

CLAIMS

1. An evaporative cooling device comprising:
 - a central chamber, the central chamber defining an upper chamber and a
 - 5 lower chamber separated by a divider;
 - one or more heat exchange units surrounding the central chamber;
 - an upper fan arranged above the upper chamber and a lower fan arranged
 - below the lower chamber; and
 - a water circuit;
 - 10 wherein each heat exchange unit comprises an evaporative cooling element and an
 - air to water pre-cooler, the pre-cooler being placed ahead of a lower portion of the
 - cooling element and the water circuit is arranged to irrigate the cooling element and
 - collect the irrigated water below the cooling element for delivery to the pre-cooler
 - whereby pre-cooled air may be drawn inwardly through the pre-cooler and the lower
 - 15 part of the cooling element by the lower fan and ambient air may be drawn inwardly
 - through the upper part of the cooling element by the upper fan.
2. The device according to claim 1, wherein the water circuit comprises a sump for
- collection of the irrigated water, the sump comprising an annular channel
- surrounding the lower fan.
- 20 3. The device according to claim 1 or claim 2, wherein four heat exchange units
- are arranged in a square around the central chamber.
4. The device according to claim 1 or claim 2, wherein the a single heat exchange
- unit surrounds the central chamber.
5. The device according to any of claims 1 to 4, comprising a housing, defining a
- 25 lower outlet from the lower chamber and an upper outlet from the upper
- chamber and having an outer periphery provided with inlet openings.
6. The device of claim 5, comprising removable screens located across the inlet
- openings.

7. The device according to any preceding claim, wherein the one or more evaporative cooling elements each comprise a stack of finned plates of aluminium material.
8. The device of claim 7, wherein the plates are arranged to extend vertically and inwardly and are spaced from each other laterally.
9. The device of claim 8, wherein the fins are formed by slits through the plate extending vertically and the fins are displaced laterally from the plate.
10. The device according to any preceding claim, wherein the one or more evaporative cooling elements are provided with a water retaining coating.
11. The device of claim 10, wherein the water retaining coating comprises an open fibrous structure.
12. The device according to any preceding claim, wherein the divider is movable whereby the relative sizes of the upper chamber and lower chamber can be varied.
13. The device according to any preceding claim, wherein the water circuit comprises a pump, arranged to cause circulation of water through the pre-cooler for delivery to the evaporative cooling element.
14. A method of operating an evaporative cooling device to deliver a supply of cooled air to a habitable space, the method comprising:
 - trickling water over an evaporative cooling element;
 - passing a first volume of air through a first portion of the evaporative cooling element to cool the water and exhausting the air to ambient in a first axial direction;
 - delivering the cooling water to an air to water pre-cooler;
 - passing a second volume of air through the pre-cooler and through a second portion of the evaporative cooling element and exhausting the air to the habitable space in a second axial direction opposite to the first axial direction.

15. The method of claim 14, wherein the evaporative cooling device is an evaporative cooling device according to any of claims 1 to 13.