

Analysis of the influence of UNMANNED aerial vehicles stationed in Tower Airport on tower structure safety

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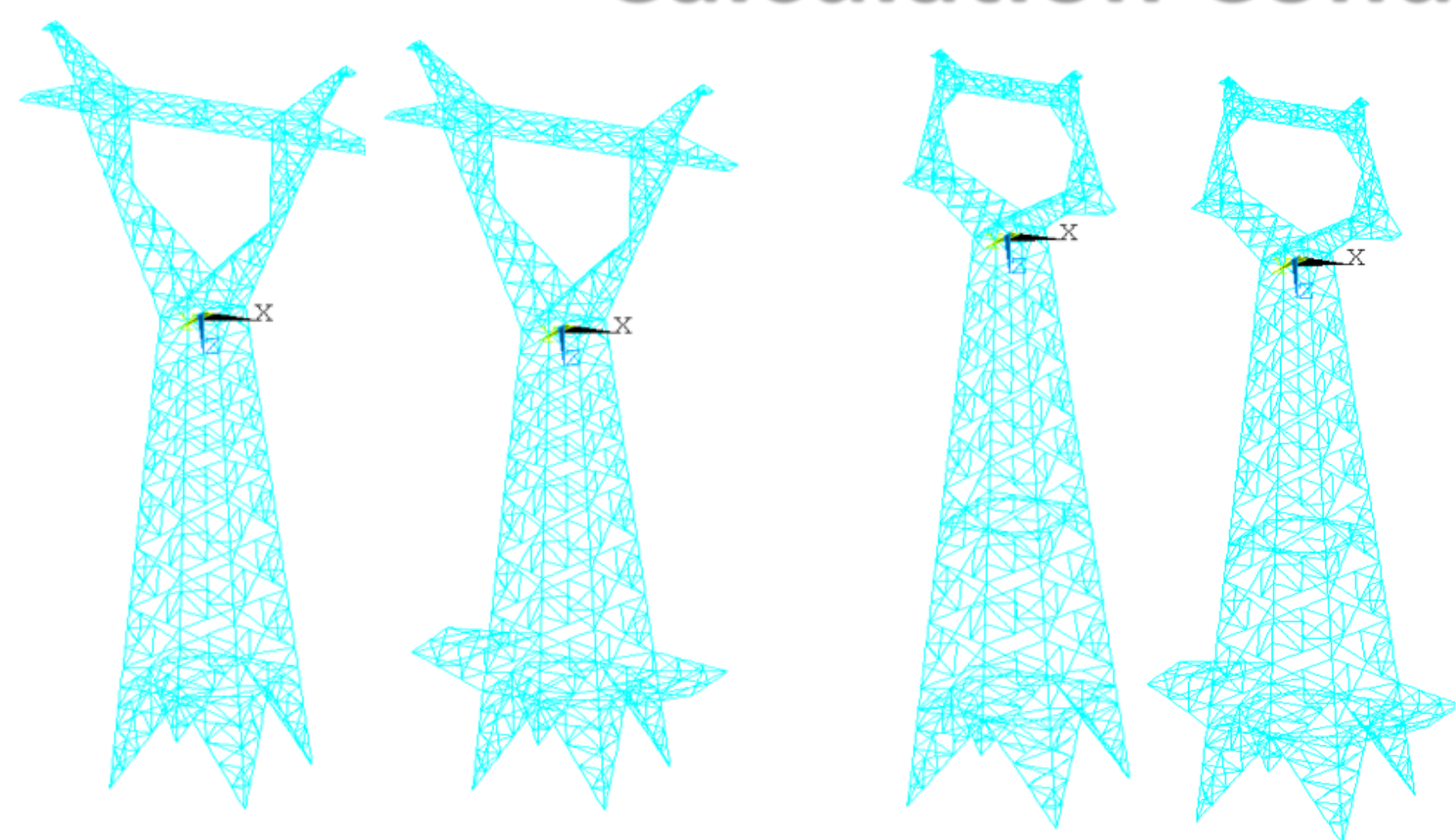
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Background

UAV automatic airport provides UAV with field storage, signal relay and power connection functions. It is a supporting support equipment for intelligent inspection of UAV. Generally, the UAV automatic airport can be arranged on the ground or on the tower. However, due to site limitations, the layout on the ground has the following problems:

- Both UAVs and autonomous airfields are precision equipment, which are vulnerable to animal and human damage when deployed in the field.
- It involves the occupation of private land, which increases the difficulty and cost of construction.
- The deployment position of the ground airport is not high, and the visual range of wireless communication equipment such as remote control and base station in the airport is affected.

Calculation Conditions



Wine cup tower

Cat head tower

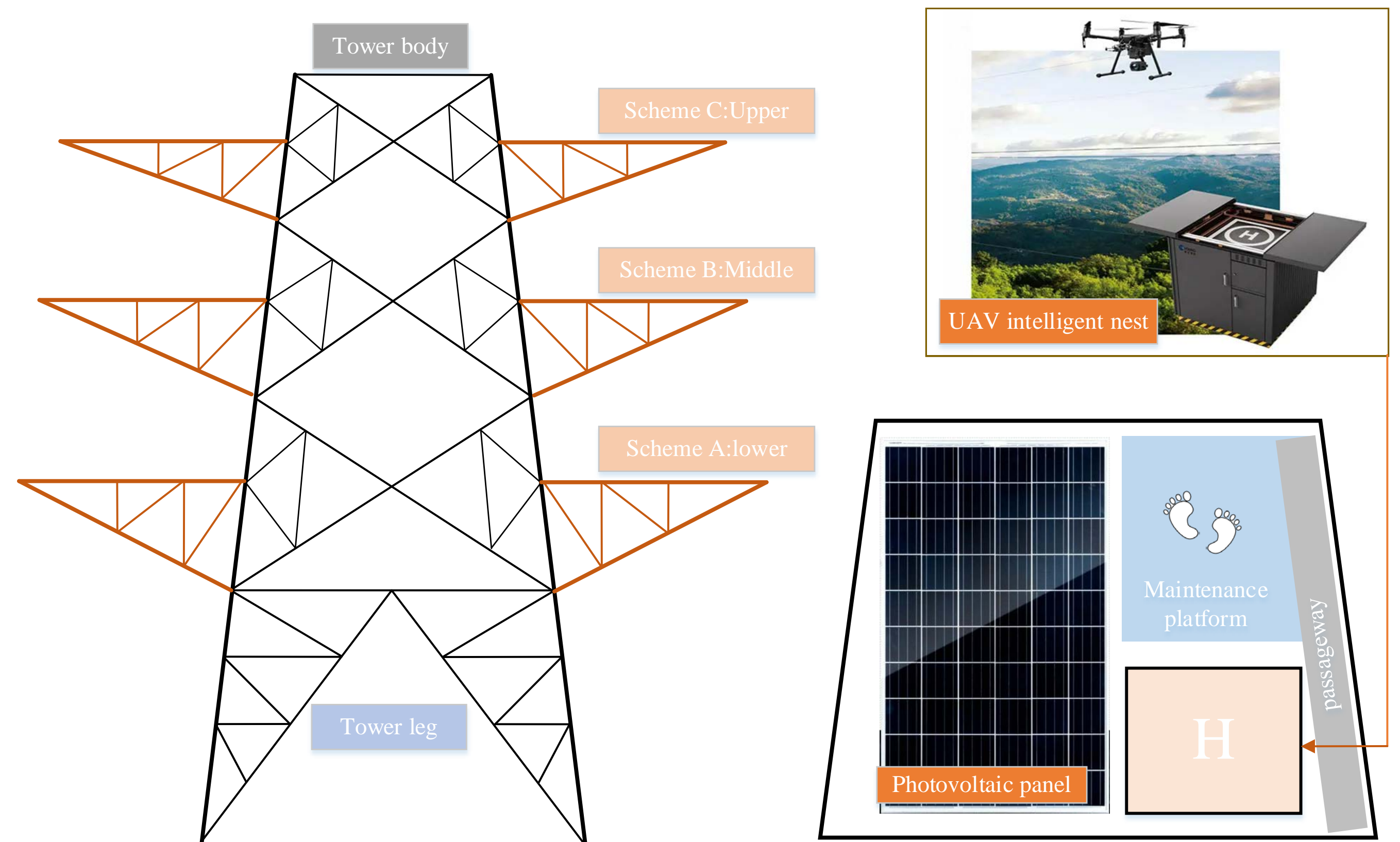
Dry word tower

Basic dimensions of iron tower

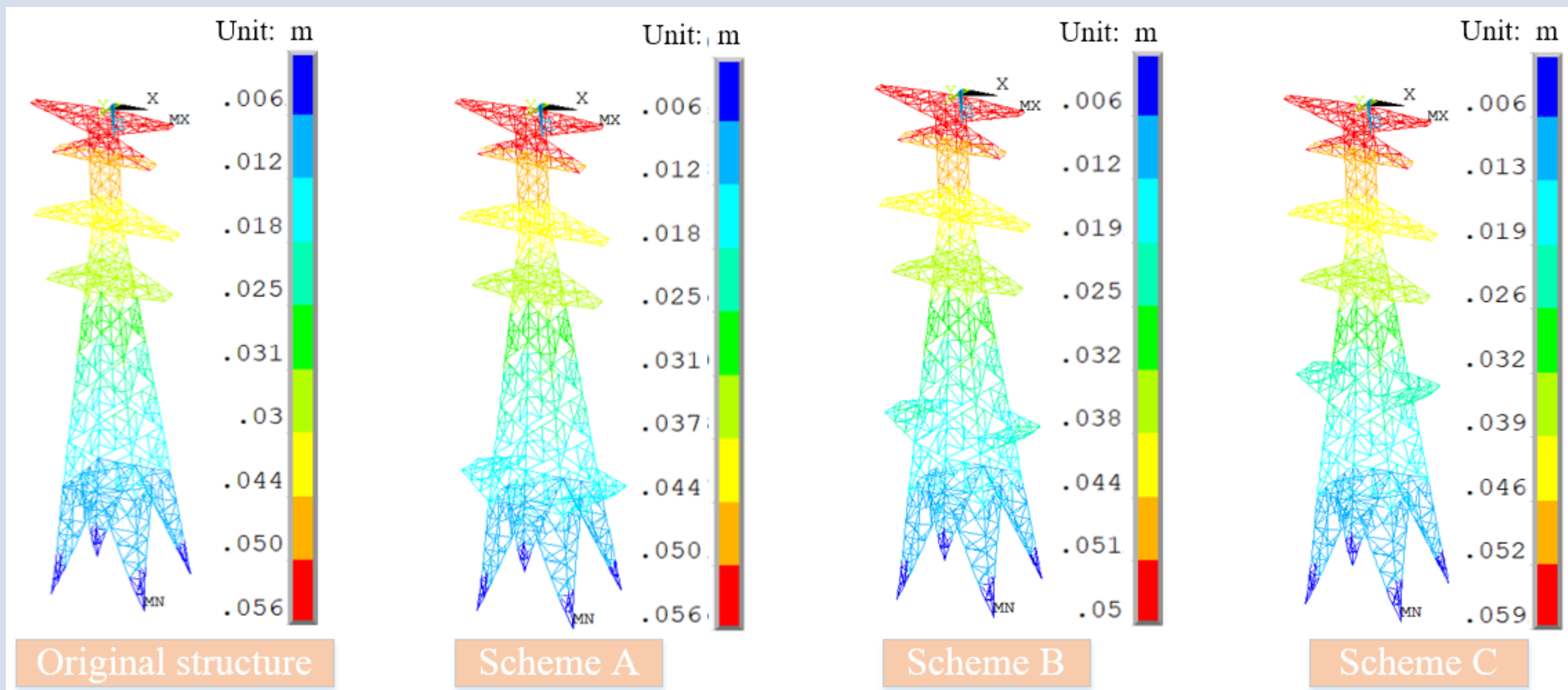
Tower number	High tower (m)	Call according to height (m)	The root drive (m)
2A5-ZB1	37	23.5	5.69
2A5-ZM1	40.5	31	6.85
2A5-J4	39.5	30	8.4
2E5-SJ1	47.5	30	9.097

The permanent load is mainly the gravity load of the UAV hangar and photovoltaic panel, and the variable load is mainly the wind load, snow load and additional load during installation and maintenance.

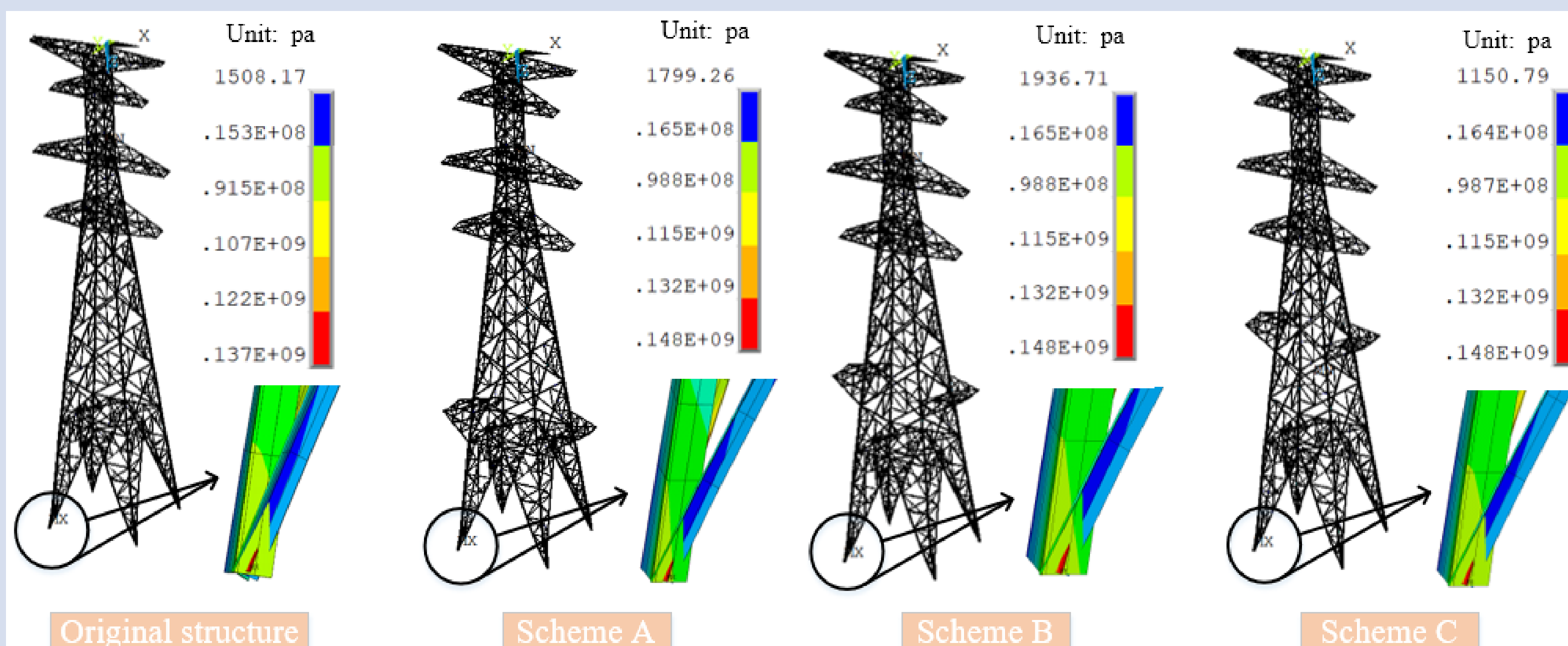
The layout of the tower airport



Calculation results and analysis



Main displacement cloud diagram of finite element model



Stress cloud diagram of finite element model

Summary of drum tower results

Position the platform	Horizontal typhoon load (kN)	The maximal displacement (m)	Maximum stress (MPa)
Scheme C	1.8785	0.059227	148
Scheme B	1.7175	0.057710	148
Scheme A	1.5642	0.056825	148
Original structure	—	0.056625	137

According to the analysis results, considering the convenience of UAV operation and the actual layout of the tower, it is suggested to **choose plan A (the lower part of the tower)** to build the UAV platform at the bottom of the tower, which has the minimum impact on the structural safety of the tower.

Summary of results of different tower types

Tower type	State of the tower	Maximal displacement (m)	Percentage change (%)	Maximum stress (MPa)	Percentage change (%)
Wine cup tower	Original structure	0.141352	-0.0092	233	7.3
	Platform	0.141339		250	
Cat head tower	Original structure	0.376172	-0.00798	542	1.8
	Platform	0.376090		552	
Dry word tower	Original structure	0.109591	0.0584	197	0.1
	Platform	0.109655		199	

According to the analysis results, when the UAV platform is set at the bottom of the iron tower, **placing a drone platform under the tower will not adversely affect the tower and that it remains reliable and stable.**