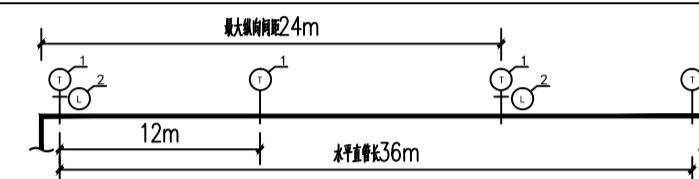
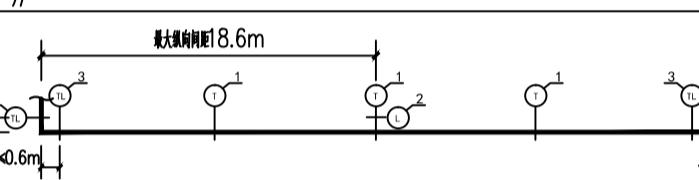
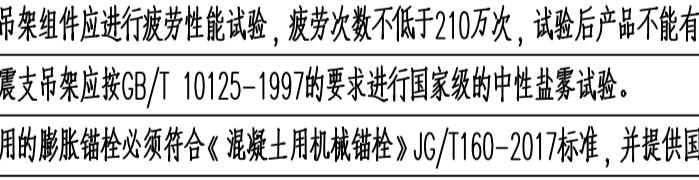
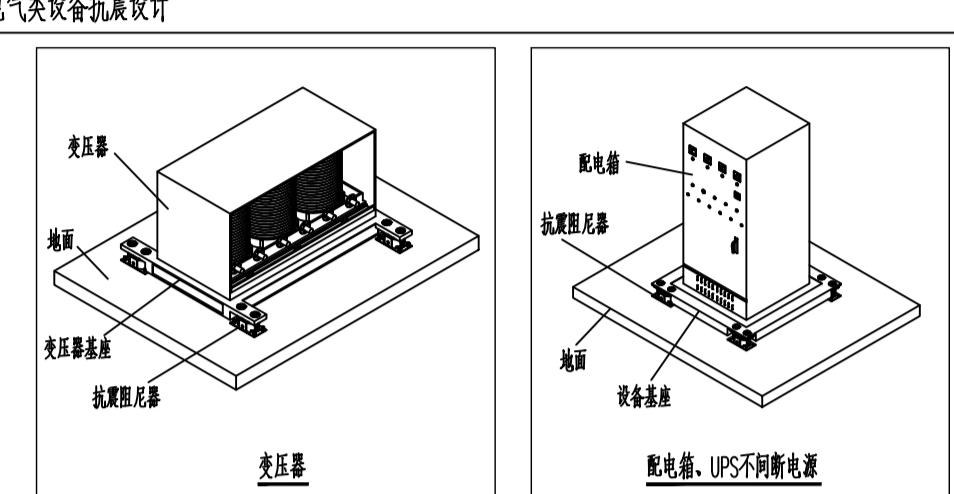


电气专业抗震设计说明

一、工程概况		3. 每段水平直管道应至少设置一个纵向抗震支吊架，当两个纵向抗震支吊架间距超过最大设计间距时，应按《建筑机电工程抗震设计规范》第8.2.3条要求间距依次增设纵向抗震支吊架。例如：刚性连接金属管道为36m，按最大24m的间距依次设置纵向支撑，直至所有支撑间距均满足要求。			
二、设计依据		 <p>1-侧向抗震支吊架 2-纵向抗震支吊架</p>			
2.1 依据《建筑抗震设计规范》GB50011-2010, 3.7.1(强条) 非结构构件，包括建筑非结构构件和建筑附属机电设备，自身与结构主体的连接应进行抗震设计；		<p>4. 刚性连接的水平管道，两个相邻的加固点允许纵向偏移，水管及电线套管不得超过最大侧向支吊架间距的1/16，风管、电缆梯架、电缆托盘和电缆槽盒不得超过其宽度的两倍。</p>  <p>1-侧向抗震支吊架</p>			
2.2 依据《建筑机电工程抗震设计规范》GB50981-2014, 1.0.4(强条) 抗震设防烈度为6度及6度以上地区的建筑工程必须进行抗震设计；		<p>5. 水平管道在转弯处0.6m范围内设置侧向抗震支吊架。若斜撑直接作用于管道，可共作为另一侧墙线的纵向抗震支吊架。例如：纵向抗震支吊架最大间距24m，侧向抗震支吊架最大间距12m，则双向抗震支吊架距下一纵向抗震支吊架间距为(24+12)/2+0.6=18.6m。</p>  <p>1-侧向抗震支吊架 2-纵向抗震支吊架 3-侧向抗震支吊架</p>			
三、设计目的		<p>机电设备的抗震设计使建筑给水排水、供暖、通风、空调、燃气、热力、电力、通讯、消防等机电工程设施遭遇地震后，取得减轻地震破坏，防范次生灾害，尽量避免人员伤亡，减少经济损失的效果。</p>			
四、设计范围		<p>7. U型槽钢为冷弯型槽钢，截面尺寸为41×41mm、41×62mm等，长度为3m或6m的标准型材，钢材为Q235B及以上级别，槽钢理论壁厚不低于2.0mm。</p> <p>8. 抗震支吊架U型槽钢内缘须带齿牙，且齿牙深度不小于0.9mm，并且所有零件的安装依靠机械咬合实现，以保证整个系统的可靠连接。</p> <p>9. 支吊架组装过程中，应做到可视化检测。</p> <p>10. 抗震支吊架系统，应具备权威机构第三方检测报告，包含以下内容：</p>			
抗震支吊架系统设计主要包括内容：		<p>10.1. 抗震连接构件：管道连接构件等逐个具有力学性能检测报告，且抗震连接座的试验在20.25kN的试验荷载下，不能出现塑性变形和断裂，确保管束在地震作用下的安全荷载；</p> <p>10.2. 抗震支吊架按图集CJ/T 476-2015的要求进行国家级的第三方权威机构进行外观、部件荷载、组合荷载及防腐性能的检测试验，试验力值应以9kN为起始试验荷载，试验后的力值不低于8.95kN；</p> <p>10.3. 槽钢锁扣应进行防滑测试；</p> <p>10.4. 槽钢应同时具备三面抗压检测，正面不低于23.6kN，侧面不低于13.5kN，背面不低于22.5kN；</p> <p>10.5. 支吊架所有材质应采用国家标准《碳素结构钢》GB/T 700规定的Q235钢，并具有相关国家的材料性能（应包含屈服强度不低于315MPa，断后伸长率不低于27.5%）报告，材料需经镀锌钝化处理，镀层满足GB/T4956-2003的要求，涂层厚度不低于60μm（螺牙产品不低于50μm），能够满足长期使用性能要求；</p> <p>10.6. 支吊架组件应进行耐火性能试验，试验时长不低于120min，管夹不允许断裂，吊槽钢最大变形量不超过5mm；</p> <p>10.7. 支吊架组件应进行疲劳性能试验，疲劳系数不低于210万次，试验后产品不能有明显的断裂或者裂纹；</p> <p>10.8. 抗震支吊架应按GB/T 10125-1997的要求进行国家级的中性盐雾试验。</p> <p>10.9. 采用的膨胀管件必须符合《混凝土用机械锚栓》JC/T160-2017标准，并提供国家建筑中心的检测报告；</p>			
2. 当两个侧向抗震支吊架间距超过最大设计间距时，应在中间增设侧向抗震支吊架。例如：刚性连接金属管道长为24m，侧向抗震支吊架最大间距12m，首先于两端加设侧向支撑，再依次按12m设置侧向支撑。		 <p>1-侧向抗震支吊架</p>			
六、抗震支吊架设计要求		<p>根据GB-50981规定，水平地震力应按预定负荷时的重力荷载计算；管道的侧向抗震支撑应计入未设抗震支撑管道的纵向水平地震力。</p>			
七、抗震支吊架间距计算规则					
根据GB-50981规定中规定，水平地震力应按预定负荷时的重力荷载计算；管道的侧向抗震支撑应计入未设抗震支撑管道的纵向水平地震力。					
八、电气系统机电设备抗震设计图例					
1. 电气类设备抗震设计					
					
2. 对于内径大于等于80mm的电气配管及重力大于等于150N/m的电缆梯架、电缆槽盒、母线槽应进行抗震设计。					
2.1 根据现场安装空间的大小、需要及16D707-1第24~25页，可以采用符合承载能力要求的单侧抗震支撑，安装形式示意图：					
<img alt="Two diagrams showing single-sided seismic support for a cable ladder架 (left) and a cable tray架 (right). Labels include: 电缆梯架单侧向支撑 (single-sided seismic support for cable ladder架), 电缆梯架双侧向支撑 (double-sided seismic support for cable ladder架), 电缆梯架 (cable ladder架), 侧向连接座 (lateral connection seat), 侧向连接座A (lateral connection seat A), 侧向连接座B (lateral connection seat B), 侧向连接座C (lateral connection seat C), 侧向连接座D (lateral connection seat D), 侧向连接座E (lateral connection seat E), 侧向连接座F (lateral connection seat F), 侧向连接座G (lateral connection seat G), 侧向连接座H (lateral connection seat H), 侧向连接座I (lateral connection seat I), 侧向连接座J (lateral connection seat J), 侧向连接座K (lateral connection seat K), 侧向连接座L (lateral connection seat L), 侧向连接座M (lateral connection seat M), 侧向连接座N (lateral connection seat N), 侧向连接座O (lateral connection seat O), 侧向连接座P (lateral connection seat P), 侧向连接座Q (lateral connection seat Q), 侧向连接座R (lateral connection seat R), 侧向连接座S (lateral connection seat S), 侧向连接座T (lateral connection seat T), 侧向连接座U (lateral connection seat U), 侧向连接座V (lateral connection seat V), 侧向连接座W (lateral 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seat YY), 侧向连接座ZZ (lateral connection seat ZZ), 侧向连接座AA (lateral connection seat AA), 侧向连接座BB (lateral connection seat BB), 侧向连接座CC (lateral connection seat CC), 侧向连接座DD (lateral connection seat DD), 侧向连接座EE (lateral connection seat EE), 侧向连接座FF (lateral connection seat FF), 侧向连接座GG (lateral connection seat GG), 侧向连接座HH (lateral connection seat HH), 侧向连接座II (lateral connection seat II), 侧向连接座JJ (lateral connection seat JJ), 侧向连接座KK (lateral connection seat KK), 侧向连接座LL (lateral connection seat LL), 侧向连接座MM (lateral connection seat MM), 侧向连接座NN (lateral connection seat NN), 侧向连接座OO (lateral connection seat OO), 侧向连接座PP (lateral connection seat PP), 侧向连接座QQ (lateral connection seat QQ), 侧向连接座RR (lateral connection seat RR), 侧向连接座SS (lateral connection seat SS), 侧向连接座TT (lateral connection seat TT), 侧向连接座UU (lateral connection seat UU), 侧向连接座VV (lateral connection seat VV), 侧向连接座WW (lateral connection seat WW), 侧向连接座XX (lateral connection seat XX), 侧向连接座YY (lateral connection seat YY), 侧向连接座ZZ (lateral connection seat ZZ), 侧向连接座AA (lateral connection seat AA), 侧向连接座BB (lateral connection seat BB), 侧向连接座CC (lateral connection seat CC), 侧向连接座DD (lateral connection seat DD), 侧向连接座EE (lateral connection seat EE), 侧向连接座FF (lateral connection seat FF), 侧向连接座GG (lateral connection seat GG), 侧向连接座HH (lateral connection seat HH), 侧向连接座II (lateral connection seat II), 侧向连接座JJ (lateral connection seat JJ), 侧向连接座KK (lateral connection seat KK), 侧向连接座LL (lateral connection seat LL), 侧向连接座MM (lateral connection seat MM), 侧向连接座NN (lateral connection seat NN), 侧向连接座OO (lateral connection seat OO), 侧向连接座PP (lateral connection seat PP), 侧向连接座QQ (lateral connection seat QQ), 侧向连接座RR (lateral connection seat RR), 侧向连接座SS (lateral connection seat SS), 侧向连接座TT (lateral connection seat TT), 侧向连接座UU (lateral connection seat UU), 侧向连接座VV (lateral connection seat VV), 侧向连接座WW (lateral connection seat WW), 侧向连接座XX (lateral connection seat XX), 侧向连接座YY (lateral connection seat YY), 侧向连接座ZZ (lateral connection seat ZZ), 侧向连接座AA (lateral connection seat AA), 侧向连接座BB (lateral connection seat BB), 侧向连接座CC (lateral connection seat CC), 侧向连接座DD (lateral connection seat DD), 侧向连接座EE (lateral connection seat EE), 侧向连接座FF (lateral connection seat FF), 侧向连接座GG (lateral connection seat GG), 侧向连接座HH (lateral connection seat HH), 侧向连接座II (lateral connection seat II), 侧向连接座JJ (lateral connection seat JJ), 侧向连接座KK (lateral connection seat KK), 侧向连接座LL (lateral connection seat LL), 侧向连接座MM (lateral connection seat MM), 侧向连接座NN (lateral connection seat NN), 侧向连接座OO (lateral connection seat OO), 侧向连接座PP (lateral connection seat PP), 侧向连接座QQ (lateral connection seat QQ), 侧向连接座RR (lateral connection seat RR), 侧向连接座SS (lateral connection seat SS), 侧向连接座TT (lateral connection seat TT), 侧向连接座UU (lateral connection seat UU), 侧向连接座VV (lateral connection seat VV), 侧向连接座WW (lateral connection seat WW), 侧向连接座XX (lateral connection seat XX), 侧向连接座YY (lateral connection seat YY), 侧向连接座ZZ (lateral connection seat ZZ), 侧向连接座AA (lateral connection seat AA), 侧向连接座BB (lateral connection seat BB), 侧向连接座CC (lateral connection seat CC), 侧向连接座DD (lateral connection seat DD), 侧向连接座EE (lateral connection seat EE), 侧向连接座FF (lateral connection seat FF), 侧向连接座GG (lateral connection seat GG), 侧向连接座HH (lateral connection seat HH), 侧向连接座II (lateral connection seat II), 侧向连接座JJ (lateral connection seat JJ), 侧向连接座KK (lateral connection seat KK), 侧向连接座LL (lateral connection seat LL), 侧向连接座MM (lateral connection seat MM), 侧向连接座NN (lateral connection seat NN), 侧向连接座OO (lateral connection seat OO), 侧向连接座PP (lateral connection seat PP), 侧向连接座QQ (lateral connection seat QQ), 侧向连接座RR (lateral connection seat RR), 侧向连接座SS (lateral connection seat SS), 侧向连接座TT (lateral connection seat TT), 侧向连接座UU (lateral connection seat UU), 侧向连接座VV (lateral connection seat VV), 侧向连接座WW (lateral connection seat WW), 侧向连接座XX (lateral connection seat XX), 侧向连接座YY (lateral connection seat YY), 侧向连接座ZZ (lateral connection seat ZZ), 侧向连接座AA (lateral connection seat AA), 侧向连接座BB (lateral connection seat BB), 侧向连接座CC (lateral connection seat CC), 侧向连接座DD (lateral connection seat DD), 侧向连接座EE (lateral connection seat EE), 侧向连接座FF (lateral connection seat FF), 侧向连接座GG (lateral connection seat GG), 侧向连接座HH (lateral connection seat HH), 侧向连接座II (lateral connection seat II), 侧向连接座JJ (lateral connection seat JJ), 侧向连接座KK (lateral connection seat KK), 侧向连接座LL (lateral connection seat LL), 侧向连接座MM (lateral connection seat MM), 侧向连接座NN (lateral connection seat NN), 侧向连接座OO (lateral connection seat OO), 侧向连接座PP (lateral connection seat PP), 侧向连接座QQ (lateral connection seat QQ), 侧向连接座RR (lateral connection seat RR), 侧向连接座SS (lateral connection seat SS), 侧向连接座TT (lateral connection seat TT					