

Competition Brief for 2009 Delta Cup - International Solar Building Design Competition

GOAL OF COMPETITION

Combined with the reconstruction after Wenchuan earthquake in Sichuan Province, the competition with a theme of "Sunshine and Hope" is facing the whole world to collect design scheme of rural "Sunshine primary school" and some of awarded submissions will be put into construction in disaster area.

Taking the competition as a platform let's open out technology of solar building, promulgate the concept of sustainable operation, express our love and responsibility to the children in disaster area and make their life and studying filled with gladness, hope and genial sunshine.

THEMES OF COMPETITION:

1. Rural Sunshine Primary School in Ma Er Kang area;
2. Rural Sunshine Primary School in Mian Yang area.

ORGANIZER:

International Solar Energy Society
Chinese Renewable Energy Society

OPERATOR:

China National Engineering Research Center for Human Settlements
Special Committee of Solar Buildings, Chinese Renewable Energy Society

SPONSOR:

Delta Environmental & Educational Foundation

JURY MEMBERS:

Mr. Cui Kai, Deputy Board Member of IUA (International Union of Architects); Vice President of Architectural Society of China; National Design Master and Chief Architect of China Architecture Design & Research Group.

Ms. Anne Grete Hestnes, Former President of International Solar Energy Society and Professor of Department of Architecture, Norway Science & Technology University.

Mr. Deo Prasad, Asia-Pacific President of International Solar Energy Society (ISES) and Professor of Faculty of the Built Environment, University of New South Wales, Sydney, Australia.

Mr. Mitsuhiro Udagawa, President of ISES-Japan; Doctor of Engineering of Waseda University and professor of Department of Architecture, Kogakuin University.

Mr. M.Norbert Fisch, Professor of TU Braunschweig, President of the Institute of Architecture and Solar Energy Technology, Germany and Doctor of Stuttgart University, Germany.

Mr. Lin Xiande, President of Taiwan Green Building Committee; Doctor of Tokyo University, Japan and Professor of Faculty of Architecture of Success University, Taiwan.

Mr. Zhong Jishou, Chief Commissioner of Special Committee of Solar Building, Chinese Renewable Energy Society and Doctor of China University of Mining & Technology.

Mr. Xi Wenhua, Director-General of Gansu Natural Energy Research Institute; Director-General of UNIDO International Solar Energy Center for Technology Promotion and Transfer; expert in sustainable energy field from United Nations, international coordinator.

Mr. Feng Ya, deputy chief engineer of Southwest Architecture Design and Research Institute of China; deputy director of special committee of building thermal and energy efficiency, Architectural Society of China, Doctor of Chongqing University.

APPRAISAL METHODS:

1. Organizing Committee will check up eligible entries and confirm shortlist entries.
2. Jury will appraise and select out awarded works.

APPRAISAL STANDARD:

1. The entries must meet the demands of the Competition Requirement.
2. The entries should embody originality in order to encourage innovation.
3. The submission works should meet relevant national technological codes, regulations and the demands of usable function. The building technology and solar energy technology should have adaptability to each other.
4. The submission works should play the role of reducing building energy consumption by utilization of solar energy technology and have feasibility.
5. The submission works should be advanced under the preconditions of economic practicability and technical liability.
6. A percentile score system is adopted for the appraisal.

APPRAISAL INDICATORS:

| APPRAISAL INDICATOR | EXPLANATION | SCORES |
|--|--|--------|
| Building design | Including layout planning, design ideas, usage function, architectural innovation and others. | 40 |
| Utilization of active solar energy technology | Technology concerning collecting, transforming, transmitting and utilizing solar energy by special equipments. Innovation is encouraged. | 10 |
| Utilization of passive solar energy technology | Technology of utilizing solar energy by special building design and construction. Innovation is encouraged. | 30 |
| Adoption of other technology | Other technology concerning new energy utilization, water saving, materials saving and land saving. Innovation is encouraged. | 10 |
| Operability of the technology | Feasibility, popularization of relevant technology and economy demands | 10 |

THE TASK OF BUILDING DESIGN AND PROFESSIONAL GLOSSARY (Annex)

Annex 1: Climate conditions of the rural sunshine primary school in Ma Er Kang area

Annex 2: Climate conditions of the rural sunshine primary school in Mian Yang area

Annex 3: Task requirement of building design for rural sunshine primary school

Annex 4: Professional Glossary

PRIZES:**General Prize :**

Building design and selected solar energy technology must be excellent in adaptability to each other.

First Prize: 2 winners.

The Trophy Cup, Certificate and Bonus RMB 50,000 (before tax) will be awarded.

Second Prize: 4 winners.

The Trophy Cup, Certificate and Bonus RMB 20,000 (before tax) will be awarded.

Third Prize: 6 winners.

The Trophy Cup, Certificate and Bonus RMB 5,000 (before tax) will be awarded.

Honorable Mention Prize: 40 winners.

The Certificate will be awarded.

PRIZE FOR TECHNICAL EXCELLENCE WORKS:

Prize works must be innovative with practicability in aspect of technology adopted or design.

The quota of it is open-ended. The Certificate will be awarded. In all cases the Jury's decision will be final.

REQUIREMENTS OF THE WORK:

1. The work should reach the depth of scheme design level in building design and should be with relevant technical drawings in technology utilization. Drawings and text must be expressed clearly and its data must be mentioned exactly.
2. Basic contents of the work include:
 - 2.1 A brief of the design scheme (no more than 200 words) including scheme concept, general application technology of solar energy, design innovation, etc.
 - 2.2 Relevant technical and economic indicators expressed with a "list of technical and economic indicators" showed as a sample in annex 3.
 - 2.3 The general layout (1: 500, including site and environmental design), building plan of all floors, façade and section (1: 100~1: 200, which could fully show the building and its relationship, inner and outer), detail drawings for key parts and joints (scale is unlimited) and necessary figures or charts.
 - 2.4 Rendering perspective drawing (1-3).
 - 2.5 Participants should arrange the submission into two or four exhibition panels, each 840mm×590mm in size (arranged vertically). Font type should be in boldface. Font height is required as follows: title with 25mm; first subtitle with 20mm; second subtitle: 15mm; figure title: 10mm; design description in Chinese: 8mm, in English: 6mm; dimensions and labels: 6mm. File resolution: 100 dpi in JPEG or PDF format.
3. Participants should send (upload) a digital version of submission via FTP to the organizing committee, who will compile, print and make exhibition panels for all entries.
4. Text requirement: The brief of the design scheme (see 2.1) should be in Chinese and English, the others are in English. Participants should try to use the words from the Professional Glossary in Appendix 4.

PARTICIPATION REQUIREMENTS:

1. Institutes of architectural design, colleges and universities, research institutions and research and manufacture enterprises of solar energy are welcome to make competition groups with professionals of architecture, structure and equipment to attend the competition.
2. Please visit www.isbdc.cn. You may fill the registration list according to the instruction and gain an exclusive number of your work after submitting the list. One work only has one registration number. The number should be indicated in the top left corner of each submission work with height in 6mm. Registration time: 25th June, 2008 – 1st December, 2008.
3. Participants must agree that the Organizing Committee may publish, print, exhibit and apply their works in public.
4. The authors whose works are edited into the publication should cooperate with the Organizing Committee to adjust their works according to the requirements of printing.

ADDITIONAL ITEMS:

1. Participant's digital file must be uploaded to the organizing committee's FTP site (www.isbdc.cn) before 1st January, 2009. Other ways will not be accepted.
2. Any mark, sign or name related to participant's identity should not appear in, on or included with submission files, otherwise the submission will be deemed invalid.
3. The Organizing Committee will publicize the process and result of the appraisal online in a timely manner, compile and print publication of awarded works. The winners will be honored and awarded.
4. In 30 days after firstly published two of publication of award works will be freely presented by the Organizing Committee to the competition teams who are awarded.
5. The information concerning the competition as well as explanation about the competition may be checked and inquired in the website of the competition.

ANNOUNCEMENT ABOUT OWNERSHIP AND COPYRIGHT:

1. The Organizing Committee of the competition reserves the right of publishing, printing, and exhibiting the works, and also the right to use the submission works for school construction in Wenchuan earthquake area. When the works are used by the Organizing Committee, the names of authors will be affixed. In the mean while the works will be properly treated in technical according to the requirements of printing or project construction. All of submission works will be not returned back.
2. All authors must take responsibility for their copyrights of the works including all of disputes of copyright caused by the works.

ANNOUNCEMENT:

1. It implies that everybody who has attended the competition activities including participants, jury members and members of the Organizing Committee has accepted all requirements mentioned above.
2. All participants must accept the appraisal of the jury as the final result of the competition.
3. The Organizing Committee reserves final right to interpret for the competition activities.

Organizing Committee of International Solar Building Design Competition 2009

Website: www.isbdc.cn

Address of Organizing Committee:

China National Engineering Research Center for Human Settlements

Special Committee of Solar Buildings

No.19, Che Gong Zhuang Street,

Xi Cheng District,

Beijing, China

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ANNEX1:

Climate conditions of the rural sunshine primary school in Ma Er Kang area

1. Basic climate conditions

North latitude 31.5°, east longitude 102.2°, measured point has height above sea level 2666 meters

| Month | Air temperature | Relative humidity | Daily solar irradiation (horizontal) | Daily solar irradiation (30° slope surface) | Barometric | Air velocity | Ground surface temperature |
|-----------|-----------------|-------------------|--------------------------------------|---|------------|--------------|----------------------------|
| | °C | % | kW·h/m ² /d | kW·h/m ² /d | kPa | m/s | °C |
| January | -0.5 | 38.7 | 3.15 | 4.53 | 67.2 | 0.8 | -4.6 |
| February | 2.9 | 39.4 | 3.71 | 4.62 | 67.2 | 1.1 | -2.6 |
| March | 6.5 | 46.9 | 4.06 | 4.48 | 67.2 | 1.3 | 1.1 |
| April | 9.8 | 53.6 | 4.77 | 4.78 | 67.4 | 1.4 | 5.3 |
| May | 12.8 | 62.3 | 4.94 | 4.63 | 67.6 | 1.3 | 8.5 |
| June | 15.1 | 72.8 | 4.60 | 4.21 | 67.6 | 1.0 | 11.4 |
| July | 16.2 | 75.2 | 4.56 | 4.22 | 67.7 | 1.0 | 13.1 |
| August | 15.6 | 74.7 | 4.36 | 4.23 | 67.8 | 0.9 | 12.4 |
| September | 13.1 | 76.9 | 3.89 | 4.08 | 67.9 | 0.8 | 9.2 |
| October | 9.3 | 71.3 | 3.52 | 4.16 | 67.9 | 0.8 | 5.0 |
| November | 3.9 | 52.7 | 3.27 | 4.52 | 67.7 | 0.7 | 0.0 |
| December | -0.5 | 42.8 | 3.11 | 4.72 | 67.5 | 0.6 | -3.4 |
| Average | 8.7 | 59.0 | 4.00 | 4.43 | 67.6 | 1.0 | 4.7 |

2. Climate parameters for HVAC system design

| | Summer | Winter |
|---|--------|--------|
| Outdoor air conditioning design dry bulb temperature (°C) | 27.3 | -5.9 |
| Outdoor air conditioning design web bulb temperature (°C) | 17.3 | — |
| Daily mean air temperature (°C) | 19.2 | — |
| Dry bulb temperature of ventilation calculation (°C) | 22.5 | -2.3 |
| Relative humidity of air conditioning calculation (%) | 51 | 39 |
| Mean air velocity (m/s) | 1.2 | 1.0 |
| Wind direction | WNW | WNW |

3. Climate parameters for heating system design in winter

Outdoor air conditioning design temperature: -3.9°C. Dominated wind direction WNW, with mean air velocity 2.8m/s

ANNEX 2:

Climate conditions of the rural sunshine primary school in Mian Yang area

1. Basic climate conditions

North latitude 31.5°, east longitude 104.7°, measured point has height above sea level 472 meters

| Month | Air temperature | Relative humidity | Daily solar irradiation (horizontal) | Daily solar irradiation (30° slope surface) | Barometric | Air velocity | Ground surface temperature |
|-----------|-----------------|-------------------|--------------------------------------|---|------------|--------------|----------------------------|
| | °C | % | kW·h/m ² /d | kW·h/m ² /d | kPa | m/s | °C |
| January | 5.6 | 77.9 | 2.46 | 3.27 | 86.8 | 4.0 | -0.9 |
| February | 7.8 | 75.9 | 2.64 | 3.05 | 86.6 | 4.2 | 1.2 |
| March | 11.6 | 73.0 | 3.04 | 3.22 | 86.4 | 4.4 | 6.0 |
| April | 17.2 | 71.8 | 3.82 | 3.79 | 86.3 | 4.6 | 12.4 |
| May | 22.1 | 67.9 | 4.18 | 3.92 | 86.1 | 4.4 | 17.2 |
| June | 24.3 | 75.5 | 3.94 | 3.63 | 85.9 | 4.2 | 19.9 |
| July | 26.1 | 80.5 | 4.04 | 3.75 | 85.8 | 3.6 | 21.8 |
| August | 25.6 | 80.8 | 3.78 | 3.66 | 86.0 | 3.4 | 20.8 |
| September | 21.6 | 81.7 | 2.94 | 3.00 | 86.4 | 3.9 | 17.1 |
| October | 17.3 | 79.8 | 2.42 | 2.66 | 86.8 | 4.0 | 11.8 |
| November | 12.2 | 78.2 | 2.38 | 3.01 | 87.0 | 4.0 | 6.6 |
| December | 6.8 | 78.4 | 2.32 | 3.19 | 87.0 | 4.0 | 1.0 |
| Average | 16.6 | 76.8 | 3.17 | 3.35 | 86.4 | 4.1 | 11.3 |

2. Climate parameters for HVAC system design

| | Summer | Winter |
|---|--------|--------|
| Outdoor air conditioning design dry bulb temperature (°C) | 32.8 | 0.8 |
| Outdoor air conditioning design web bulb temperature (°C) | 26.3 | — |
| Daily mean air temperature (°C) | 28.5 | — |
| Dry bulb temperature of ventilation calculation (°C) | 29.3 | 2.9 |
| Relative humidity of air conditioning calculation (%) | 65 | 82 |
| Mean air velocity (m/s) | 1.3 | 0.8 |
| Wind direction | WNW | ENE |

3. Climate parameters for heating system design in winter

Outdoor air conditioning design temperature: 2.6°C. Dominated wind direction ENE, with mean air velocity 2.5m/s

ANNEX 3:

Task requirement of building design for rural sunshine primary school

A rural sunshine primary school has 12 classes and 45 students for each. The total students are 540. The shape of the school site will be better as a rectangle and the site area is no more than 1.0 hectare. The school consists of teaching building (no more than three stories) and accessory building (no more than two stories). Total building area should be within 3100m². The distribution of usable area of the school is showed in Table 1.

DESIGN REQUIREMENT:

1. The planning and building design must be clear in division, reasonable in function and convenient to contact with each other.
2. The scheme should have a good solution in orientation, daylighting, sound insulation, etc. Teaching room must meet the demand that the windows on first floor can get full sunlight at least for two hours on midwinter day (Dec.22nd).

3. Sport field:

Exercise field: 2.3m²/ student

Basketball and volleyball field: at least one for six classes

Football field can be set depending on the condition.

4. Common classrooms and other main teaching rooms should have good condition of daylighting and natural ventilation.

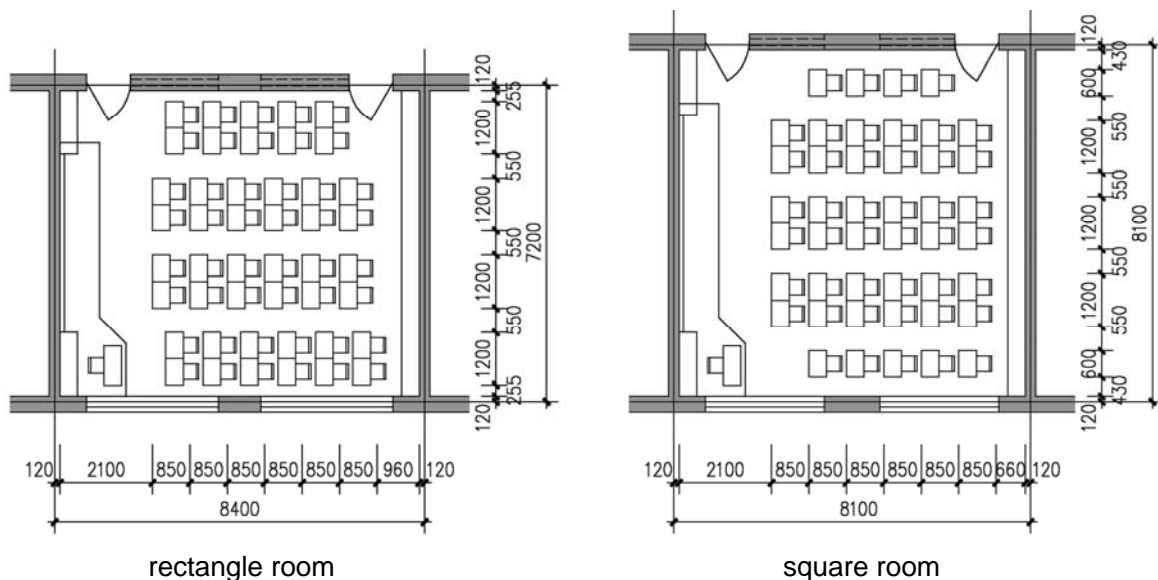
5. Besides the satisfaction of basic function requirement, the classroom layout should effectively make use of solar energy.

The size of common classroom is suggested as follows (mm).

Rectangle room (axes to axes): 8400(length)×7200(width)

Square room (axes to axes): 8100(length)×8100(width)

The arrangement is indicated in following sketches.



6. The position of students' toilet and drinking point should be arranged well in order to escape being crowded and bad smell diffusing out.

7. The structure form of teaching building is framework.

TABLE1 REFERENCE INDICATORS OF USABLE AREAS OF THE SCHOOL (m²)

| SERIAL NUMBER | ITEM | USABLE AREA PER ROOM | QUANTITY | TOTAL AREA |
|---------------------|---|-------------------------|----------|------------|
| TEACHING BUILDINGS | | | | |
| 1 | Common classroom | 52 | 12 | 624 |
| 2 | Music classroom | 67 | 1 | 67 |
| 3 | Instrument room | 18 | 1 | 18 |
| 4 | Audio-visual room | 90 | 1 | 90 |
| 5 | Audio-visual equipment room | 18 | 1 | 18 |
| 6 | Laboratory | 75 | 1 | 75 |
| 7 | Preparation room | 40 | 1 | 40 |
| 8 | Labor skill room | 52 | 2 | 104 |
| 9 | Room for science and technical activities | 52 | 1 | 52 |
| 10 | Reading room for teachers | 42 | 1 | 42 |
| 11 | Reading room for students | 50 | 1 | 50 |
| 12 | Book storehouse | 36 | 1 | 36 |
| 13 | Sport equipment room | 33 | 1 | 33 |
| 14 | Teacher office | 18 | 6 | 108 |
| ACCESSORY BUILDINGS | | | | |
| 15 | Administration office | 18 | 6 | 108 |
| 16 | Radio & association office | 18 | 3 | 54 |
| 17 | Health office | 20 | 1 | 20 |
| 18 | Storage for general affairs | 18 | 2 | 36 |
| 19 | Repairing room for woodworker | 28 | 1 | 28 |

| | | | | |
|-------------------|--|-----------------------------|---|------|
| 20 | Reception & duty room | 22 | 1 | 22 |
| 21 | Hostel for single staffs | | | 33 |
| 22 | Canteen for teachers and other staffs | | | 46 |
| 23 | Boiling water room | | | 24 |
| 24 | Toilet for students | | | 84 |
| 25 | Toilet for teachers and others staffs | | | 14 |
| 26 | Bathroom | | | 24 |
| 27 | Bike parking | 0.1m ² / student | | 54 |
| Total usable area | | | | 1850 |

TABLE2 MAIN TECHNICAL AND ECONOMIC INDICATORS

| SERIAL NUMBER | ITEM | UNIT | QUANTITY |
|---------------|---|----------------|----------|
| 1 | Total site area | ha | |
| 2 | Total building area | m ² | |
| | Teaching building area | m ² | |
| | Accessory building area | m ² | |
| 3 | Road & square area | m ² | |
| 4 | Sport field | m ² | |
| 5 | Greening area | m ² | |
| 6 | Floor area ratio(excluding sport field) | | |
| 7 | Greening rate(excluding sport field) | % | |
| 8 | Building density | % | |

| | | | |
|----|---------------------|------|--|
| 9 | Car parking number | car | |
| 10 | Bike parking number | bike | |

Annex 4:

Professional Glossary

| | |
|---------------------------------------|------------|
| absorptance for solar radiation | —太阳辐射热吸收系数 |
| accessory entrance | —辅助入口 |
| administration office | —行政办公室 |
| administrative room | —行政用房 |
| air collector | —空气集热器 |
| air quality test (AQT) | —空气质量检测 |
| area ratio of window to wall | —窗墙面积比 |
| artificial marsh effect | —人工湿地效应 |
| association office | —社团办公室 |
| atrium lighting | —中庭采光 |
| audio-visual room | —电化教室 |
| auxiliary thermal source | —辅助热源 |
| basketball field | —篮球场 |
| bathroom | —浴室 |
| bike parking | —自行车棚 |
| boiling water room | —开水房 |
| book storehouse | —书库 |
| building area | —建筑面积 |
| building density | —建筑密度 |
| building energy saving rate | —建筑节能率 |
| building intelligent control system | —智能建筑控制系统 |
| canteen for teachers and other staffs | —教工食堂 |
| capillary radiation | —毛细管辐射 |
| central heating | —集中供暖 |
| close-coupled solar water heater | —紧凑型太阳热水器 |
| closed system | —封闭系统 |
| collector array | —集热器阵列 |
| common classroom | —普通教室 |
| dehumidification system | —除湿系统 |
| design working life | —设计使用年限 |
| differential temperature controller | —温差控制器 |
| direct system | —直接系统 |
| double façade building | —双层幕墙 |
| drainback system | —回流系统 |
| duty room | —值班室 |
| economic analysis | —经济分析 |
| energy saving method | —节能措施 |

| | |
|---|-------------|
| energy storage & heat recovery system | —能量储存和回收系统 |
| external windows insulation system | —外窗隔热系统 |
| fill up layer | —填充层 |
| floor area ratio | —容积率 |
| floor panel heating | —地板辐射采暖 |
| forced circulation system | —强制循环系统 |
| freeze protection | —防冻 |
| greening rate | —绿地率 |
| ground layer | —地面层 |
| health room | —保健室 |
| heat insulating layer | —隔热层 |
| heat insulation window | —隔热窗户 |
| heat metering device | —热量计量装置 |
| heat pump heat supply | —热泵供暖 |
| heat storage tank | —贮热水箱 |
| hostel for single staffs | —单身教工宿舍 |
| household-based heat metering | —分户热计量 |
| index of building heat loss | —建筑物耗热量指标 |
| indirect system | —间接系统 |
| indoor comfort level | —室内舒适度 |
| insolation standard | —日照标准 |
| instantaneous collector efficiency | —集热器瞬时效率 |
| instrument room | —乐器室 |
| labor skill room | —劳动技术教室 |
| laboratory | —实验室 |
| low temperature hot water floor radiant heating | —低温热水地板辐射供暖 |
| lower energy consumption | —低能耗 |
| main entrance | —主入口 |
| multi-storey dwelling | —高层住宅 |
| music classroom | —音乐教室 |
| natural circulation system | —自然循环系统 |
| natural ventilation | —自然通风 |
| nominal working pressure | —额定工作压力 |
| open system | —敞开系统 |
| passive solar energy utilization | —被动太阳能利用 |
| payback time | —回收年限 |
| permanent index | —耐用指标 |
| phase change material (PCM) | —相变材料 |
| phase change solar system | —相变太阳能系统 |
| phase change thermal storage | —相变蓄热 |
| photovoltaic system | —光伏发电系统 |
| plane roof | —平屋面 |
| preparation room | —准备室 |
| PV façade | —光伏幕墙 |
| quantity of energy saving | —节能量 |

| | |
|--|-------------|
| quasi-steady state | —准稳态 |
| radio room | —广播室 |
| rain water collection | —雨水收集 |
| reading room for students | —学生阅览室 |
| reading room for teachers | —教师阅览室 |
| reception room | —传达室 |
| remote storage system | —分离式系统 |
| repairing room for woodworker | —木工修理室 |
| roller shutter sun shading system | —卷帘外遮阳系统 |
| roof insulation system | —屋面隔热系统 |
| roof planting | —屋顶植被 |
| room for science and technical activities | —科技活动室 |
| schoolyard | —运动场地 |
| secondary entrance | —次入口 |
| shutter ventilation | —百叶通风 |
| sloping roof | —坡屋面 |
| solar altitude | —太阳高度角 |
| solar azimuth | —太阳方位角 |
| solar cell | —太阳能电池 |
| solar chimney | —太阳能烟囱 |
| solar collector | —太阳能集热器 |
| solar driven absorption cooling | —太阳能驱动吸收式制冷 |
| solar driven desiccant evaporative cooling | —太阳能驱动吸附式制冷 |
| solar fraction | —太阳能保证率 |
| solar house | —太阳房 |
| solar plus supplementary system | —太阳能带辅助热源系统 |
| solar preheat system | —太阳能预热系统 |
| solar radiant heat | —太阳辐射热 |
| solar wall | —太阳墙 |
| solar water heating | —太阳能热水器 |
| sport equipment room | —体育器械室 |
| storage for general affairs | —总务库 |
| sunshading coefficient | —遮阳系数 |
| teacher office | —教师办公室 |
| teaching building | —教学楼 |
| teaching room | —教学用房 |
| thermal conductivity | —导热系数 |
| thermal efficiency curve | —热效率曲线 |
| thermal insulation | —保温 |
| thermal pressure | —热压 |
| thermal stability | —热稳定性 |
| thermal storage characteristic | —蓄热特性 |
| thermal storage | —储热器 |
| through-draught | —穿堂风 |
| toilet for students | —学生厕所 |

| | |
|--------------------------------------|--------|
| Toilet for teachers and other staffs | —教工厕所 |
| track and field ground | —田径场 |
| tracking collector | —跟踪集热器 |
| tridimensional virescence | —立体绿化 |
| triple co-generation | —三联供 |
| usable area | —使用面积 |
| ventilation simulation | —通风模拟 |
| volleyball field | —排球场 |
| water storage capacity | —储水量 |
| waterproof layer | —防水层 |
| wetproof layer | —防潮层 |
| wind speed distribution | —风速分布 |