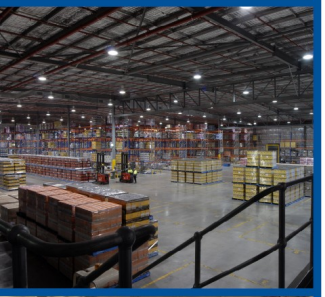


# Current Trends in Warehouse Design, Construction & Operation

by Rodney Davies

Presentation at Winery Engineers Association National Conference

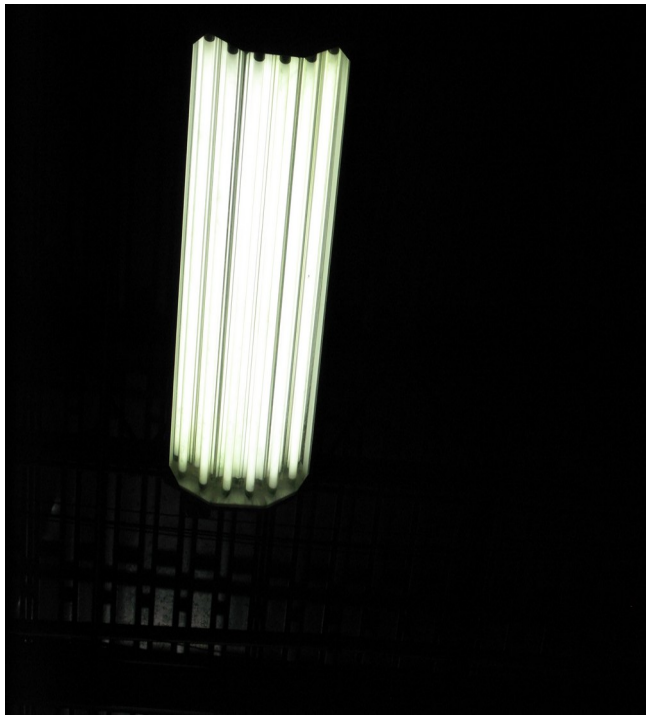
24 -25 June 2009

# Lower Energy Lighting & Controls

- Traditionally highbay lighting
  - Alternate fittings on different circuits (manual control)
  - Combined with skylights (thermal comfort issues?)
  - Motion control not possible due to restrike time
- Dimmable highbay lighting systems
  - Concerns about lamp life and colour quality
  - Recently installed in some large warehouses
  - Long term effectiveness still to be proven
- ‘Steppable’ highbay lighting systems
  - Two power levels
  - Motion sensor control possible between high and low power level

# Lower Energy Lighting & Controls (cont)

- Highbay fluorescent lighting systems
  - Lower energy usage
  - More consistent colour representation
  - Motion sensor controls
  - Not yet common in Australia



# Fire engineering and sprinkler heads

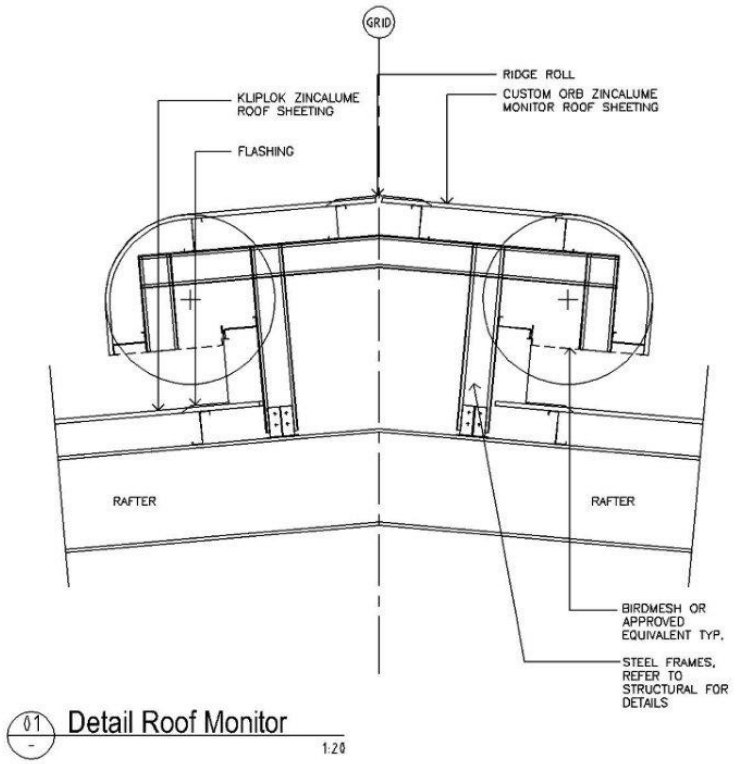
- Insurers becoming more active in specifying requirements to be designed into buildings – eg FM Global.
- Early Suppression Fast Response (ESFR) sprinkler systems
  - Activate early and deluge fire to extinguish it before it spreads
  - Impose restrictions on building geometry including ceiling heights, storage heights, commodity classification and roof pitch
  - Needs high co-ordination with structure and other services
- Avoidance of In-Rack sprinklers desirable as they are prone to damage.
- Have insurers involved early in the facility design process
- Reuse fire test water, & consider collecting roof water for fire water

- Pictures of ESFR sprinklers and control mode sprinklers in operation??

# Energy minimisation

- Greenstar rating
  - Assesses environmental design of buildings
  - Exists for commercial, retail & institutional buildings
  - Voluntary system, but some organisations specifying it for their own buildings
  - Pilot tool for industrial buildings released in October 2008
- Thermal comfort usually addressed by evaporative coolers, or louvres in conjunction with mechanical or passive rotary ventilators
- Large throat width ridge ventilators
  - No energy usage
  - More effective than rotary ventilators
  - Potential benefits to structural framing design

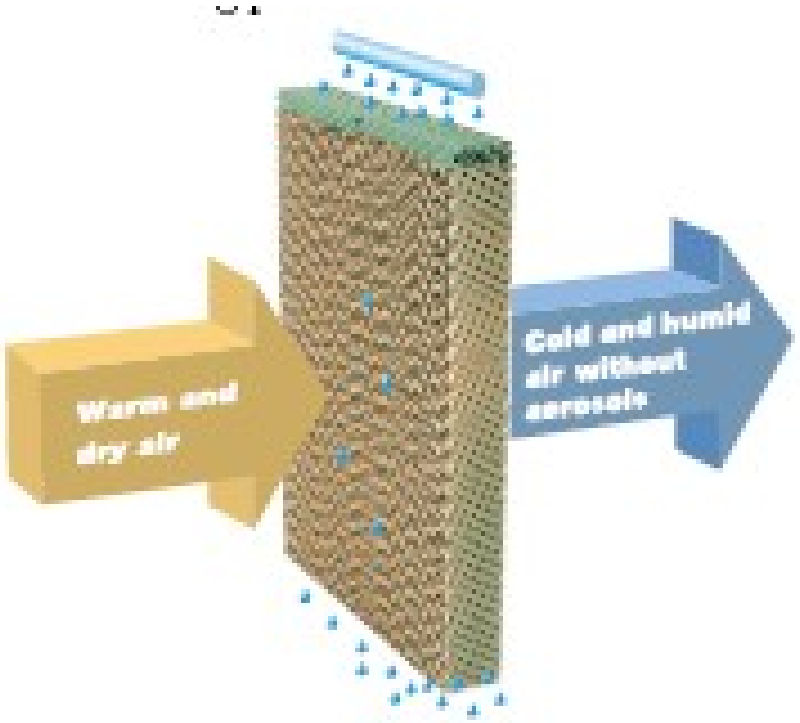
# Ridge Vent

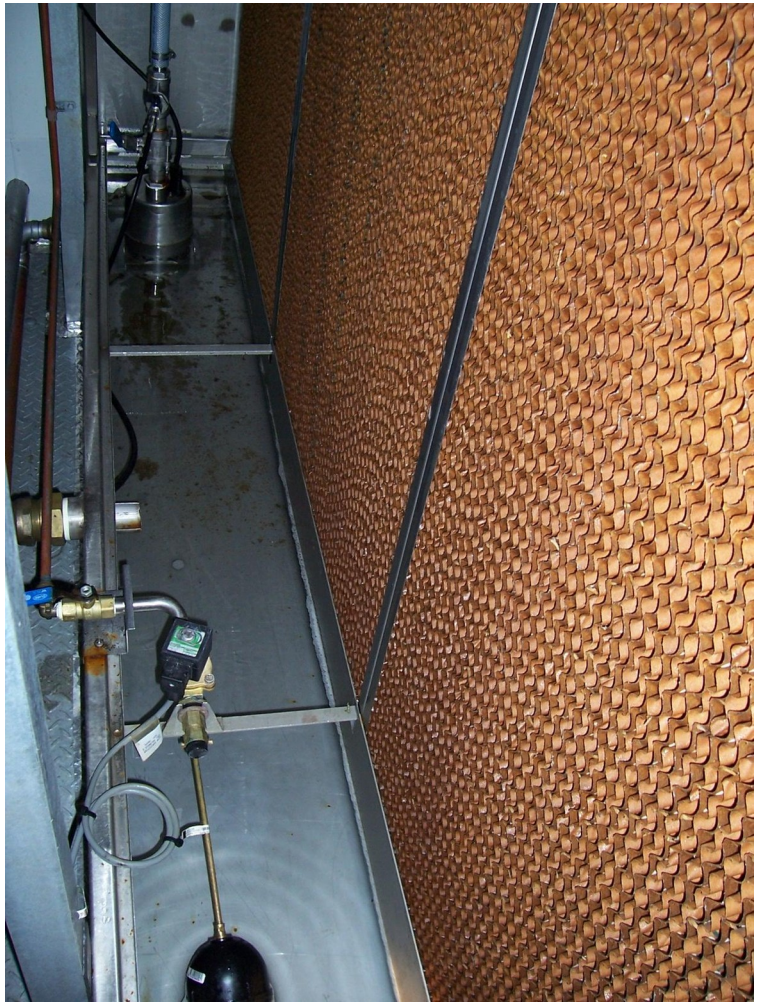

GRID
RIDGE ROLL
CUSTOM ORB ZINCALUME MONITOR ROOF SHEETING
KLIPLOK ZINCALUME ROOF SHEETING
FLASHING
RAFTER
RAFTER
BIRDMESH OR APPROVED EQUIVALENT TYP.
STEEL FRAMES, REFER TO STRUCTURAL FOR DETAILS
01
Detail Roof Monitor
1:20

# Humidification Systems

- Traditional humidifiers have recirculated water passing over honeycomb pad with air forced through
  - High captial costs
  - Increased power costs as air flow restricted by pad
  - High level of maintenance required to keep pad and water clean

# Pad Humidification System



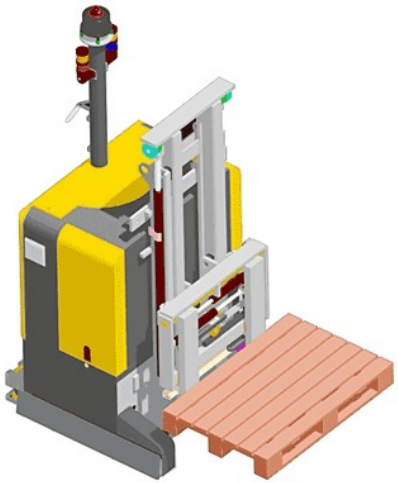
# Humidification Systems (cont)

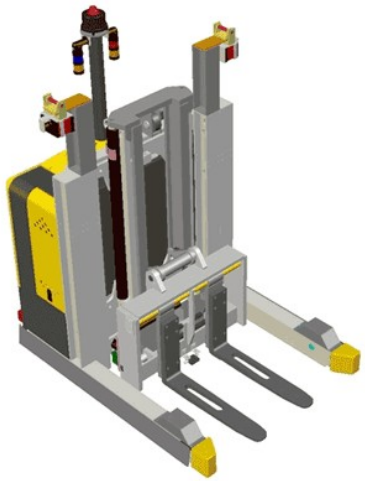
- Spray humidification system has fine water mist sprayed directly into the air stream
  - Humidity levels monitored and water spray automatically controlled
  - Increases efficiency and accuracy of humidification
  - Lower capital cost
  - Lower operating costs
  - Lower maintenance costs
- Benefits greatest when:
  - Accuracy of humidification level is important
  - Multiple pad humidifiers would otherwise be required
  - Potable water is suitable for spray humidification
  - Power consumption is an important consideration
  - Evaporator arrangement suits spray humidification

# Spray Humidification System

# Laser Guided Vehicles

- Unmanned vehicles, guided by laser
- Can work in existing facilities
- Proximity laser scanning sensors detect presence of obstacles to avoid collision





# Racking Systems

- Traditionally
  - Single Selective – low storage density, high selectivity
  - Double Deep – medium storage density, medium selectivity
  - Drive-In – high storage density, low selectivity
- ‘Satellite’ racking
  - Similar arrangement to drive-in racking
  - Increased selectivity compared with drive-in racking
- Remote trolley loads and unloads pallets in racking
  - Allows forklift to operate two trolleys at once, increasing productivity
  - Improved pick choice (don’t need to unload levels above and below)

# Satellite Racking

# Floor Construction

- Aim with floors to minimise joints
  - Joints are points of weakness in slab
  - Can require high maintenance
  - Can cause damage to MHE if not maintained
- Traditionally conventionally reinforced
  - Simple construction method, familiar to contractors
  - Long construction time due to number of pours
  - Large number of joints
- Reinforced slab strips
  - Fewer joints
  - Simple construction
  - Difficult to accommodate drains, thickenings, etc

# Floor Construction (cont)

- Post-Tensioned (PT) slabs
  - Increased speed of construction
  - Reduced number of joints
  - Difficult to accommodate drains, thickenings, etc
  - More expensive, but can have thinner slab (subject to curling criteria)
  - Contractor expertise may be lacking
- Fibre reinforced slabs
  - Steel fibres in lieu of steel mesh
  - Relatively new to Australia, but becoming more common
  - Simple construction
  - Fewer joints can be achieved
  - Reduced construction time
  - Can have thinner slab, subject to curling criteria
  - Need to use contractor experienced with these types of slabs

# Floor Construction

- Common elements to floors
  - Locate joints in non-trafficable areas (eg under racking)
  - Armour joints with metal edges
  - Limit widths of joints to minimise damage to solid wheeled equipment
  - Attention during construction to joint alignment and level
  - Care in subgrade preparation