable section of paving or in the landscape.
- The water is then distributed via the manifold to 6 individual lines that run from the manifold to a set of four fog poles each (one line will send water up four of the poles). A total of 24 poles will carry water to create the fog sphere.

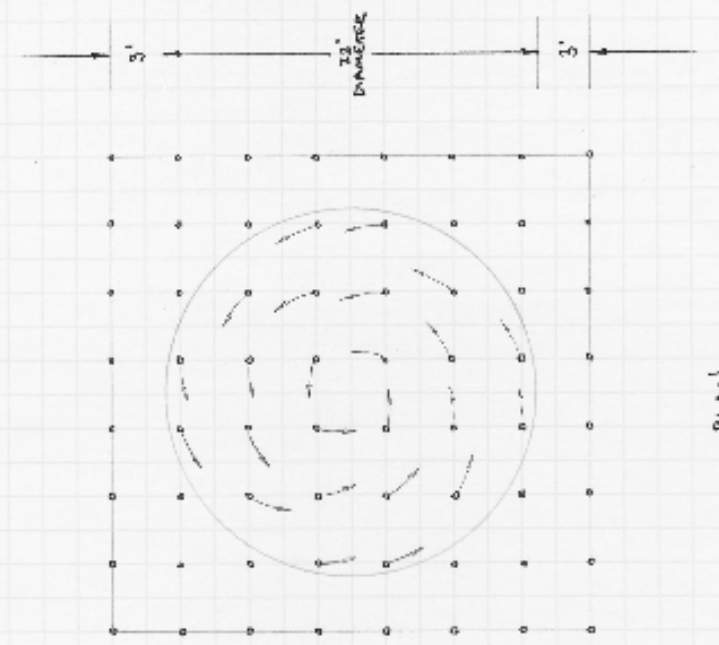
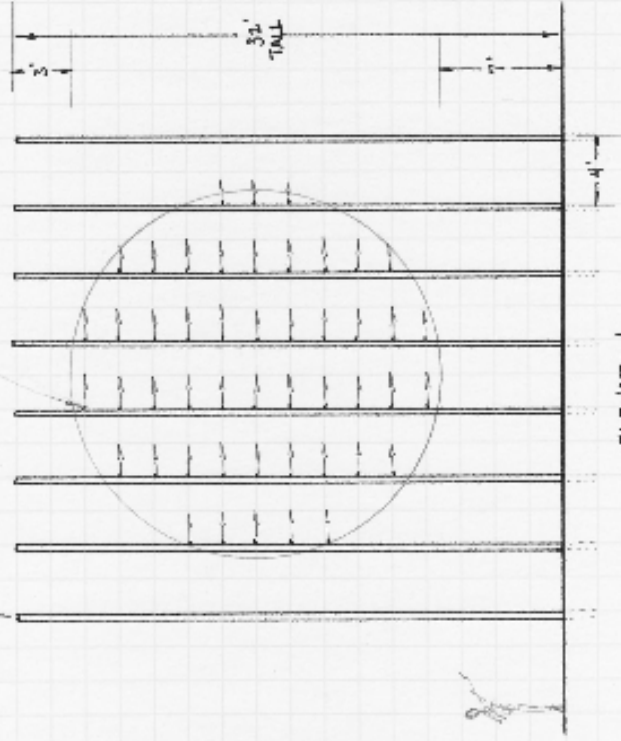
### **Design & Manufacturing:**

- The Local Engineering Firm will design the poles, including the structural foundation, mounting, insulation systems.
- The Local Engineering Firm will design the heat trace system including the required electrical and connections.
- The Local Engineering Firm will design utilities to support the Fog System which will be - Either 230 volt single phase or 460 volt three phase and water supply. Depending on the final pump specified.
- The Local Engineering Firm will design the required piping from the Mechanical/Storage Building to the manifold and the small manhole which will contain the manifold.
- The assembly described above will be manufactured off site by the Fog Design Contractor who will also design and supply the water filtration system, pumps, pipes and nozzles for the fog system.
- If a weather sensor should be needed to improve the performance of the system it will be designed and provided by the Fog Design/Contractor.
- There will be 15% extra nozzles for normal maintenance provided by the Fog Design/Contractor.

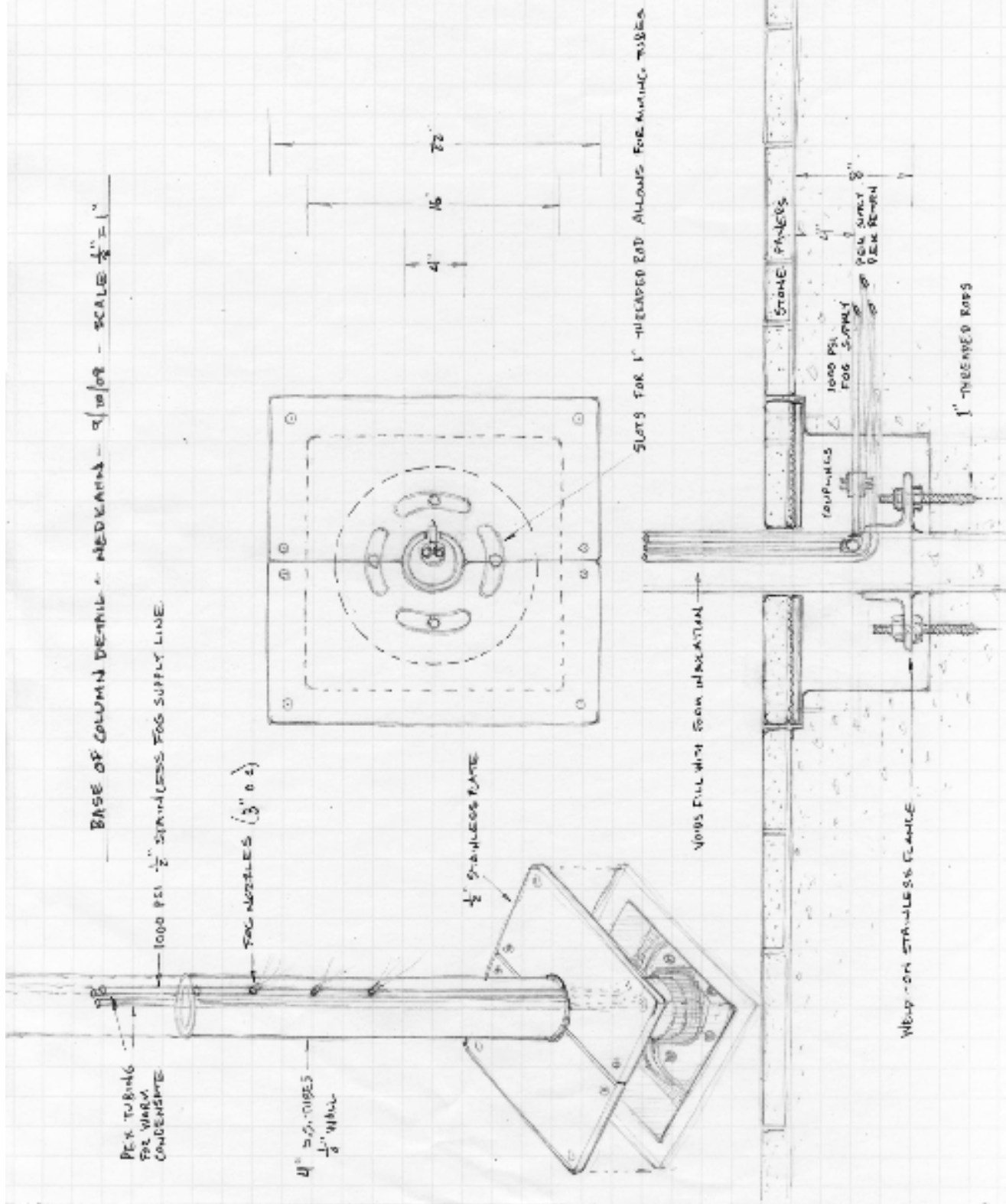
INDUCTIVE COUP - REVISED 9/20/09 - NEW PLAN

3"  $\phi$  STEEL-LESS ROLES

100 NOZZLES ON 3" CENTERS



BASE OF COLUMN DETAIL - MEDKAMA - 9/10/08 - SCALE 1/8" = 1"



PEX TUBING FOR WARM CONDENSATE

1000 PSI 1/2" STAINLESS FOG SUPPLY LINE

FOG NOZZLES (3" O.D.)

4" DIA. HOLES 1/2" THICK

1/2" STAINLESS PLATE

4" 16" 72"

SLOTS FOR 1" THREADED ROD ALLOWS FOR MOVING TUBES

VOIDS FILL WITH FOAM INSULATION

STONE PANELS

1000 PSI FOG SUPPLY

1" THREADED ROD

WELD ON STAINLESS FLANGE

1" THREADED ROD