

# Mean Radiant Temperature

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## REPORT

### RESEARCH METHOD:

The research began with the social and historical development of typical HVAC systems. This research established the social, economic, and ecological effects of conventional conditioning systems and inversely suggest social, economic, and ecological opportunities for MRT systems. This research also identifies numerous ways to challenge the efficacy of conventional HVAC systems.

The next step of the research concerned the physiological processes of the human body that make radiant transfer the most effective form of heat transfer. As such, this research works begins at the scale of the phenomenon: body-building heat transfer. This work on ideal physiological heat transfer preceded work on building systems that will maximize the effect of radiant transfer.

A series of MRT building systems were then analyzed for their radiant and hygroscopic performance. One distinct advantage of MRT systems is their capacity to collapse contemporary construction systems into a single layer of construction and limit the increasing number of building systems. Thus, building material and energy systems that could integrate multiple systems through reduction were the target of this phase. Several systems-from rammed earth to various new concrete assemblies and mixes-were evaluated.

The results of all this research was then directed towards the design of a test case. The test case will be built in the summer of 2007 in a climate with rather extreme climatic conditions: in the mountains of Colorado. The intent is to evaluate both the premises of MRT systems as both construction and human comfort propositions.

### KEY FINDINGS:

An architecture based upon the Mean Radiant Temperature has the following advantages:

### ENERGY:

- MRT systems are inherently integrated solutions.
- Lower energy consumption: low temperature heating and high temperature cooling.
- Radiant heat transfer is the most efficient form of heat transfer for bodies in buildings
- Hydronic systems are the most efficient method thermodynamically for distributing heat energy in a building.
- Hydronic systems are the most efficient method spatially for distributing heat energy in a building.
- MRT lowers the required air temperature
- MRT systems can be entirely solar powered, no fossil fuels are required.
- MRT buildings have drastically lower embodied energy and life cycle costs

#### ECONOMICS:

- Architecture/Engineering/Construction Re-alignments
- MRT buildings are inherently more durable, requiring less building replacement and extending building life.
- MRT buildings require less maintenance
- MRT systems require less construction time
- Less energy consumption = less operating costs
- MRT systems are not capital intensive

#### ARCHITECTURE:

- MRT systems are inherently integrated solutions.
- MRT systems make architecture more architectural.
- MRT systems are MAXMIN
- MRT systems are more sensible

