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Episode  
#101

# Cooling and AC

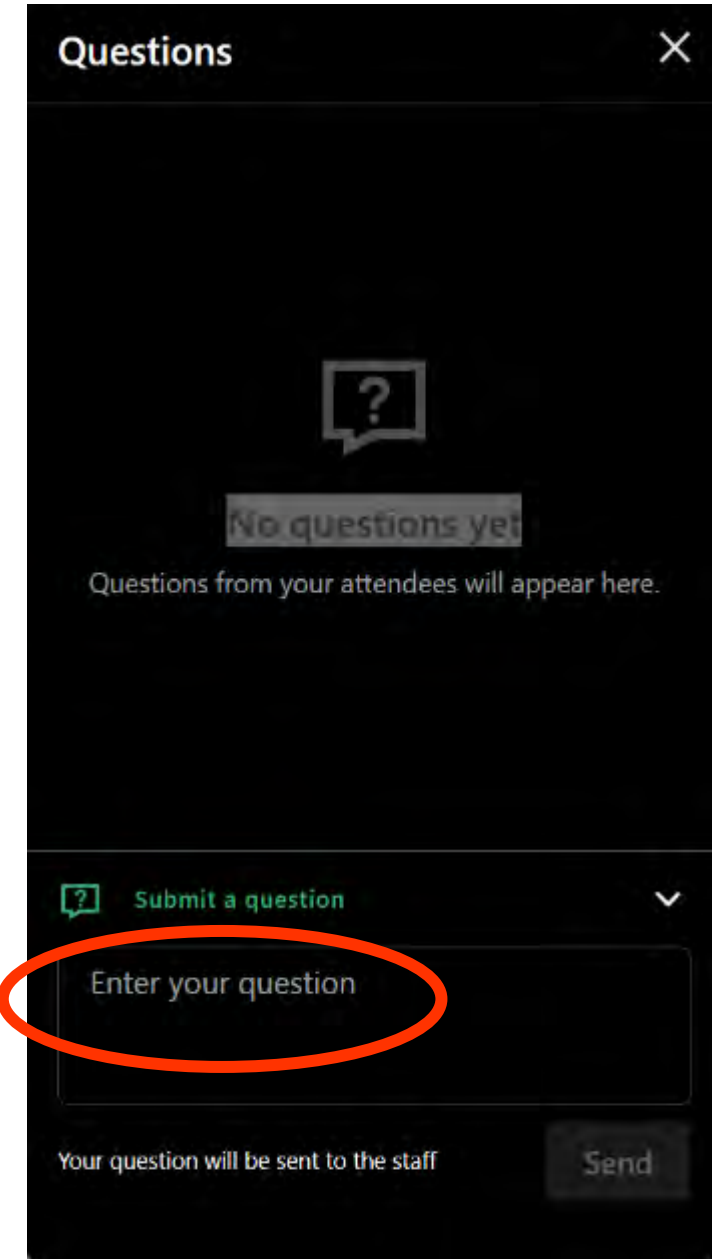
# Your questions please?



1. Find Questions symbol on the webinar control menu.
2. Please enter your questions in the text box of the webinar control panel window. (remember to press send)



Remember: The completion of a Nautel webinar qualifies for ½ SBE re-certification credit, identified under Category I of the Re-certification Schedule for SBE Certifications.



# Ideas for things to discuss

- **Air conditioning or forced air?**
  - Pros and cons
  - Understanding your environment and building
- **Airflow issues**
  - You can have lots of air and still no cooling
- **Long term care**
  - Filters/condenser coils/heat exchangers
- **Other thoughts**
  - How to add redundancy
  - Optimizing the existing facility



# MTBF: SD FET in Mixed Ambient T

| % of time | Ta | Tj  | MTBF |
|-----------|----|-----|------|
| 5         | 50 | 180 | 2E6  |
| 60        | 40 | 170 | 4E6  |
| 35        | 30 | 160 | 8E6  |

Weighted failure rate=

$$0.05/2E6 + 0.60/4E6 + 0.35/8E6 \\ =2.19E-7$$

MTBF=  $1 / 2.19E-7 = 4.57E6$  hours  
or 1.9% in 10 years

| % of time | Ta | Tj  | MTBF  |
|-----------|----|-----|-------|
| 5         | 50 | 190 | 0.6E6 |
| 60        | 40 | 180 | 2E6   |
| 35        | 30 | 170 | 4E6   |

Tj max increased by 10°C

$$0.05/0.6E6 + 0.60/2E6 + 0.35/4E6 \\ =4.71E-7$$

MTBF=  $2.12E6$ , or 4% failure in 10 years.

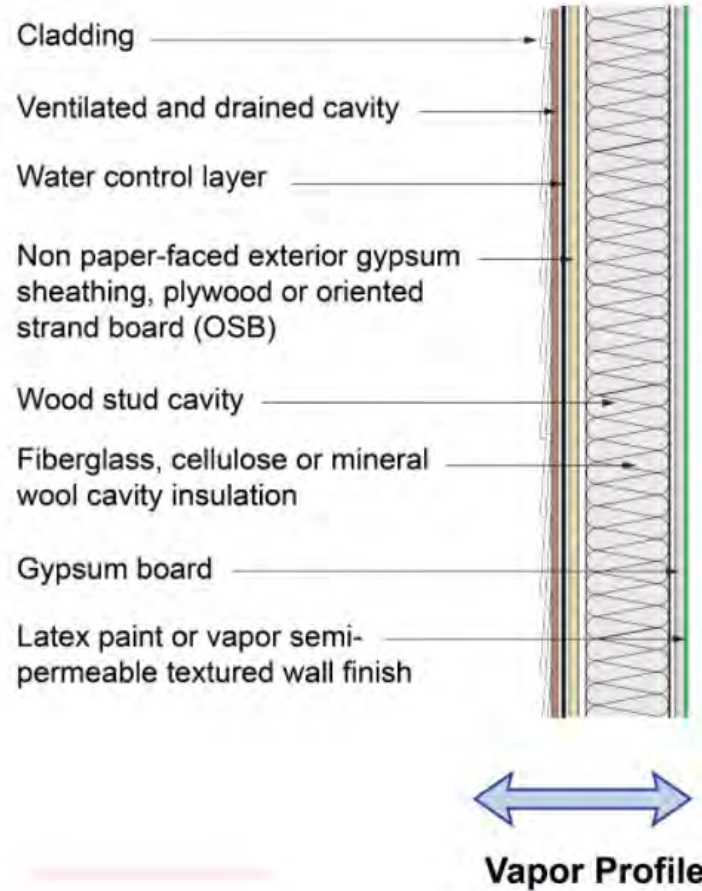
# Know your environment



<https://www.buildingscience.com/documents/building-science-insights-newsletters/bsi-120-understanding-walls>



# Know your building



<https://www.buildingscience.com/documents/building-science-insights-newsletters/bsi-120-understanding-walls>

# Know your equipment

## Calculate transmitter heat load:

$\text{TPO/efficiency} = \text{power consumed} *$

$\text{Power consumed} - \text{TPO} = \text{waste heat (in watts)}$

$\text{Waste heat} * 3.413 = \text{BTU/hr}$

$\text{BTU/hr}/12,000 = \text{tons of AC required}$

Eg:  $10\text{kW}/0.72 = 13.889 \text{ kW}$  of power consumption  
 $13.889 - 10\text{kW} = 3888.9 \text{ watts}$  wasted as heat  
 $3888.9 * 3.413 = 13,273 \text{ BTU/hr}$   
 $13,273/12,000 = 1.11 \text{ tons of air conditioning}$

\* - allow for modulation in AM transmitters... multiplying by 1.25 will be close



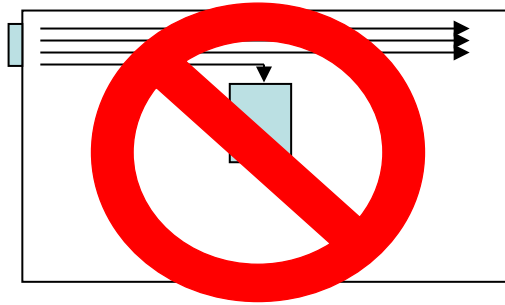
# Know your equipment

- POSITIVE PRESSURE!
  - More air into building than out of it
  - Allow for transmitter airflow
    - For example, transmitter requires 1500 CFM
      - Bring 3000 CFM of filtered air into building
      - Exhaust 2000 CFM
- If you install louvres in ducting, you can cycle exhaust air into room in winter for heating.

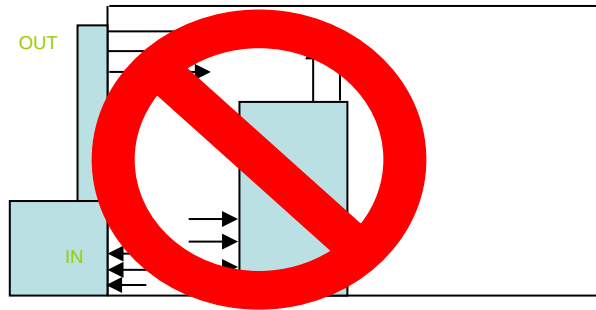
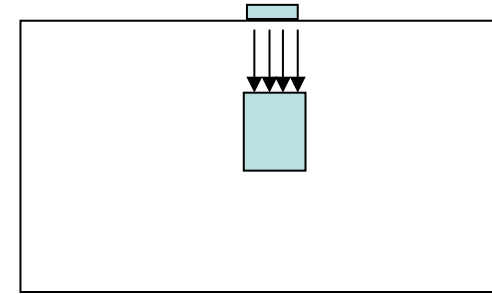


# Know which way the wind blows

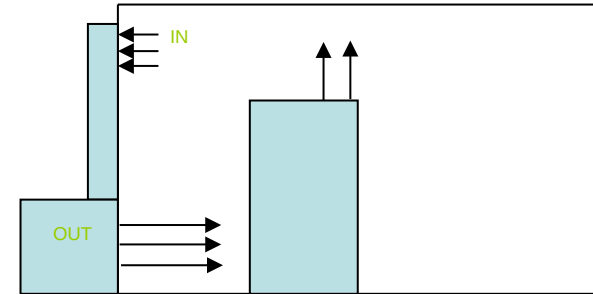
AIRFLOW DIRECTION IS CRITICAL!



TOP  
VIEW



SIDE  
VIEW



# Matrix Summary

|                                               | <i><b>WATER</b></i> | <i><b>AIR</b></i> |
|-----------------------------------------------|---------------------|-------------------|
| <i><b>Initial cost</b></i>                    |                     | ✓                 |
| <i><b>Installation Cost and Time</b></i>      |                     | ✓                 |
| <i><b>Operating Cost</b></i>                  | ✓                   |                   |
| <i><b>Noise</b></i>                           | ✓                   |                   |
| <i><b>Redundancy</b></i>                      |                     | ✓                 |
| <i><b>Hot Pluggable Modules</b></i>           |                     | ✓                 |
| <i><b>Maintenance</b></i>                     |                     | ✓                 |
| <i><b>Environmental Contamination</b></i>     | ✓                   |                   |
| <i><b>Customer Resources and Training</b></i> |                     | ✓                 |
| <i><b>Scalability</b></i>                     |                     | ✓                 |

# Keep It Cool



- Air Conditioners come in many shapes and sizes (and costs)
- Consider redundancy
  - Size air conditioners at just under the full building heat load and install two, in a main/alternate configuration
- Always take building and environmental heat load into effect. The transmitter, while the primary source of heat, will not be the ONLY source.
- Depending on location, security to protect outside units from copper thieves may be required.

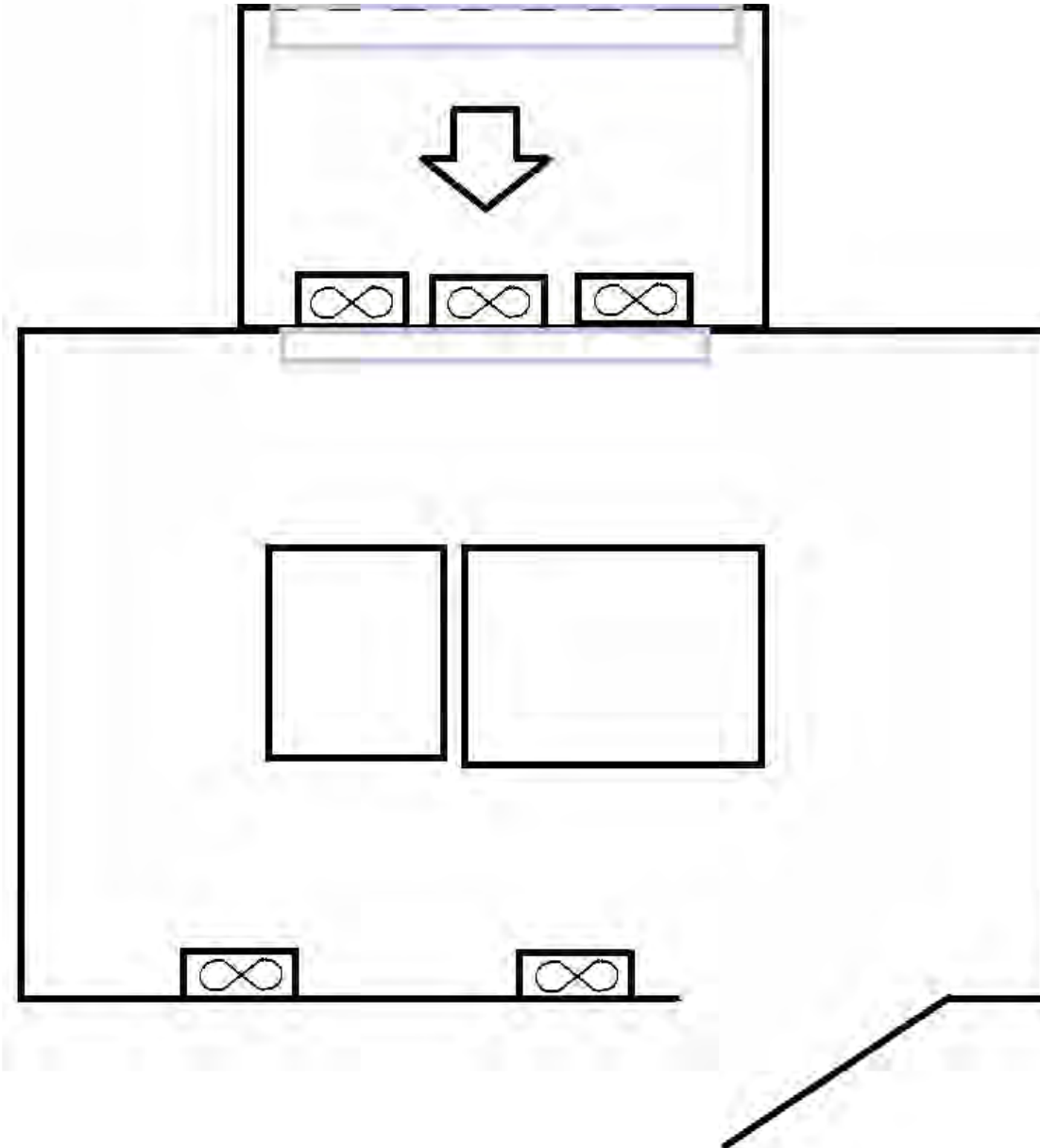
# Airflow Considerations

- Airflow is also important
  - As much air as possible should flow through equipment
  - Don't defeat the purpose by reversing direction





# Keep It Clean



# Clean equipment is happy equipment



Poor airflow, or insufficient cooling,  
can be expensive!!!

# Clean equipment is happy equipment



Air filters – on incoming air and equipment – are there to keep things clean

- \_ They must be cleaned or replaced regularly
- \_ Equipment should NOT be operated with air filters removed, unless a provisions are in place for additional filtering of incoming air. This is rarely advisable
- \_ Do NOT replace air filters with a different type without consulting the equipment manufacturer
- \_ Some air filters require spraying with a sticky substance (FilterKote™) for proper operation

# Clean equipment is happy equipment



Cool, clean transmitter sites make for happy transmitters, happy engineers – and happy technical support staff!



<https://www.infineon.com/dgdl/an-1057.pdf?fileId=5546d462533600a401535591d3170fbd>

International  
**IOR** Rectifier

## Application Note AN-1057

Heatsink Characteristics

<https://www.radioworld.com/tech-and-gear/how-to-beat-the-summer-heat>

### How to Beat the Summer Heat

Still sweltering? Adopt these tips to make next summer a lot more pleasant for you

BY JOHN MARCON

PUBLISHED: AUGUST 14, 2018 · UPDATED: JULY 2, 2024



# Online Information



## **Webinars**

<https://www.nautel.com/resources/webinars/>



## **Nautel Waves Newsletter**

<https://www.nautel.com/newsletters/>



## **YouTube**

<http://www.youtube.com/user/NautelLtd>



## **Online Info, such as the Broadcasters' Desktop Resource**

<https://www.thebdr.net/>



# THANK YOU!



**Worry-Free**  
Transmission