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# **Comparative Study on Traditional and Modern** Urban Textures: Form, Energy and Climate

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#### Introduction



In the tide of anti-Modernism in the twentieth Century, there are a large number of studies have argued the superiority of the traditional urban texture that are compared with the modern urban texture from sociological and historical view. However, there are few studies focusing on the discussion of the comparison of the traditional and modern urban texture from physical view (climate and energy).

Salat et al. has made a sharp criticism to modern urban forms from the view of energy and climate. In his study, the density, the energy performance and the other related indicators between Paris-Haussmann district and "Radiant City" of Le Corbusier are roughly estimated; the results show that the performance of energy demand and solar energy use of traditional urban forms in Paris is much better than the plates and towers that compose "Radiant City".



In this paper, the classical examples of traditional and modern urban texture in hot-summer and coldwinter climatic area in China are extracted and studied comparatively. The key characteristics such as buildings' archetype, urban density and street section are discussed in the proposed case studies in Wuhan. Their environmental performances such as buildings' energy consumption and outdoor thermal comfort are compared comprehensively by the numerical simulation.

## Comparative study on buildings' energy consumption







Implantation of tours in

traditional urban texture

**Archetype:** the schematic layouts of the three generic built forms



Case	Types	Etotal w			$\Delta E_{total s}$		n,
0	slab18	181.36	593.81	0.00	0.00	0.00%	0.00%
1	pavilion36	230.47	706.43	49.11	112.62	27.08%	18.97%
2	court9	182.76	600.48	1.41	6.67	0.78%	1.12%

Table. 2: Comprehensive analysis of heating and cooling loads (Wh/m<sup>2</sup>) of the case group of site coverage (SC)  $\Delta E_{total_w}$ SC E<sub>total w</sub> Case  $\Delta E_{total s}$ E<sub>total s</sub> n η<sub>w</sub> η<sub>s</sub> 5 0.60 230.94 601.80 0.47 -104.64 0.20% -14.81% 2 0.43 220.43 651.91 -10.04 -54.53 -4.35% -7.72%

		pavilion36 n=11(basic)	3	9	0.33	222.97	682.70	-7.50	-23.74	-3.25%	-3.36%
			0	11	0.27	230.47	706.44	0.00	0.00	0.00%	0.00%
			4	13	0.23	239.01	727.44	8.54	21.00	3.71%	2.97%
			5	15	0.20	246.06	746.19	15.59	39.76	6.76%	5.63%
pavilion36 n=5, SC=0.60	pavilion36 n=19, SC=0.16	pa∨ilion36 n=19	6	17	0.18	257.27	764.53	26.80	58.10	11.63%	8.22%
Density: the schematic layouts of the case studies of SC			7	19	0.16	267.01	782.13	36.54	75.69	15.86%	10.71%

### Comparative study on outdoor thermal comfort



Conclusion

- The buildings' energy performance and outdoor thermal comfort of the archetype of courts that is extracted from the traditional urban texture is more favorable than the modern layout of pavilions /tours, as the archetype of courts is more compact and more conducive to the growth of shadow in urban canyon.
- With the fixed plot ratio value (0.3) and the variation of SC value, the most optimal buildings' energy performance appears in the case study of multi-story pavilion with middle-higher site coverage (0.43) that presents the typical density and form of traditional urban texture; • The galleries (arcade form) of urban canyon as the microclimate buffer space brings more shadow in summer, the positive effect of galleries is more evident on the side facing south of urban canyon oriented W-E.

