


West Coast Innovation Technology City Experience Center

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Primary energy need :

79.81 kWhpe/m².

(Calculation method : Primary energy needs)

ENERGY CONSUMPTION

Range (kWhpe/m ²)	Grade
< 50	A
51 à 90	B
91 à 150	C
151 à 230	D
231 à 330	E
331 à 450	F
> 450	G

Economical building (Grades A-C) | *Energy-intensive building* (Grades D-G)

Building Type : Other building
Construction Year : 2019
Delivery year : 2021
Address 1 - street : Intersection of Dongyue middle road and Jianing Road, Huangdao District 266500 QINGDAO,
Climate zone :

Net Floor Area : 4 736 m²
Construction/refurbishment cost : 110 000 000 ¥
Cost/m2 : 23226.35 ¥/ m²

Certifications :



General information

West Coast Innovation Technology City Experience Center is located at the intersection of Dongyue Middle Road and Jianing Road, Huangdao District, Qingdao, Shandong Province, as a landmark in the Innovation Technology City. It integrates multiple functions such as Sinochem/Jinmao brand display, urban regional future planning, business communication, and leisure; sets up Sinochem Science and Technology Museum, regional future planning sand table, VIP meeting room, and spaces of shared communication, book bar, water bar, office, etc. The design and construction of the project combine the regional characteristics of the coastal city of Qingdao, applies the concepts of green waves, sea fishing culture and green technology to the overall design, and uses a large number of log colors and plants to form a city living room with a natural temperature between the "waves". The experience center integrates green, healthy, intelligent, scientific and technological building concepts, aiming to create an urban interactive center, sharing ecology, modernity, and technology.

Energy. This project implemented the national standard "Design Standard For Energy Efficiency of Public Buildings" (GB 50189-2015) and Shandong provincial standard (DB/J 14-036-2006). The energy consumption simulation analysis proved that 39.18% energy saving was achieved through the optimization design of building orientation, shape coefficient, and building enclosure. The project is equipped with a solar photovoltaic (PV) system, with the annual power generation accounting for 11.56% of the total energy consumption, which achieves energy conservation and carbon emission reduction.

Environment. The site of the project was originally an unused vacant space, then the concept of green waves in Qingdao coastal city was introduced into the new building design, which greatly improved the visual experience of residents. The experience center is 17.35m high, with good vision, natural lighting and ventilation. There are municipal park in the east and a ground floor building in the south. In the construction stage, according to the national green construction requirements, the project carried out measures about environmental protection and avoided the impact on residents. Meanwhile, the solid waste was classified and recycled according to municipal requirements; only units with transportation permits are qualified for the off-site transportation and ensures that the cover is tight with no scattering before the waste is reasonably treated.

Health. There is no air pollution source in the windward position of the project; the exhaust outlet of the building is not in the crowded activity area and windward side; the plants are non-toxic and harmless, exerting no impact on the outdoor environment. The magnetic field intensity around the site is less than one-fifth of the specified exposure intensity, and the transformer and outdoor units of air conditioners are set in the area far away from people's long-term stay to prevent the influence of indoor and outdoor electromagnetic radiation effectively. CFD simulation technology is used to optimize indoor air distribution and provide the best air circulation form for the building.

Comfort. The hall of the experience center adopted a glass curtain wall structure, and the light transmission area accounts for more than 70% of the entire façade. The lighting system is arranged around the building with no blind spot, therefore provided a visually comfortable environment. The indoor design temperature and wind speed are appropriate, and the room temperature and humidity can be independently controlled to ensure the thermal and humidity comfort of the personnel activity area. There is no large-scale equipment on site, no people gathering after working hours, no noise pollution; special calculation and analysis of indoor and outdoor space noise were conducted to provide users with a comfortable acoustic environment.

Data reliability

3rd part certified

Photo credit

China Jinmao Qingdao Company
Beijing Jinmao Green Building Technology., Ltd.

Stakeholders

Contractor

Name :

Construction Manager

Name :

Stakeholders

Function : Thermal consultancy agency

lidanrui@sinochem.com

<https://www.greenjm.cn/>

Beijing Jinmao Green Building Technology., Ltd. as the technical support unit for the project, carried out the full-cycle planning and design to make the project meet the technical requirements and earn the certifications of HQE EXCEPTIONAL and the Health

Contracting method

General Contractor

Owner approach of sustainability

Qingdao is located at 120°33'E 36°07'N, slightly north of the the Tropic of Cancer. According to the solar energy resources zoning in China, it belongs to the "third types" (with the annual sunshine hours of 2000-3000 h and the radiation of 502-586×104 kJ/ m²·a) and is recommended to use solar energy. The statistical data of the meteorological department shows that Qingdao has few consecutive rainy days, while the annual average sunshine hours is 2541 h, and the annual sunshine radiation intensity can reach more than 1600 kWh per square meter. Therefore, solar PV system is considered suitable from the natural conditions.

In this project, the solar PV system adopted the cadmium telluride thin-film PV glass, a thin-film solar cell based on the heterojunction of p-type CdTe and n-type CdS. The average annual power generation of the system in the first five years can be 43700 kWh, while the total energy demand of the project is only 378000 kWh, which means the renewable energy can supply 11.56% of the total energy demand. At the end of its service life, CdTe components can be recycled to reduce environmental pollution.

In this project, the refrigerant used in the outdoor unit of the multi-split air conditioner is R410A, which is a new type of environmentally friendly refrigerant that does not contain fluorine, with the ODP value of zero, and no harm to the ozone layer.

Architectural description

The project comprehensively improves building users' physical and mental health to create a comfortable and healthy indoor environment, which pays attention to an excellent scheme with both green and healthy. Perfect fitness, communication, leisure space, such as gym, art stairs, outdoor activity space, operation management optimization, and health knowledge publication can largely encourage employees to join the ranks of active health and promote their physical, psychological, and social health.

To create a new and high quality city, the project is equipped with electronic intelligent control system, CdTe thin film building integrated photovoltaic (BIPV) technology, high-efficiency inverter multi-split air-conditioning system, heat recovery system, high-efficiency lighting, water-saving appliances, direct drinking water, sponge city special design, integration of civil engineering and decoration, BIM technology, negative ion spray (combined with outside handrails) and other green, healthy and intelligent technologies.

This plot was originally an unused space. It greatly improved the visual experience of residents after construction. The east and south sides of the experience center are respectively Jianing Road and Dongyue Middle Road. A music fountain was built at the entrance to enhance the residents' experience with an open and inclusive design. The design of the exhibition center introduced the concept of green waves in Qingdao coastal city, and adopted the design of four glass curtain walls with a height of less than 20 meters. It creates a modern landmark building with a strong sense of science and technology, making the Innovation Technology City more dynamic and forward-looking.

Building users opinion

When working indoors, there are no obvious draft feelings; the temperature and humidity are suitable and can be adjusted at any time; the air is fresh; no obvious outdoor noise, excellent vision.

The indoor leisure area is spacious; communication is not affected by others. It is an excellent place to relax for both reading and tea break.

The outdoor spaces are covered with green plants, fountain, spray gallery, vitality zone, which brings pleasant feelings when exercise and walk.

Energy

Energy consumption

Primary energy need : 79,81 kWhpe/m².

Primary energy need for standard building : 116,05 kWhpe/m².

Calculation method : Primary energy needs

Final Energy : 79,81 kWhfe/m².

Breakdown for energy consumption :

HVAC: 47.78 General lighting socket equipment: 20.16 General power equipment: 10.15 Other: 2.90

Envelope performance

Envelope U-Value : 0,40 W.m⁻².K⁻¹

More information :

(1) The roof adopted 100 mm insulation layer of rock wool board, with the compressive strength ≥ 0.15 MPa, and the average heat transfer coefficient $K(W/ \cdot K)=0.38$. (2) Rock wool boards were adopted for external wall thermal insulation, with the thickness of 100 mm, and average heat transfer coefficient $K(W/ \cdot K)=0.40$; the bottom contact with outdoor air raised or cantilever floor, the floor under 80 mm thick B1 level extruded insulation board, $K(W/ \cdot K)=0.42$. (3) The 50 mm thick rock wool board insulation layer was used under the floor between the heating room and non-heating room, $K(W/ \cdot K)=0.78$. (4) When the partition wall of non-heating space and heating space is 200 mm reinforced concrete wall or block wall, 20 post vitrified micro bead insulation layer shall be made on one side of the heating room, $K(W/ \cdot K)=1.42$. (5) The external window and glass curtain wall were made of heat-insulating aluminum alloy window frame, with radiant rate ≤ 0.15 Low-E 5+12Ar+5 insulating glass, heat transfer coefficient of $1.90 W/ \cdot K$, solar heat gain coefficient of 0.35, water tightness of Class 3, and visible light transmittance of 0.40. (6) The gap between the outer door and window frame and the door and window opening were filled with polyurethane and other high-efficiency thermal insulation materials, and the joint was filled with sealing paste, and cement mortar shall not be used. (7) Both sides of the cold bridge are plastered with 20 thick vitrified micro bead thermal insulation mortar, $K(W/ \cdot K)=1.5$.

Building Compactness Coefficient : 0,15

Indicator : GB/T 7106-2008

Air Tightness Value : 6,00

<https://www.construction21.org/china/data/sources/users/277/20210325120236-zzzzzzzzz.docx>

Real final energy consumption

Real final energy consumption/m² : 70,59 kWhfe/m².

Year of the real energy consumption : 2 020

Renewables & systems

Systems

Heating system :

- Others

Hot water system :

- No domestic hot water system

Cooling system :

- Roof-top

Ventilation system :

- Natural ventilation
- Single flow

Renewable systems :

- Solar photovoltaic

Renewable energy production : 11,56

<https://www.construction21.org/china/data/sources/users/277/20210325121112-zzzzzzzzz.docx>

Environment

Urban environment

The project is located at the intersection of Dongyue Middle Road and Jianing Road, Huangdao District, Qingdao, Shandong Province. Within walking distance of 500m from the entrance or exit of the project, there are three bus stops and 13 bus lines available to encourage building users to travel green.

The greening rate of the project is 51.6%, with a variety of outdoor plant species and appropriate color matching. The project planted camphor, sweet-scented osmanthus, Japanese cherry, metasequoia and other shrubs, and also planted shrubs such as flower-leaf myrtle, summer cuckoo, and bear paw, with distinct greening arrangements and beautiful ornamental value.

The project is equipped with outdoor leisure space at the west side of the experience center, covering an area of 126 m², with good lighting and ventilation, a beautiful environment and complete service facilities to promote people's communication and relaxation. The leisure space is mainly surrounded by landscape greening and a beautiful environment. Five groups of outdoor tables and chairs are set along the way for 10 people to rest. An outdoor drinking fountain is set at 0.5m on the right side, providing convenience for people to replenish water at any time. The distance between the leisure space and the public toilet in the north of the building is 3.5m, and the walking distance is 33m, which is convenient to use. An area of 378 m² of activities for the elderly and children's playground is set up in the center of the south side. According to the simulation results, 56.54% of the area meets the standard for more than two hours of sunshine, and it is well ventilated. The pavement adopted the colored synthetic surface, with leisure racks, rest seats, one large entertainment facility (combined slide) and two small amusement facilities (rocking horse). All around the leisure space adopted anti-corrosion wooden benches.

This project implements the domestic waste classification, collection, transportation and disposal to promote the domestic waste source reduction as well as waste reduction, recycling and harmless treatment. Domestic waste were divided into recyclables, hazardous waste, kitchen waste (wet waste) and other waste (dry waste). This project adopted special transportation tools to transport domestic waste by classification. The special transport tools clearly indicated the types of domestic waste to be carried, and implement closed transportation. The recyclable waste of the project accounts for 80% of the total waste weight. The garbage storage area is set in the outdoor space on the west side of the building to avoid crossing the main pedestrian passage. The area is spacious and adjacent to the freight passage, which is convenient for the transportation of the truck transportation. The garbage cans are marked with classification signs, which makes it convenient for garbage classification and recycling.

Land plot area

Land plot area : 19 791,50 m²

Green space

Green space : 10 202,80

Parking spaces

There are 40 above-ground parking spaces, including eight spaces with EV charging. This project is equipped with an intelligent parking management system to achieve the following six functions: 1. Temporary parking charge: automatic detection of ground-sensing coils; 2. Parking lot management: centralized collection, comprehensive processing and intelligent response to the parking lot information; 3. Parking guidance: provide the driver with parking space occupancy status; 4. Reverse guidance: query the vehicle's parking location and guidance route through the intelligent terminal; 5. Special vehicle management: using parking space perception, video recognition, intelligent card reading and other technical means to manage special vehicles; 6. Image comparison: store images when vehicles and cardholders move in the parking lot.

Products

Product

Intelligent Mirror

618 19

<http://www.ruijie.com.cn/>

Product category :

Display size 21.5"

Display type IPS

Aspect ratio 16:9

Resolution 1920 x R.G.B x 1080

Brightness 1000 cd/m2(Original brightness)

Contrast 4000:1 (According to screen specifications)

Viewing angle 178° (H) X 178° (V) (According to screen specifications)

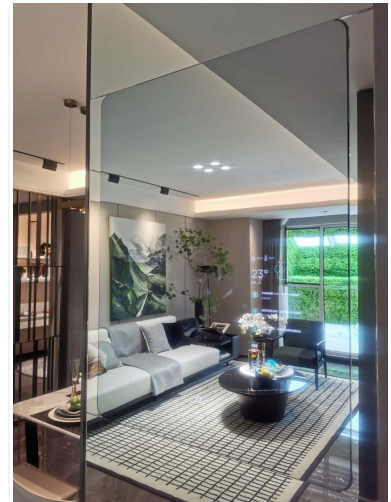
Display color 16.7M

Response time 5ms

Working life ≥25000 Hour

Designer: Intelligent Mirror adds the functions of mirror display and human-mirror interaction by embedding display screen, sensor and operating system into the traditional mirror. With the Intelligent Mirror as an interaction and information window, it is possible to build a smart ecosystem for the kitchen, bathroom, forming an open and intelligent control environment, a platform for the exchange of different intelligent devices, which lays a foundation for the realization of the whole house intelligence.

Building users: The Intelligent Mirror can realize functions such as life services, information and entertainment, intelligent control, health management. It has a great sense of use, feels like "fairy tale goes into reality".



Smart light pole

2016 4 J

<http://oring.chinapower.com.cn/>

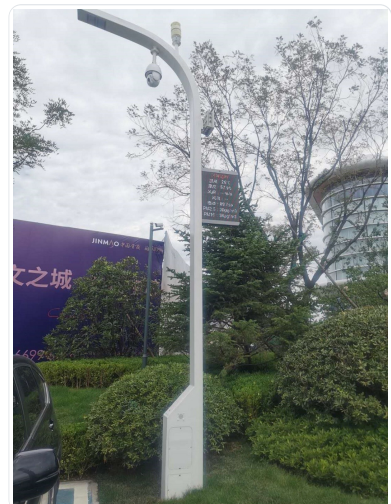
Product category :

Relying on the cloud platform, the product is equipped with temperature, humidity, wind direction, air velocity, and noise sensors, integrating the dual functions of intelligent lighting and environmental monitoring.

Designer: This product can meet the original intention of intelligent lighting design, with soft light and high luminous efficiency. It contains no harmful metal, lead, or mercury. It has green and environmental protection properties.

Construction workers: Small size, lightweight, widely used, simple installation.

Building users: The smart light pole can directly display outdoor environmental parameters such as temperature, wind speed and noise, and improve life quality.



DC charging terminal

336

<http://www.qdtgood.com/CN/default.htm>

Product category :

Product ID TZD-250-GQ/01

Input and output voltage 500-750V

Input and output current 250A

Protection grade:IP54

Designer: Perfect protection functions including overvoltage protection, undervoltage protection, overload protection, short circuit protection, leakage protection, etc.

Construction workers: Simple installation.

Building users: Stable voltage, friendly man-machine interface, easy to operate.



Double glass PV transparent components

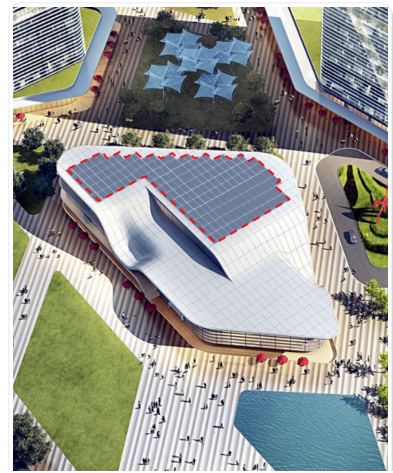
13

<http://www.rksolar.com.cn/>

Product category :

Component size 1200×600×9.7mm
Weight 16.8kg
Area 0.72
Front panel 3.2mm transparent conductive glass 3.2mm
Back panel 6mm semi-tempered/tempered glass 6mm
Junction box type Side
Junction box rating IP67
Laminated material PVB

Designer: Compared with traditional crystalline silicon modules of the same power, the product has a higher and superior temperature coefficient of power generation, and can produce more power at typical site operating temperatures. Stronger spectral response characteristics can also ensure obvious power output advantages in humid environments. The use of anti-radiation coated glass can significantly increase the power output.
User: After the end of the CdTe component's life cycle, the supplier can provide recycling services to recycle and reduce environmental pollution.



Costs

Construction and exploitation costs

Total cost of the building : 110 000 000 ¥

Energy bill

Forecasted energy bill/year : 401 177,00 ¥

Real energy cost/m² : 84.71

Real energy cost/none : 2005.89

Building Environmental Quality

Building Environmental Quality

- Building flexibility
- indoor air quality and health
- works (including waste management)
- acoustics
- energy efficiency
- renewable energies
- maintenance
- integration in the land
- mobility
- products and materials

Health and comfort

Water management

Consumption from water network : 11 542,60 m³

Water Consumption/m² : 2.44

Water Consumption/none : 57.71

The water supply source of the project is from the municipal water pipe network, with single water supply at the pressure of 0.25MPa from Jianing Road. The sales office, fire pump room, and fire water tank are all supplied by municipal pressure. The materials involved in the domestic water supply system all meet the sanitary standards for drinking water. The domestic water supply system pipes were flushed and disinfected before being put into use, and the flushing flow rate was not less than 2.0 m/s. After the completion of the pipeline construction, all water pipes were painted with relevant identification paint, and the finish paint was obvious and clear to prevent wrong connection; measures were also taken to avoid wrong drinking and misuse. After the pipes of the domestic water supply system and domestic hot water are flushed, the whole pipe shall be filled with water with the concentration of 20~30mg / L free chlorine, which shall be kept in the pipes for 24h for disinfection. Then, flush the pipes with domestic drinking water, conduct sampling and test by the health supervision department. The pipes can be used only if they meet the current national standard Standards For Drinking Water Quality (GB5749). The domestic drinking water of the project adopted decentralized direct drinking water system, while the raw water is municipal tap water. Direct drinking water pipelines adopt thin-walled stainless steel pipe, and the water production is based on membrane treatment technology. The water quality meets the requirements of the current national standard Water Quality Standards For Fine Drinking Water (CJ945). The toilets in this project all adopted the same floor drainage system with inside wall drainage, which means there is no exposed drainage pipe in the bathrooms. Such design makes the toilets clean and tidy, easy to clean, effectively reducing the drainage noise, the probability of leakage,

and effectively preventing the spread of bacteria. The toilets in the project adopted aluminum alloy or copper floor drains that effectively prevent the backflow and dryness; drain covers are chrome plated products. The installed sanitary appliances have water traps in the structure, and the water seal is no less than 50 mm. It is strictly forbidden to use movable mechanical seal instead of water seal. During the operation of the project, the property management unit will test the domestic drinking water and direct drinking water once a quarter. The number of samples at each sampling point shall be more than two, including all the including all locations where direct drinking water is used, such as the water bar on the 2nd floor, the meeting office hallway on the 3rd floor, and the direct drinking water system outdoors. Domestic water is mainly for toilet flushing in public toilets, water for hand washing, etc. According to the function of use, one random hand washing table is selected for sampling and testing on each of floors 1-3.

Indoor Air quality

Indoor CO2 concentration mg/m3 500

Indoor formaldehyde concentration mg/m3 0.076

Indoor TVOC concentration mg/m3 0.380

Indoor benzene concentration mg/m3 0.068

Indoor PM2.5 concentration µg /m3 19.8

Comfort

Health & comfort :

Only one hidden elevator was installed in this project. We encourage building users to use stairs by setting up spiral stairs and reading interactive stairs etc.

The project adopts side lighting; the lighting uniformity values of all the main functional spaces on the first, second, and third floors are no less than 0.40 and are 0.41, 0.40-0.45, and 0.41-0.48, respectively. The indoor lighting quality of the project meets the needs of the human body; the light source's color temperature is 3000K~4000K; the special color rendering index, the color tolerance of the light source, and other parameters all meet the requirements to form an excellent indoor luminous environment. LED lamps are used for outdoor nightscape lighting, courtyard lamps, lawn lamps, tree lighting lamps and buried lamps with the color temperature of about 4000K, and the color rendering index is more than 60.

Inside the main public washing rooms, toilets are separated from the wash table, which is convenient for multiple people to use at the same time and reduces mutual interference. In the second and third floors, toilets and handwashing stations are all installed in each compartment, and a shared hand washing station is also installed at the entrance to improve convenience. The activity spaces in front of the toilet and the wash station are suitable for use, and the height of the washbasin in the bathroom is 850mm, which meets the comfort requirements of the use space.

On the west side of the project, a fitness sports field of 1318 m2 is set up, accounting for 6.21% of the total land area. The sports field is divided into four parts: basketball court, table tennis court, general sports equipment court, and other activity places. The field is equipped with five fitness equipment, reserved spaces for badminton and football, etc. On the right side of the project, a continuous 360 m long fitness track is set up along the Flying Fish Square, which does not cross with the traffic flow line, therefore ensures safety. The width of the track is 1.5m, paved with blue plastic material and set up distance markers every 50m to provide convenience.

The project is designed in strict accordance with the *Codes for Accessibility Design* (GB 50763-2012):

- (1) If each entry is an accessible flat slope entrance, the slope shall not be greater than 1:20; if it is an accessible ramp entrance, the slope requirements shall meet related requirements.
- (2) One set of parking spaces, sidewalks, and public green spaces shall be equipped with accessibility facilities;
- (3) Equipped with barrier-free toilets or toilet seats;
- (4) The height difference between the inside and outside of all entrances and exits, and accessible toilet doors shall not be greater than 15mm, and the transition should be sloped;
- (5) Set up signs to clearly indicate the location and direction of the accessibility facilities, parking spaces, building entrances, elevators, public toilets or special toilets, etc.;
- (6) The door leaf for wheelchair passage at the entrance of the building is provided with a handle 900mm from the ground.

Calculated indoor CO2 concentration :

500

Calculated thermal comfort :	28.05°C	41.69°C	27.14°C	41.34°C	27.45°C	41.62°C
0.25m/s	24~26°C	50~60%	GB 50736-2012 3.			

Acoustic comfort :

According to the environmental noise value and the project building plan drawing, the environmental noise value is the largest on the southeast side, but there are no noise-sensitive rooms on the southeast side, and most of the offices are located on the northwest side of the building. Calculation of the effective sound insulation of the combination of external windows and external walls shows that the daytime indoor noise level of the office on the northwest side of the ground floor of the project is 35.81db when the windows are closed.

This project adopted the following noise reduction and shock isolation measures:

1. The ceiling units and the ceiling under the fans were provided with sound-absorbing materials. Anti-vibration foundations and the fix limiters were set under the following situations: (1) when the equipment and facilities such as fans, water pumps, compression refrigeration units (heat pump units), air conditioning units, energy recovery devices produce vibration during operation; (2) the outdoor refrigeration equipment and facilities do not produce vibration during operation, but higher requirements for sound insulation and noise reduction are required.
2. The inlet and outlet air ducts of air supply and exhaust fans are installed with 200 mm fire-proof soft joints;
3. Shock absorption hanger is used for pipeline installation and the fire-proof pad is used between the pipe and support hanger;

4. Damping pad or shock absorber are installed on the fan foundation and damper.

Carbon

GHG emissions

GHG in use : 48,40 KgCO₂/m²/

Building lifetime : 50,00

Contest

Reasons for participating in the competition(s)

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“ ”

LED

11.56%



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