网架设计说明

一、工程概况

1、网架结构型式:本网架为正放四角锥螺栓球钢网架。

2、网架平面尺寸见平面图。

3、网架有组织排水。

4、网架支承形式:多柱点支承。

5、网架平面布置图中方框为支座,支座反力单位为千牛(KN)。

2.结构安全等级 : 二 级.

二、设计所遵循规范:(施工必须遵照以下规范)

1、《建筑结构荷载规范》	GB50009-2012
2、《建筑抗震设计规范》	GB50011-2010(2016版)
3、《空间网格结构技术规程》	JGJ7-2010
4、《钢结构设计规范》	GB50017-2017
5、《钢结构工程施工质量验收规范》	GB50205-2017
6、《钢网架行业标准》	JGJ75.1~75.3--91
7、《网架结构工程质量检验评定标准》	JGJ78-91
8、《冷弯薄壁型钢结构技术规范》	GB50018-2016
9、《建筑设计防火规范》	GBJ50016-2014(2018版)
10、《建筑钢结构焊接规范》	JGJ81-2002
11、《钢网架螺栓球节点用高强度螺栓》	GB116939-2016
12、《建筑钢结构防火技术规范》	GB51249-2017
13、《建筑结构可靠性设计统一标准》	GB 50068-2018。

三、设计技术参数

1、上弦静载 0.20KN/m2

2、上弦活载 0.50KN/m2

3、下弦静载 0.00KN/m2

4、基本风压 :0.55KN/m2

5、基本雪压: 0.50KN/m2

6、温度变化值:±30度。

7、地震设防烈度:8度,基本地震加速度取0.20g,所在场地设计地震分组为第二组,场地类别为Ⅱ类,网架顶尼如0.03,关键杆件长细比控件150,压杆120。

8、地面粗糙度类别:B类。

9、网架自重由计算机程序自动形成。

10、荷载由程序用在节点上,使用中不得超载,杆件不承受横向荷载。

11、本工程采用空间网架设计软件(SFCAD2021)辅助设计。

四、材料要求

1、钢管:网架工程所用钢管与钢板,采用Q235B钢,其质量标准应符合现行国家标准<<碳素结构钢>>(GB700-88),<<优质碳素结构钢>>(GB/T 699-1999)规定的要求.钢材的抗度度实测值与抗拉强度实测值的比值不应大于0.85;钢材应有明显的屈服时的强度实测值与抗拉强度实测值的比值不应大于0.85;钢材应有明显的屈服台阶,且伸长率应小于20%;钢材应有良好的可焊性和合格的冲击韧性。

2、钢球:螺栓球采用《优质碳素结构钢》GB/T699-1999规定的45号钢锻造,表面应光滑,无裂纹,无过烧,无麻点。

3、高强螺栓:采用<<钢网架螺栓球节点用高强度螺栓>>(GBT16939-2016)规定的0Cr20MnTiB,35CrMo,35VB钢,成品不允许任何部位,任何

深度或任何长度的淬火裂纹。调质后的高强螺栓性能等级应满符合

<<钢结构用高强度大六角头螺栓>>(GB1228)规定的10.9s性能等级的材料,

螺纹应符合<<普通螺纹公差与配合>>(GB197)中的6g级,表面需发黑处理

并涂防锈油。

4、封板、锥头:材质均应符合《碳素结构钢》GB/T700规定的Q235B钢,钢管直径

大于等于75时封板厚采用锥头,连接焊缝以及锥头的任何截面应与连接的钢管等强,焊皮应除

干强度和变形的要求。封板、锥头外观不得有裂纹,过烧及氧化皮,并有试验报告。

5、套筒:材质应符合《碳素结构钢》GB/T700规定的Q235B钢或符合《低合金结构钢技术条件》

(GB1591)规定的16Mn钢或《优质碳素结构钢钢号及一般技术条件(GB699)规定的45号钢)。

表面外观不得有裂纹,过烧及氧化皮。

6、螺栓螺杆性能指标要求:螺栓螺杆及螺纹钢筋的抗拉强度实测值与屈服强度实测值的比值不应小于1.25;

屈服强度实测值与屈服强度标准值的比值不应大于1.3,且在最大拉力下的总伸长率实测值不应小于7%。

7、紧固螺钉:材质采用0.6级螺钉,0.9级螺钉70号弹簧钢。

8、焊条

a)焊材为Q235B钢时,采用E43 303型电焊条,焊条性能应符合《碳钢焊条》(GB5117)的规定

b)焊材为Q235钢与5号钢焊接时采用E43xx型电焊条,焊接前对球进行预热至150-200° C;

c)容以上两类焊接采用二氧化碳气体保护焊,则焊丝应符合《二氧化碳气体保护焊用钢焊丝》(GB8110).

9、网架所用材料做应有出厂合格证明书,无出厂证明书的材料应经过试验确认合格后方能使用.

所有产品质量应符合《钢网架行业标准》。

五、焊缝

1、钢管与封板、锥头组成杆件时,两端对接焊缝为全熔透焊缝。

2、支座螺栓球与底座的焊接外接焊缝预热至150-200° C并使用定位焊方可焊接;

3、未注明尺寸的焊缝一律满焊,最小焊缝高度为最小构件厚度的1.5倍且不小于Hf=6mm.

4、钢管对焊接

a)钢管对接焊缝,相邻两节点之间不得有两个拼接点,且接管最小长度应大于800mm,且拉杆不得对接;

b)钢管对接焊缝需留口,其坡V形缝的角度为60° -90°,焊缝高 h>t(t为管壁)

如用衬垫焊接,则焊缝根部宽度b>2mm,衬垫厚度>0.5t;

c)钢管对接后,其直线度公差均不得超过名义长度的L/1000.

5、网架的焊缝质量检验应达到<<钢结构工程施工质量验收规范>>

(GB50205-2001)规定的二级标准要求.

六、网架制作、安装

1、网架的制作、运输、安装应遵守《网架结构设计与施工规程》JGJ7-2010和

《钢结构工程施工质量验收规范》GB50205-2017,《钢网架螺栓球节点》

JG11-2016,《钢网架螺栓球焊接标准》JG12-1999。

2、构件出厂前应要进行预拼接工作;如因紧张过度而有困难,采取必要的临时加固措施。

3、预埋件过度板与网架支座板采由螺栓连接,所以在施工中应地对保证其位置和标高。

为符合防雷要求网架支座与柱顶预埋件钢板焊接连通,预埋钢板与柱内通长电气部

焊接连通。预埋件的偏低尺寸,标高以及平整度需符合设计要求,预埋件的允许偏差如下:

a).预埋件中心线与定位轴线的偏移<15mm;

b).标高误差<30mm;

c).预埋件钢板平整度<3mm。

七、网架除锈、涂装

1、网架在制作前钢材必须进行钢板除锈,要求无锈油,无灰尘、油污等。除锈等级应符合

《涂装前钢材表面锈蚀等级和除锈等级》(GB7923.4-2013)中Sa2.5。

2、钢材除锈后,按《钢结构工程施工质量验收规范》(GB50205-2017)要求涂装,涂防锈底漆

两道(2X35um),面漆两道(2X35um);处于暗装厚度不小于125um,安装过程中遭损伤部位

应进行补涂,使之不低于相邻部位护等级;高强螺栓和螺栓球零螺纹部分均应涂以防锈油。

3、本网架外观对八等级为二级;网架防火等级为二级,钢结构防火应满足建筑专业的要求,达到其规定的耐火极限要求:1.5小时

钢柱.钢支撑:2.0小时;钢结构防火保护采用喷涂(非涂)防火涂料,室内隐蔽构件,选用非膨胀型防火涂料,

钢结构防火涂料涂厚度不小于20um;防火构造满足《建筑钢结构防火技术规范》 GB51249-2017

中4.2.1要求。

4、所选用的钢结构防火(防腐)涂料与防锈钢涂漆(涂料)之间应进行相溶性实验,实验合格后方可使用。

5、网架结构安装完成后应将多余孔洞用油毡子堵塞(期限届时完成)。

6、运输、堆放时要正放平。

八、网架分析结果简要

1、杆件最大拉力/压力(685.8/-1614.9)KN。

2、最大挠度Z=-255.5mm

3、本计算结果仅为网架部分,钢筋砼柱由甲方根据网架支座底向力按计计算确定.

九、图例 上弦杆 —— 腹杆 —— 下弦杆 ---- 节点 ○ 支座

十、材料表中,所选用规格不但有卷板,若卷料难有

固理时,保经设计单位同意,材料表中下料长度为

理论下料长度,下料前需按比例实际放样,准确

校对各钢管尺寸无误,下料长度应避免出现错误。

十一、本钢网架施工图应经具有钢结构施工资质的施工单位进行

行细化并按样设计且经过甲方及设计院认可后方可施工安装。

十二、网架加工前应对现场尺寸进行复测,确认无误后方可加工安装。

十三、其它

网架安装及使用中均不允许在杆件上悬挂重物.

钢网架应定期进行检验,保养与维护,损坏构件应更换。

Grid design instructions

I. Project overview

1. Project name: Algeria Grid works
2. Structural type of the mesh frame: this mesh frame is a four-angle cone bolt ball carbon steel mesh frame.
3. See the frame plan.
4. Organized drainage of the network frame.
5. Network frame support form: multi-column point support.
6. The frame in the layout plan of the network frame is the support, and the support reverse force unit is Qianniu (KN).
7. Equipment weight: 0.20KN / m2
8. Structural safety level: Grade II.
9. Structural importance system: 1.0
II. Design specifications: (Construction must follow the following specifications)
1. Code for Load of Building Structure, GB50009-2012
2. Code for Seismic Design GB50011-2010 (2016)
3. Technical Specification for Space Grid Structure, JGJ7-2010
4. Design Standard for Steel Structure GB50017-2017
5. Steel Structure Engineering Construction Quality Acceptance Standard, GB50205-2020
6.Steel Grid Industry Standard JGJ75.1~75.3---91
7.Standard for Network Construction Engineering Quality Inspection and Evaluation(JGJ78-91)
8. Technical Specification for Cold-bent Thin-walled Steel Structure GB50018-2016
9. Fire Code for Building Design GBJ50016 (2018)
10. Welding Code for Building Steel Structure JGJ81-2002
11. High-strength bolts for steel balls GB116939-2016
12. Technical Code for Fire Protection of Building Steel Structure GB51249-2017
13. Unified Standard for Building Structure Reliability Design GB 50068-2018.

III. Design technical parameters
1. Quiet load of 0.50KN / m2
2. The upper load is 0.50KN / m2
3. Lower string static load of 0.00KN / m2
4. Basic air pressure: 0.55KN / m2
5. Basic snow pressure: 0.50KN / m2
6. Temperature change value: ± 30 degrees.
7. Earthquake fortification intensity: 7 degrees, basic seismic acceleration value of 0.15g, Design seismic group of the site is the first group, Site category is three categories, network frame damping ratio 0.02, key rod length fine ratio pull rod 180, pressure rod 150.
8. Ground roughness category: Class B.
9. The dead weight of the network frame is automatically formed by the computer program.
10. The load must act on the node, and shall not be overloaded in use, and the rod parts shall not bear the transverse load.
11. The computer-aided design system (MST2020)

IV. Material requirements
1. Steel pipe: The steel used in the structure shall meet the following requirements, and shall have a quality certificate and re-inspection report.
a. The ratio of measured yield strength of steel and tensile strength of steel shall not be greater than 0.85;
b. Steel shall have obvious yield steps, and elongation shall not be less than 20%;
c. Steel shall have good weldability and qualified impact toughness;
d. Adopt Q235B steel, and the material meets the relevant regulations of the material compliance (carbon structural steel GB / T700200б).
And had the tensile strength, elongation rate, yield strength, cold bending test and sulfur, phosphorus and carbon content of qualified assurance.Steel pipes may be high-frequency welded or seamless steel pipes.
The product quality meets the provisions of the <Straight Joint Welded Steel Pipe (GB / T 13793) or the Seamless Steel Pipe for Structure (GB / T 181 63).
2. Steel ball: the bolt ball shall be forged with No.45 steel specified in High Quality Carbon Structural Steel GB / T699-2015.
3. The surface shall be smooth, no cracks, no excessive burning and no jamming.
3. High strength bolts: use <steel frame bolt ball nodes>> (GB116939-2016)
Designated 40Cr, 20MnTiB, 35CrMo, 35VB steel, finished permitted.any
Quenched crack of a depth or any length.The performance grade of high strength bolts after quality adjustment must meet
<<Steel Frame Bolt Ball Joint hexagonal head bolts>> (GB1228).
The thread shall conform to level 6g in <ordinary thread tolerance and coordination>> (GB197), and the surface shall be blackened
And apply anti-rust oil.
4. Seal the plate.Tone head: the material shall meet the Q235B steel specified in GB / T700, steel pipe diameter greater than head of 75 must be used. Any section of the joint weld and the cone head shall be strong with the connected steel pipe, and the thickness shall be guaranteed
Requirements for proving strength and deformation.Seal plate, cone head appearance shall not be cracked.Over-burn and oxidized skin, and test reports.
5. Sleeve: The material shall meet the Q235B steel specified in Carbon Structural Steel GB / T700 or the Technical Conditions for Low Alloy Structural Steel
(GB1591) Steel specified in 45 Steel Steel Number and General Technical Conditions (GB699).
Surface and free of burning cracks.Over-burn and oxidized skin.
6. Requirements for bolt rod and reinforcement performance: the ratio of measured tensile strength of anchor bolt rod and reinforcement reinforcement to that of yield strength shall not be less than 1.25;
The ratio of the measured yield strength value to the standard yield strength value shall not be greater than 1.3, and the measured total elongation value at the maximum tensile force shall not be less than 9%.
7. Fastening screws: the materials use 40 chromium steel or 40 boron steel or No.70 spring steel.
8. Welding strip
A) When the base material is Q235B steel, E4303 shall be adopted and whose performance shall meet the provisions of Carbon Steel Welder (GB5117)
b) The base material is E43xx with No.45 welding strip, and the bat is preheated to 150-200 degrees C and using the positioning frame before welding;
c) Welding strip and two types of solids adopt CO 2 gas protection welding, the welding wire shall comply with Steel Welds for CO 2 Gas Protection Welding (GB8110).
9. All the materials used in the grid rack shall be with The factory qualification certificate, and the materials without the factory certificate must be tested and confirmed before they can be used. The quality of all products shall meet the Steel Grid Industry Standards.

V. Welding seam
1. Steel pipe and sealing plate.When the cone head forms a rod, the butt welds at both ends are strong welds.
2. The welding of the support bolt ball and the base must be preheated to the ball to 150-200 degrees C and using the positioning frame before welding;
3. Welds not indicated shall be full of welding, and the minimum weld height is 1.5 times the minimum member thickness and not less than Hf=6mm.
4. Double welding and splicing of steel pipe
A) Steel pipe butt weld, there shall not be two joints between the two adjacent nodes, and the minimum takeover length shall be greater that
At 800mm, and the pull rod shall not butt;
b) Steel pipe butt joint section, the angle of bilateral V joint is 60-90 degrees and the weld is high h> t (t is pipe wall)
c) When the pad is used, the weld root width is b 2mm and the pad thickness is 0.5t;
d) After the steel pipe docking, the linear tolerance shall not exceed 1 / 1000 of the nominal length.
5. Welding quality inspection of the network frame shall reach <<steel structure engineering construction quality acceptance standards>> and
Secondary standard requirements specified in (GB50205-2020).
6. The quality grade of welding seam shall comply with the Code of the current national standard Code for Steel Structure Engineering Construction Quality Acceptance of Construction Quality of Steel Structure Works
For butt weld with steel of less than 6mm thickness, the weld quality grade shall not be determined by ultrasonic flaw detection.

VI. Production and installation of the network frame
1. The production, transportation and installation of the mesh shall comply with the mesh Structure Design and Construction Regulations, JGJ7-2010 and
Acceptance Standard for Construction Quality of Steel Structure Works GB50205-2020, Bolt Ball node JG11-2016, The Standard for Inspection and Acceptance of Steel Network Rack, JG12-1999.
2. It is necessary to preassemble the components before leaving the factory; If holding, pay attention to the arrangement of lifting points and take necessary temporary reinforcement measures.
3. The excessive plate of the embedded parts and the network frame support plate are connected by bolts, so its position and elevation shall be absolutely guaranteed during the construction. In order to meet the requirements of lightning protection, the network frame support and the embedded steel plate of the column are welded and connected, and the embedded steel plate and the column have a long electrical bar.
Ensure that the position, elevation and flatness of the embedded parts shall meet the design requirements. The allowable deviation of the embedded parts is as follows:
a).The offset of the centerline and the positioning axis of the embedded parts is <15mm;
b).The elevation error is <30mm;
c).The steel plate flatness of the embedded parts is <3mm.
7. Grid frame for rust removal and coating
1. The steel must be completely removed before production, without rust, dust, oil, etc.The rust removal grade shall meet Sa2.5 in Steel Surface (GBT8923.4-2013)
2. After steel rust removal, paint and rust prevention primer according to the Standard for Construction Quality Acceptance of Steel Construction Engineering (GB50205-2020)
Two courses (2X35um), two finishes (2X35um); total dry paint film thickness is not less than 125um, and paint film damage site during installation
It shall be applied to no less than the protection level of adjacent parts; high strength bolts and bolt ball bolt threads shall be coated with anti-rust oil.
3. The single fire resistance grade of this building is Grade II; the fire prevention grade of the network frame is Grade II. The fire prevention of the steel structure should meet the requirements of the construction specialty and meet the specified fire resistance limit beam: 1.5 hours piling bar.Steel support: 2.0 hours; the fire protection of steel structure by spraying (coating) fire protection coating; indoor concealed components, using expansion type fire protection coating. The coating thickness of steel structure shall not be less than 3mm; the fire protection structure meets the GB51249-2017 for Building Steel Structure Fire Prevention
Section 4.2.1 Requirements.
4. Phase soluble test should be carried out between the selected steel structure fire prevention (anti-corrosion) paint and the anti-corrosion prevention paint (paint), which can only be used after the test is qualified.
5. After the installation of the network frame structure, the excess holes should be blocked with greasy felt (completed when painting).
Transportation.Prevent rain stain stacked.

VII. Brief network frame Stability results
1. Maximum tensile force / pressure (1644.2/-2369.2) KN.
2. Maximum deflection of Z=-178.2mm
3. The calculation result is only the grid part.Reinforced concrete column shall be determined by Party A according to the internal force design of the network frame support base.

IX. Illustration
Upper string bar — abdomen bar— lower string bar— node ○support

X. In the materials table, the selected specifications shall not be replaced arbitrarily, if the materials are available
In difficult, the consent of the design unit, and the material length in the material table is The the length of the material, the local real sample of the grid should be released before the material Check the size of each steel pipe, the length of the material shall avoid negative error.

11. The construction drawing of the steel grid frame shall be carried out by the construction unit with the steel structure construction qualification

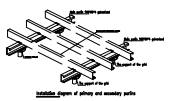
Detailed and sample cut, design and approved by Party A and the design institute

XII. The site size of the grid shall be retested before processing, and it can be processed and installed after it is correct.

Thirteen, other

Heavy objects are not allowed to be suspended on the rod parts in the installation and use of the network frame.

Steel mesh frames shall be regularly inspected, maintained and maintained, and vulnerable components shall be replaced.



Installation diagram of primary and secondary parts