AMN info about piping

- The following guide can be used in a lot of situations.
- Ask if you have any questions and AMN Misting will guide you.

Placement of nozzles

- If you have air inlet or fans the most optimal nozzle placement is at the top of the air inlet/fan.
  - Beware of the fact that too cold air (freezing temp.) from inlets in the winter can cause damage to pipe system and nozzles
- Without external air flow, use small nozzles (max. 0,2 mm) and use interval operation.
  - Operation range: ON period - 5 to 10 sec. (no water on the floor). The ON-period depends on the height of the nozzle and the misting level (temp. and humidity).
  - OFF time is variable.
- Placing nozzles at both stainless and polymer-pipe.
  - When you have mounted the complete pipeline, you start mounting the nozzles.
  - Nozzles are typically mounted at an angle upwards at approx. 20 degrees, but this is very individual. Avoid that “water mist" hits the ceiling, beams, lights etc., as it may cause local water drips.

How much water for cooling and humidifying

Illustrative examples:

Relative humidity changes from 30% Rh to 75% Rh.

Outside temp	Cool down to inside temp	gram of water / m^3 air
15 degrees	9,2 degrees	2,8 gram
20 degrees	13,1 degrees	3,3 gram
25 degrees	16,9 degrees	3,7 gram
30 degrees	20,7 degrees	4,0 gram
35 degrees	24,6 degrees	4,5 gram
40 degrees	28,4 degrees	5,1 gram

- In general: Calculate 2,5 gram water / m^3 air
- In warm and dry countries/environments: Calculate 5 gram water / m^3 air

Length expansion of pipes

- Steel pipe about 0,01 mm / meter / 30°C
- Polymer pipe about 0,1 mm / meter / 30°C
  - Indicative length changes:
    - 100 meter of steel pipe 100 and 30°C temperature difference

    => Length differ 30 mm (lock on the middle => +/- 7,5 mm at each end)
    - 33 meter of polymer pipe and 30°C temperature difference

    => Length differ 100 mm (lock on the middle => +/- 25 mm at each end)

- If the pipe-system is mounted in cold conditions the tolerance will only be **+ PLUS.**
  Mounted in hot conditions only **– MINUS** tolerance.

Pressure loss in pipes

- SS steel pipe, inside diameter Ø10,8 mm
  - Without consumption: 500 liter/h gives a pressure drop of 0,3 bar / 10 meter
  - With consumption: 500 liter/h gives a pressure drop of 0,1 bar / 10 meter
    - Example: 1000 l/h feed pipe, 100 meter long => pressure drop of 9,9 bar.
- Polymer pipe, inside diameter Ø6 mm
  - Without consumption: 500 liter/h gives a pressure drop of 4,8 bar / 10 meter
  - With consumption: 500 liter/h gives a pressure drop of 1,9 bar / 10 meter
    - Example: 250 l/h pipe with consumption, 100 meter long => pressure drop of 14,2 bar.

- Pipeline with consumption (nozzles) and pressure drop of up to 10 bar in the pipeline, only reduces the performance of nozzles with 5 to 10 % why it this is not essential.

Practical information

- Nozzle
  - Filter integrated in the nozzle assembly, is a very important point over a year or more because minerals inside the pipe loosens and can cause blocking of the nozzle.
  - The integrated anti-drip valve close with about 5 bar and is important to avoid dripping and because it is not draining the pipe in the stand-by position.
  - The impeller inside the nozzle tip is removeable for cleaning with acid if blocked with lime or other minerals.
  - Big is better ! A bigger hole in nozzle is not so prone to be blocked.
- Pump system
  - If you do not need max. capacity from the pump, it is a very good idea, reducing the pressure to 40-50 bar and only use the max pressure of 70 bar, when needed.
  - Be sure that the incoming water temperature is always below 50°C, as lime is excreted above this temperature and this can cause problems with clogged nozzles.
  - It is important that water is mechanical filtered with 5 micron filter in front of the pump. 5 micron filter should be enough when you know that a 0,2 mm nozzle = hole 200 my.

Air inside pipe

- Avoid air pockets inside the pipelines.
  - Installation of piping with small increase up, may be a good solution.
  - Trapped air (air pockets) can cause increased dripping from nozzles when stopping.
  - Last nozzle should always be placed as near the end of the pipe as possible to avoid the risk of air pockets in the end of the pipe.
  - If using bleed-off valve in a pipeline we recommend the bleed-off valve is mounted at the end of a pipeline. This is done in order to ensure replacement of water completely out to the end of the pipe.

Bleed-off valve

- If you have a special request that there is absolutely no drip from the nozzles, when stopping the misting, you will need a bleed off valve.
- The bleed-off valve opens about 10 sek and closes again to avoid the pipe is drained. If the pipe is drained, air will enter the pipe and make more dripping when the system stop and start misting both when stopping and starting up the misting.
- If there is a large air flow below the nozzles bleed-off becomes redundant.
- With a small tank solution mounted before the pump. Pressure from the pipe goes back to the tank, when pump stops and you avoid dripping from nozzles.

Water quality

- Water quality must be bacteria free and with a minimal of mineral content.
  - A hardness in the water over 15 usually often gives problems.
  - High lime content in the water can create clogged nozzle tips.
    Turn into the minimum interval operation in a way where the system starts up approximately 5 seconds every about half hour.
  - Impure water may require purification. Ask local water specialists.
- Avoid stagnant water in the pipeline.
  - Bleed-off valve in a pipe system can be mounted at the end of a pipeline in order to ensure replacement of water completely, also in the end of pipelines.
  - In industrial plants with high hygiene requirements and low water consumption it is recommended to flush the pipeline approx. every 6 hours (through the bleed-off valve at the end of the pipeline).

Hygiene of water in the pipeline

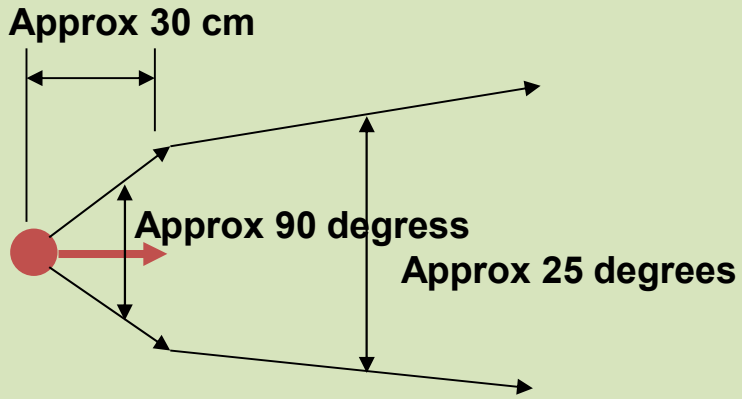
- Water in 10 meter stainless steel pipe Ø10,8 mm = 0,9 liter => 54 liters / hour
- Water in 10 meter polymer pipe Ø6 mm = 0,3 liter => 18 liters / hour

- Last nozzle is always placed near the end of the pipeline, in order to ensure that the above-mentioned amount of water can be replaced at least every 6 hours + reduces the risk of air pockets in the end of the pipe.

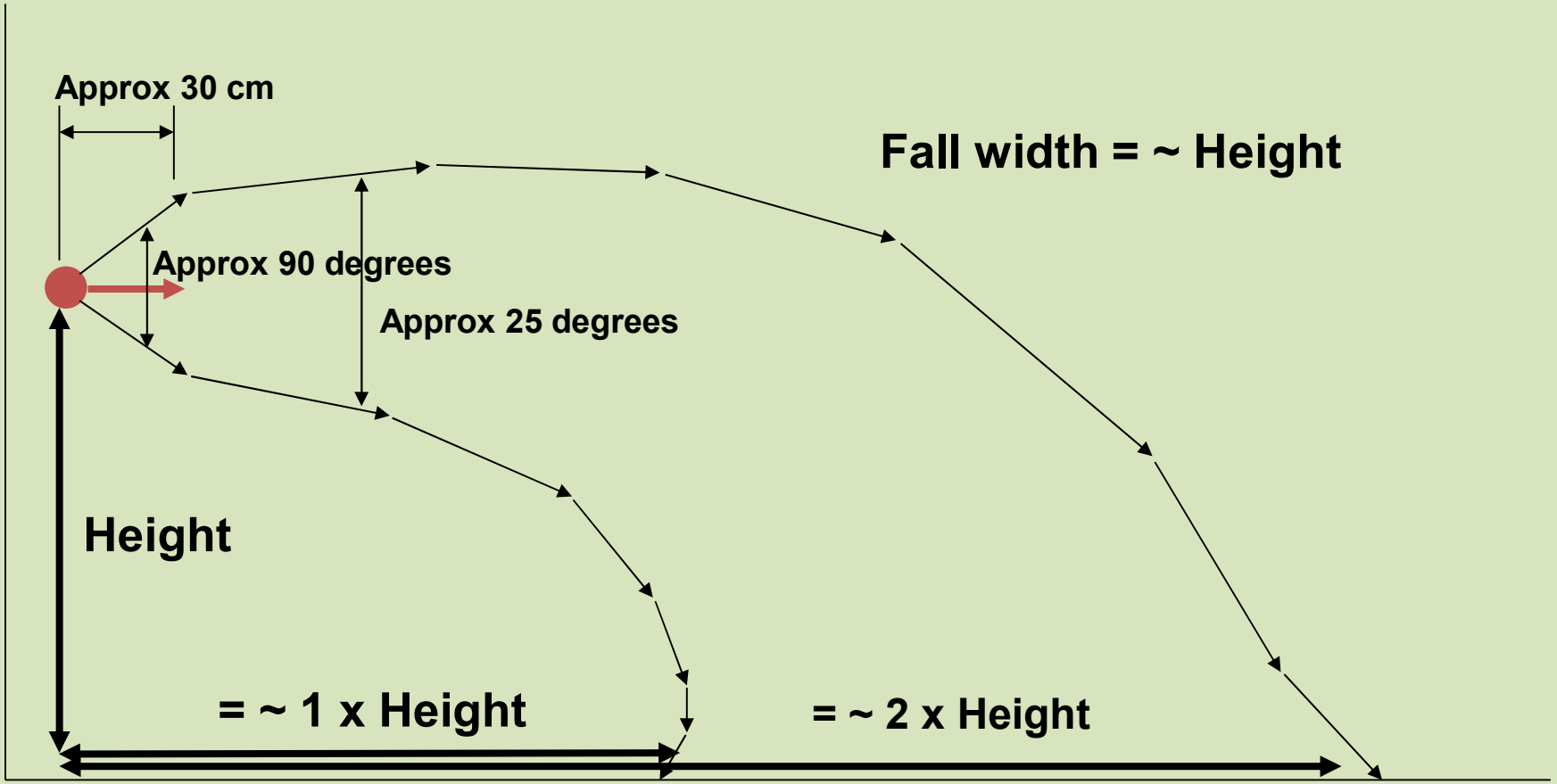
- If you are uncertain whether you fulfil the required minimum consumption, you should establish flushing of pipes, so you always use fresh water.

- Please also have attention to a long water supply pipelien to the pump system. May cause hygiene problems at large dimensions, warm environment and low consumption.

- If the system has been stopped for a long time, the pipelines should be flushed with fresh water before the actual operation is restored again.



Guiding theoretical spray-image



Guiding spray-image without air movement