Test Report
EN 1808
Safety requirements for suspended access equipment - Design calculations, stability criteria, construction - Examinations and tests

Report Number.....:	HPT-230608L0923S
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Applicant's name.....:	Beijing Ihurmo Industry Co., Ltd.
Address.....:	Beiqijia Industrial Park, Changping District,Beijing102204,China
Test specification:	
Standard.....:	EN 1808:2015: Safety requirements for suspended access equipment - Design calculations, stability criteria, construction - Examinations and tests
Test procedure.....:	MD Report
Non-standard test method……..:	N/A
Test item description……..:	Suspended platform
Trade Mark.....:	N/A
Manufacturer.....:	Same as Applicant
Model/Type reference.....:	ZLP250, ZLP500, ZLP630, ZLP800, ZLP1000

Testing procedure and testing location:

Testing Laboratory.....:	**Shenzhen Huapin Testing Technology Co., Ltd.**
Address.....:	Room 302, Comprehensive Building, Songbai Industrial Park, No 4, Yangyong Industrial Road, Tangxiayong Community, YanluoStreet, Bao'an District , Shenzhen.
Date of Test.....:	Jun 05, 2023 to Jun 14, 2023
Tested by (name + signature).....:	Evan Guo
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Approved by(name + signature).....:	Lody Guo

List of Attachments (including a total number of pages in each attachment): Attachment 1: Photos, 1 pages.
Summary of testing: The product covered by this report has been tested and complies with the applicable requirements of this standard.

Tests performed (name of test and test clause): All applicable tests.	**Testing location:** See page 2 testing lab and location for details.

Summary of compliance with National Differences (List of countries addressed): ☒ **N/A**
Possible test case verdicts: - test case does not apply to the test object..... : N/A (or N) - test object does meet the requirement..... : P (Pass) - test object does not meet the requirement.....: F (Fail)

EN1808			
Clause	Requirement – Test	Result – Remark	Verdict
6	Structural, stability and mechanical calculations for SAE		P
6.1	General		P
	The design calculations for all SAE shall be carried out in accordance with European codes and engineering practices including, if necessary, the effects of elastic deformations. All failure modes of materials shall be considered including fatigue and wear.		P
6.2	Safety margin allowed within the calculations		N/A
6.2.1	Calculating the stresses in structures		P
6.2.1.1	General		N/A
	For the three load cases defined in Table 2 and Table 3 the calculation of the different members is set out allowing a safety margin for the critical stresses. Taking the three common failure modes into account:		P
6.2.1.2	Allowable stresses		P
	For carbon and stainless steels where the ratio between the elastic yield limit σE and the breaking limit σR is less than 0,7 refer to Table 2. Where the ratio is higher than 0,7 refer to FEM 1.001 booklet 2.		N/A
6.2.1.3	Checks against fatigue		P
	For SAE structures subject to fatigue the minimum number of cycles and load spectrum to take into account are set out in Table 4.		N/A
6.2.2	Calculating the stress in mechanisms		P
6.2.2.1	General		P
	The calculated stress shall not exceed the allowable stress derived from Table 5, using the breaking stress of the material.		N/A
6.2.2.2	Checks against fatigue and wear		P
	For mechanical parts subject to fatigue and wear (except for surfaces in contact with wire ropes) the minimum number of operating hours and load spectrum to take into account are set out in Table 6.		N/A
6.3	Design loads and forces		P
6.3.1	General		P

	The rated load (RL) of the SAE and the maximum number of persons (n) permitted on the SAE are to be stated by the manufacturer or supplier (see 3.6.2).		P
6.3.2	TSAE Compatibility		P
	Since some TSAE incorporating platform mounted hoists are modular the WLL of the suspension rig and its accessories shall be equal to or greater than the WLL of the hoists plus the reaction transmitted by the weight of the safety ropes, tension weights and the power cable.		P
6.3.3	De-rating the WLL of hoist(s)		P
	The WLL of hoists may be de-rated by the manufacturer or his appointed representative, providing the condition in 6.3.2 is satisfied.		N/A
6.3.4	Rated load on the platform		P
6.3.4.1	Platform for one person		N/A
	RL Mp Me Mm (Minimum RL = 120 kg)		N/A
6.3.4.2	Minimum load capacity		P
	The minimum load capacity of the deck (RF) shall be 200 kg/m2.		P
6.3.4.3	Calculation of RL		N/A
	The RL is calculated in accordance with the formulae (1) or (2) and distributed over a surface area Sa located on a length T:		N/A
6.3.4.4	Single point suspended platform or chair		N/A
	The minimum RL shall be 120 kg.		N/A
6.3.4.5	Two point suspended platform		P
6.3.4.5.1	To prove the strength of the platform the RL, distributed over a length T, is assumed to be applied in the most unfavourable position.		P
6.3.4.5.2	If a two point suspended platform extends beyond a suspension point a stability coefficient against overturning of 2 shall be applied to the load (W) located on the cantilevered section of the platform to ensure adequate stability.		P
6.3.4.6	Multi-point suspended platform and hinged continuous platform		P
6.3.4.6.1	The RL is calculated in accordance with the Formulae (1) or (2) and distributed over a surface area Sa as shown in Figure 5.		N/A
6.3.4.6.2	For a wide work platform where T<B as shown in Figure 7 Sa is a square area with a side dimension equal to:		N/A
6.3.5	Wind loads		P

6.3.5.1	Design wind speeds in accordance with Table 7 that should be considered for all SAE likely to be affected by wind when in service.		P
6.3.5.2	The full exposed area of one person standing on an open TSP platform is 0,7 m2 with the person's effective centre of area 1 m above the platform floor.		P
6.3.5.3	Wind loads are assumed to act horizontally at the centre of the area of the component parts of SAE.		P
6.3.5.4	The wind loads acting on a platform shall be considered to be acting on the suspension points of the associated suspension rig.		N/A
6.3.5.5	For BMUs an additional calculation is needed for storm force winds with the machine in the parked position.		N/A
6.3.5.6	Calculations shall be used to prove that a suspension rig will not move by wind forces alone, whether in service or in the parked position, when the service brake(s) have been applied. Where storm wind forces can move a suspension rig an anchoring device shall be provided at the parking position.		N/A
6.3.6	Forces exerted by persons		P
6.3.6.1	The minimum value to be used for the forces exerted by persons on the guardrails or top edge of a rigid side of a platform is assumed to be 200 N for each of the first two persons on the platform and 100 N for each additional person, these forces acting in the horizontal direction at 500 mm intervals.		N/A
6.3.6.2	The guardrail or top edge of a rigid side of a platform shall be able to resist, without permanent deflection, a vertical load of 1 kN applied at the most unfavourable position.		N/A
6.3.6.3	The mesh or cladding of a platform shall not fail when a horizontal force of 200 N distributed over an area of 100 × 100 mm is applied at any location on the surface.		N/A
6.4	Platform structural calculations		P
	The strength of the platform is to be proven by calculation for the load cases expressed below:		N/A
6.5	Calculations for suspension rigs		P
6.5.1	General		P
	Suspension rigs shall be designed and constructed to withstand the loads derived from the static and dynamic tests and any additional dynamic loads caused by a failure of a hoist or suspension wire rope.		N/A
6.5.2	SAE incorporating auxiliary material hoist		P

	Stability and strength calculations of the machine, including the materials hoist, to be performed in accordance with Table 9 or Table 10 and Table 11 or Table 12.		N/A
6.5.3	Structural calculations for suspension rigs		P
6.5.3.1	Structural calculations for BMU suspension rigs		P
	The strength of BMU suspension rigs with either roof or platform-mounted hoists shall be proven by calculations for the load cases given in Table 9 (see Figure 11).		N/A
6.5.3.2	Structural calculations for TSP suspension rigs		N/A
	The strength of a TSP suspension rig is to be proven for the load cases given in Table 10.		N/A
6.5.4	Stability calculations for suspension rigs		P
6.5.4.1	Stability calculations for BMU suspension rigs		P
	This section applies to rail and non-rail mounted BMU suspension rigs with either roof or platform-mounted hoists. The rails may contribute to the resistance to the overturning moment if the anchoring system and roof structure have been designed accordingly.		N/A
6.5.4.2	Stability calculations for TSP suspension rigs		N/A
	This section applies to rail and non-rail mounted TSP suspension rigs. The rails may contribute to the resistance to the overturning moment if the anchoring system and roof structure have been designed accordingly.		N/A
6.5.5	Rail tracks and their support systems		P
	The following items shall be checked against limiting values:		P
6.5.6	Requirements for other suspension rigs		P
6.5.6.1	Strength of davit mechanical anchors		N/A
	This section applies to a davit that is fixed to a roof structure.		N/A
6.5.6.2	Calculation for parapet clamp		N/A
	A parapet clamp is regarded as having adequate strength if the clamp withstands the forces imposed in Formula 12 and Formula 13.		N/A
6.5.6.3	Monorails		N/A

	Monorails should be calculated in accordance with Table 13. Monorails for suspended platforms with more than one hoist should be calculated in such a way that only one hoist or suspension system is assumed to fail. This means that a load of 2,5 × WLL is used for the first or only hoist and 1,25 × WLL for any other hoist(s).		N/A
6.5.6.4	Monorail support anchors		P
	All partially or totally hidden fixings associated with SAE should be designed for the lifetime of the building or structure using appropriate materials to ensure that enclosed components are not required to be exposed in the future to check for possible corrosion.		P
6.5.6.5	Stability calculation for counterweighted suspension beam		P
	A suspension beam is regarded as stable if, when referring to the most unfavourable fulcrum, the stability moment is equal to or greater than three times the overturning moment when the WLL of the beam in its working configuration.		N/A
6.5.6.6	Secondary wire rope anchor on rigid structures		P
	When secondary wire rope anchor points are attached to a structure having a high rigidity (e.g. concrete or metal structures) the stresses within the anchor points, the SAE and the structure itself shall not exceed the yield limit of the materials when calculating the stresses imposed by a force equal to:		N/A
6.6	Loadings on the building		N/A
6.6.1	Safety factors		N/A
	The design calculations defined in this standard are carried out in accordance with the permissible stress method.		N/A
6.6.2	Recommended values for partial safety factor (f)		P
	Load case 1 = Variables actions in normal operating condition		P
6.7	Calculation for steel wire rope		P
	NOTE These requirements apply to all suspension and secondary steel wire ropes involved directly or indirectly in supporting a platform.		P
6.7.1	General		P
	The self-weight of the rope shall be included in the calculations.		P
6.7.2	Calculation of the Force S in the suspension wire rope		P
6.7.2.1	Roof mounted hoist with double active rope suspension system		N/A

	S is equal to the total self-weight of the platform plus the self-weight of the ropes and the RL permitted on the platform placed on the area Sa located in the most unfavourable position (see 6.3.4 for calculation of RL and Sa) divided by the number of steel wire ropes or falls on the most loaded suspension point. See load in position +) in Figure 7 and Figure 8.		N/A
6.7.2.2	Platform mounted hoist		N/A
	S is equal to the WLL of the hoist divided by the number (Nr) of steel wire ropes used in that hoist carrying the suspended load. The self-weight of the ropes and any tension weights shall be included in the calculation.		N/A
6.7.3	Rope terminations		P
	Rope terminations that carry the full suspended load and their associated safety ropes shall be capable of supporting at least 80 % of the minimum breaking load of the rope.		N/A
6.8	Calculation for restraint systems		P
	The mullion guide and anchor restraint points shall be securely attached to the building and capable of withstanding the operational and wind loads imposed upon them with the platform in any position. The members linking the platform to the mullions or anchor restraint points shall also be capable of withstanding the operational and wind loads imposed upon them. For calculation purposes, the minimum design value of the force applied by the restraint system at a single point on vertical facades shall be 1 kN in any direction.		N/A
7	Suspended platforms		P
7.1	Requirements for the platform		P
7.1.1	The dimensions shall be sufficient for the number of persons allowed on the platform together with their tools and materials. As a general rule, the minimum internal width of the platform ignoring any control boxes and panels should be not less than 500 mm. The working surface shall be at least 0,25 m2 per person.		P
7.1.2	The decking of the platform shall have a sound, slip resistant surface (e.g. latticed or chequer plate). It shall be fixed so that it can only be removed by intention.		P
7.1.3	Any openings in the decking shall be dimensioned so as to prevent the passage of a sphere of 15 mm in diameter. Adequate provision shall be made for drainage.		N/A

7.1.4	Guardrails, intermediate rails and toe boards shall be fitted to the perimeter of the platform. The height to the top of the guardrail shall be not less than 1,0 m measured from the upper side of the rail to the surface of the platform decking. The clear vertical distance between the intermediate rails and either guardrails or toe boards shall not exceed 500 mm. Intermediate rails are not required if the platform is clad. For TSPs, toe boards shall be not less than 150 mm above the surface of the platform decking. Toe boards are not required if the platform is clad. There shall be no sharp edges or corners.		P
7.1.5	Where there is a high risk of objects falling onto the platform and endangering persons then it shall be provided with a roof or other means of protection.		P
7.1.6	Where a specific Risk Assessment indicates that there is a need for PPE e.g. on a BMU, which has a roof mounted hoist system and the platform is being manually lowered, (in an emergency situation) the platform could rest on a ledge or obstruction and could become unbalanced and tilt.		N/A
7.1.7	Minimum height of stirrups:		N/A
7.1.8	Components shall not have sharp edges, angles or protruding parts that could cause injury.		N/A
7.2	Modular platforms		P
7.2.1	All components shall be designed to ensure that they cannot be incorrectly assembled. Fixing bolts and other devices shall be clearly visible without any dismantling.		P
7.2.2	Components that form joints shall be designed to withstand the stresses they will have to support during use and repeated assembly and disassembly so that once assembled they can only be dismantled by intention.		N/A
7.2.3	Small parts such as anchor pins and retaining clips shall be joined together by permanent linking connections.		N/A
7.3	BMU platforms		P
7.3.1	BMUs with platform-mounted hoists shall be provided with wire winders to store the suspension and safety ropes with guards that allow their operation to be visually monitored. Management of the power cable by means of a storage compartment or other means is to be considered.		P
7.3.2	All sides of BMU platforms shall be completely enclosed. If mesh sides are incorporated they shall be so designed to prevent the passage of a sphere of 15 mm diameter except for foot holes. Where appropriate, platforms shall be fitted with handles and foot holes that assist users when entering or leaving the platform.		N/A

7.4	Platform gates		P
7.4.1	Access gates shall slide or open inwards.		P
7.4.2	Access gates shall be constructed to return automatically to the closed and fastened position or shall be interlocked to prevent operation of the SAE until they are closed and fastened. The access gate shall only open by intentional intervention.		N/A
7.5	Multi-deck platforms		P
7.5.1	A multi-deck platform can be a TSP or BMU depending upon the location and nature of the task.		P
7.5.2	If two or more decks, one above the other, are used, a hatch shall be provided in the upper deck with a ladder allowing safe access between the decks. The hatch shall open upwards and not obstruct the ladder and shall not be able to remain in the open position.		N/A
7.5.3	The minimum clear height between two decks shall be 2 m.		P
7.5.4	Where the distance between the two decks is greater than 2,5 m protection hoops on the access ladder shall start at 2 m height measured from the surface of the lower platform base.		P
7.6	Suspended chairs		P
7.6.1	A suspended chair can be a TSP or BMU depending upon the location and nature of the task.		P
7.6.2	The seat of a chair shall not be less than 450 mm wide.		N/A
7.6.3	The back of the chair shall conform to Figure 4a) and shall be curved to fit the dorsal form.		N/A
7.6.4	A two-point restraint belt with a width of at least 40 mm shall be provided for the operator. Each anchor point of the two-point restraint belt shall have a minimum resistance to deformation of 1,2 kN.		N/A
7.6.5	All controls, including the emergency stop, shall be within easy reach of the operator.		N/A
7.7	Restraint systems		P
7.7.1	General		P
	Where SAE is used in outdoor locations affected by wind and where the working height above ground level determines that a working rope length of greater than 40 m will be required then a platform restraint system is deemed to be necessary or limitations should be placed on its use.		N/A
7.7.2	Mullion guide systems		P

7.7.2.1	Limit switches shall automatically stop the downward motion of a suspended platform to ensure that the restraint assemblies do not disengage from the mullion guides at the lowest level. If the lower ends of the guides are higher than ground level then provision shall be made to ensure that the platform and persons may be transferred to a position of safety should an emergency arise.		P
7.7.2.2	The mullion guides shall be designed so that the restraint assemblies may be easily attached or detached. Provision shall be made for operators to attach and detach these assemblies on the platform without the need for tools, at any position.		N/A
7.7.3	Suspension wire rope restraint systems		P
	On BMU installations where a wire rope restraint system is employed the system shall be designed to conform to the following conditions:		P
7.7.4	Placing strict limitations on permitted wind speed		N/A
	On buildings up to 60 m in height operational limits on the use of a BMU system based on wind speed can be applied under certain circumstances where no platform restraint system is installed. This approach will inevitably reduce the time during which a BMU is available for use however.		N/A
7.7.5	Other restraint systems		P
	Other systems of cradle restraint may be utilized provided the general parameters given above are maintained.		P
7.8	Wall rollers and buffers on the platform		P
	Suspended platforms shall be provided with facade protection on their working face(s). This may take the form of buffer rollers or strips (see Figure 3 and Figure 4).		N/A
7.9	Platforms working on an incline		P
7.9.1	Additional requirements apply where suspension rigs for platforms suspended by wire ropes are working on an incline.		P
7.9.2	The platform shall be provided with rollers rolling on the incline. The number and location of rollers shall be appropriate to the maximum forces that the platform is capable of withstanding. The number and location of the rollers shall be such that the platform remains stable in use.		N/A
7.9.3	By design the platform deck shall remain horizontal within a tolerance of +/-8 degrees in both the longitudinal and lateral planes when the platform is rolling on an incline.		N/A

7.9.4	The hoisting system and associated wire rope winder(s) shall be designed to avoid any slack in the suspension rope or secondary rope. If a slack rope situation occurs lowering shall be automatically stopped.		N/A
7.9.5	If, at the end of the incline, the facade continues downwards vertically a limit switch shall detect the end of the incline and further lowering prevented.		N/A
7.9.6	The SAE shall be provided with a means for safe egress of personnel in the event of loss of power to the equipment.		N/A
7.9.7	Calculations for the stability of the suspension rig shall take into account the value and direction of forces imposed by the platform while working on an inclined facade.		N/A
8	Hoisting systems		P
8.1	General		P
8.1.1	Hoisting system		P
	A hoisting system for SAE generally incorporates hoist(s), wire ropes, pulleys and guides and associated drive systems and safety related parts.		P
8.1.2	Pulleys		P
	Minimum pitch diameter of pulleys, drums and traction sheaves is given by the following formula:		P
8.1.3	Mechanical transmission		N/A
8.1.4	Moving parts		N/A
	All moving parts of a hoist shall be guarded. For guidance, refer to EN ISO 13849-1.		N/A
8.1.5	Wire rope guides		P
	The hoisting system shall be designed so that the wire ropes are guided through the hoist(s), secondary device(s) and pulley(s) to prevent the wire ropes leaving their intended route.		N/A
8.1.6	Service brakes		P
8.1.6.1	A hoist shall be provided with a service brake which operates automatically in the event of:		N/A
8.1.6.2	An irreversible gearbox is not regarded as a brake.		N/A
8.1.6.3	The service brake shall be capable of stopping the platform travelling at rated speed and with 1,25 times the WLL within a distance of 10 cm.		N/A
8.1.6.4	The material used for brake linings shall not be flammable.		N/A
8.1.6.5	A cover against ingress of lubricants, water, dust or other contaminants shall protect brake blocks and linings.		N/A

8.2	Manually operated hoists		P
8.2.1	General		P
8.2.1.1	A manually operated hoist shall be designed to require a positive crank or lever force to lift or lower the load.		N/A
8.2.1.2	A manually operated hoist shall be provided with a means to prevent uncontrolled movement or descent. Uncontrolled movement is understood to be a movement of more than a quarter of a turn of a crank or more than 10° angle of a lever.		N/A
8.2.2	Crank operated hoists		P
8.2.2.1	The mechanical advantage offered by the gear reduction system and manual crank shall not permit lifting of a load in excess of 2,5 times the WLL when a force of 625 N is applied to the end of a crank.		P
8.2.2.2	The maximum force applied to the end of a crank for lifting the WLL of the hoist shall not exceed 250 N.		N/A
8.2.3	Lever operated hoists		N/A
8.2.3.1	The mechanical advantage offered by the gear reduction system and lever shall not permit lifting of a load in excess of 2,5 times the WLL when a force of 1 kN is applied to the end of the lever.		N/A
8.2.3.2	The maximum force applied to the end of a lever for lifting the WLL of the hoist shall not exceed 400 N.		N/A
8.3	Power operated hoists		P
8.3.1	Prime mover		P
8.3.1.1	A power-operated hoist shall be designed to be power operated when lifting and when lowering.		P
8.3.1.2	A hoist shall be able to lift and lower a load at least equal to 125 % of its WLL. If a hoist can lift a load of more than 250 % of its WLL without stalling then an additional safety device (additional to the overload device) such as a current overload device, thermal overload device or torque limiting device shall be incorporated.		N/A
8.3.2	Electro-mechanical service brakes		N/A
	NOTE In addition to 8.1.6, the following requirements apply:		N/A
8.3.2.1	In service conditions a continuous flow of current shall hold off the brake. An independent electrical device shall effect interruption of this current. If DC current feeds the brake coils an independent electrical contact shall be installed to interrupt the DC supply.		N/A

8.3.2.2	When the electric motor of the hoist is likely to function as a generator the electric device operating the brake shall not be fed by the driving motor. Braking shall become effective within 0,3 s after opening of the brake release circuit.		N/A
8.3.2.3	The action of the brake shall be applied by compression springs. These springs shall be supported and shall not be stressed in excess of 80 % of the torsional elastic limit of the material. Band brakes are not permitted.		N/A
8.3.3	Pneumatic and hydraulic mechanical service brakes		P
	NOTE In addition to 8.1.6 and 8.3.2.3, the following requirements apply.		N/A
8.3.3.1	In service conditions, a continuous fluid pressure shall be required to hold off the brake.		N/A
8.3.3.2	Brakes shall be designed in such a way that unintentional lowering of a platform is prevented. The brake shall not reach the open position until the motor provides sufficient torque to hold the platform.		N/A
8.3.4	No-power descent		P
8.3.4.1	All hoists shall have a manually operated system that allows controlled descent of the platform within a reasonable period of time in case of power failure. This system shall be readily accessible to operator(s) on the roof or on the platform.		P
8.3.4.2	The manual descent shall have a "hold-to-run" action giving a minimum of 20 % of the normal running speed of the hoist under load.		N/A
8.3.4.3	In order to control the speed a centrifugal governor may be used during no-power descent. The controlled descent speed shall be lower than the triggering speed of the secondary device. In such cases, it shall be possible to test the secondary device.		N/A
8.3.4.4	The no-power descent of a roof mounted hoisting mechanism with two independent drives shall be designed to ensure that any longitudinal inclination of the platform is limited to 14°.		N/A
8.3.4.5	The no-power descent system shall be designed to prevent any part of the body being trapped or struck (e.g. solid hand wheel, electrical interlock, power cut-off if manual crank in use).		N/A
8.3.4.6	The secondary device shall be effective at all times during no-power descent.		N/A
8.3.5	Overload detection devices		P
8.3.5.1	All SAE shall be provided with an overload detection device to avoid danger to persons and damage to machines as a result of overloading. This device shall detect the loads due to persons, equipment and materials on the platform.		P
8.3.5.2	An overload device shall be fitted for each hoist.		N/A

8.3.5.3	For in-service conditions an overload shall be detected when the platform is lifted, lowered or stationary.		N/A
8.3.5.4	For BMUs the overload device(s) shall be triggered at or before reaching a load of 1,25 times the RL of the platform.		P
8.3.5.5	For TSPs the overload device(s) shall be triggered at or before reaching a load of 1,25 times the WLL of the hoist(s) or 1,25 times the reduced WLL in the case of de-rated hoist(s).		P
8.3.5.6	The overload device(s), once triggered, shall continuously isolate all movements except lowering until the overload has been removed.		P
8.3.5.7	An overload indicator shall continuously, either visually or audibly, warn the operator(s) on the platform when the overload device has been activated.		P
8.3.5.8	The setting elements for the pre-set limit of overload devices shall be protected against unauthorized adjustment.		N/A
8.3.5.9	Overload devices shall be designed to operate in such a way that the static and dynamic tests required by this standard can be carried out.		N/A
8.3.5.10	The overload device shall operate in the load range of up to 1,6 times the WLL of the hoist. The overload device shall be capable of withstanding a static load of three times the WLL of the hoist without permanent damage.		N/A
8.3.6	No load devices		P
	SAE with roof-mounted hoists shall be provided with a device that stops the lowering of the platform as soon as a no-load situation occurs.		P
8.3.7	End of rope switch for roof mounted hoists		P
	End of rope limit switches shall stop the platform when the minimum length of rope (specified in 8.4.4 and 8.6.2 c)) is reached at the hoist mechanism.		N/A
8.3.8	Maintaining the longitudinal level of a platform (anti-tilt device)		P
8.3.8.1	General		P
	Hoisting mechanisms with two or more independent hoists shall be equipped with an automatic device to limit the longitudinal inclination of the platform to 14° from the horizontal. These devices may be either electrical or mechanical.		N/A
8.3.8.2	Electrical anti-tilt device		P
	When triggered, the electrical anti-tilt device shall:		P
8.3.8.3	Mechanical anti-tilt device		N/A

	For SAE with platform mounted hoists a solution could be to provide fall arrest devices that automatically limit the incline of the platform to 14°. These devices are self-sufficient and do not require an electrical output signal to be incorporated into the safety related part of the control system.		N/A
8.3.9	Obstacle detection		P
	SAE shall be provided with device(s) that stop the lowering of the platform when an obstruction is encountered. This is achieved by:		P
8.3.10	Lifting and lowering limit switches		N/A
8.3.10.1	Lifting limit switches shall be provided and positioned so that they automatically stop the platform at the highest level. Upward movement shall stop before contact with the ultimate lifting limit switches. Lifting limit switches may be used in the control system of the SAE to prevent or to allow suspension rig slewing, traversing, luffing, jib telescoping or slewing.		N/A
8.3.10.2	Lowering limit switches shall be provided and positioned so that they automatically stop the platform at the lowest level. If the lowest level is ground level, or a safe surface, an anti-collision device is regarded as a lowering limit switch. At the lowest level initiation of stopping shall occur before contact with the end-of-rope switches (see 8.3.7).		P
8.3.10.3	Ultimate lifting limit switches shall be provided and positioned so that the platform will come to a complete stop before reaching the extreme top of the suspension rope. After triggering of any one of these ultimate limit switches no lifting or lowering shall be possible until a competent person has taken corrective action.		N/A
8.3.10.4	Separate and independent control devices shall be used for the lifting limit and ultimate lifting limit switches.		P
8.3.10.5	For TSPs suspended from a stationary suspension rig ultimate lifting limit switches shall be provided. For TSPs rigged from ground level, lowering limit switches are not required.		N/A
8.4	Drum hoists		P
8.4.1	Safeguard against running off		N/A
8.4.1.1	The drums and their ancillary equipment shall be designed to ensure that the wire ropes cannot run sideways off a drum in the case of a slack wire rope situation.		N/A
8.4.1.2	Wire ropes shall be evenly layered on the drum (e.g. by using layering devices).		N/A
8.4.1.3	Angle of fleet		N/A

	The maximum angle of fleet as shown in Figure 19 shall not exceed 2° or else shall be calculated in accordance with the hoist geometry.		N/A
8.4.2	Drum grooving		N/A
	Wire rope drums shall be grooved, either machined or with a maximum standard of smoothness of Ra = 12,5m.		N/A
8.4.3	Hoist Drum		N/A
	A device shall be provided to stop the hoist if a wire rope coils up unevenly.		N/A
8.4.4	End of downward movement		P
	For a powered hoist, when the platform is at its lowest position, the downward movement shall be stopped automatically. At this position there shall be a minimum of two complete turns of rope remaining on the drum before the attachment point of the rope anchor system to the drum.		P
8.5	Traction hoists		P
8.5.1	Traction force		P
	The hoist shall be designed to prevent any slipping or creeping of the wire rope in the traction system during lifting and lowering a load of not less than 1,5 times the WLL (see also 8.9).		N/A
8.5.2	Traction sheave grooving		N/A
	Traction sheaves shall have grooves that have a standard of smoothness of Ra 6,3 m. The traction sheave of a hoist shall be designed to suit the type and diameter of the wire rope intended for use with the hoist.		N/A
8.6	Powered wire winders		P
8.6.1	Safeguard against running off		P
8.6.1.1	The maximum angle of fleet shall be selected to ensure safe reeling of the wire ropes. If no additional guiding system is installed the angle of fleet shall not exceed 5°.		N/A
8.6.1.2	The winder shall be provided with flanged discs for this purpose. The projection length of the flanges above the outermost wire rope layer shall be at least equal to 1,5 times the wire rope diameter.		N/A
8.6.2	Roof mounted traction hoist		P
	In the case of a roof mounted traction hoist the following additional requirements shall be met.		P
8.7	Twin capstan drum hoists		P

8.7.1	A twin capstan drum hoist shall be designed to suit the type and diameter of the wire rope intended for use with the hoist.		P
8.7.2	A twin capstan drum hoist shall be designed to ensure that tail line tensioning is maintained in all circumstances (e.g. positive transmission between capstan hoist and winder).		N/A
8.8	Jaw operated traction hoists		P
8.8.1	A jaw operated traction hoist shall be designed in such a way that one set of jaws is gripping the suspension rope at all times, including when travelling in either direction.		N/A
8.8.2	The hoist shall be fitted with a mechanism to release the jaws to allow the rope to be fed into the hoist. A lever, independent of both the forward and reverse operating lever(s), shall operate the rope release mechanism. An interlocking device shall be provided to prevent unintentional release in case the mechanism can be released under load.		P
8.8.3	For a manual jaw operated traction hoist the machine shall be fitted with a device that limits the effort applied to the lever. The platform shall be prevented from lifting if this device is activated. The setting of this device shall be not more than two times the WLL of the hoist. Lowering of the platform shall still be possible.		P
8.8.4	For a powered jaw operated traction hoist with a lifting speed of less than 1 m/min the number of hoist operation cycles required for the wire rope test shall be the same as for manual jaw operated traction hoist.		N/A
8.9	Secondary devices		P
8.9.1	General		P
	Rope suspension systems and secondary devices shall be installed to provide a coherent system to overcome the hazard of a platform falling. This requirement shall be met by one of the following.		N/A
8.9.2	Fall arrest devices		P
8.9.2.1	An overspeed fall arrest device shall automatically engage in the event of a failure of the suspension wire rope, overspeed on lowering the platform (more than 0,5 m/s), or the inclination of the platform exceeding 14°.		P
8.9.2.2	A fall arrest device shall be designed to limit the dynamic load coefficient Sd to a value that is as low as possible. The values in B.1.4 shall be considered the maximum.		N/A
8.9.2.3	A fall arrest device shall not be designed to stop the platform during normal in-service conditions.		N/A
8.9.2.4	A fall arrest device shall be engaged mechanically.		N/A

8.9.2.5	A fall arrest device shall be capable of being tested and reset. A fall arrest device shall be immediately operational after resetting and shall not be sacrificial.		N/A
8.9.2.6	The fall arrest device shall be designed so it cannot be manually released under load. However, when activated, a fall arrest device shall permit the platform to be lifted by the hoist.		N/A
8.9.3	Secondary brakes		P
8.9.3.1	Subclauses 8.1.6.4, 8.1.6.5 and 8.3.2.3 (if spring loaded secondary brake) refer to the service brake but are also applicable to the secondary brake.		P
8.9.3.2	A secondary brake shall automatically engage in the event of overspeed (more than 0,5 m/s) on lowering the platform.		N/A
8.9.3.3	A secondary brake shall be designed to limit the dynamic load coefficient Sd to as low a value as possible. The values in B.1.5 shall be considered the maximum.		N/A
8.9.3.4	A secondary brake shall only be used to arrest and sustain the platform during overspeed conditions.		N/A
8.9.3.5	A secondary brake shall engage mechanically.		N/A
8.9.3.6	For a powered hoist the secondary brake shall be fitted with a limit switch that interrupts the main power supply.		N/A
8.9.3.7	The secondary brake shall be capable of being tested and reset. The secondary brake shall be designed so that it cannot be released under load. The secondary brake shall be immediately operational after resetting and shall not be sacrificial.		P
8.9.3.8	The preset activating speed of a secondary brake shall be safeguarded against unauthorized resetting (e.g. by lead sealing).		P
8.9.3.9	The maximum inclination of the platform deck shall be not more than 14°, after the platform has stopped, due to the activation of the secondary device.		N/A
8.10	Rope pulleys		P
8.10.1	Ropes shall be prevented from leaving the grooves.		P
8.10.2	The distance between the edge of the pulleys and the protective components shall be not more than 0,3 times the rope diameter.		N/A
8.10.3	Rope grooves on pulleys shall have groove radius of between 0,52 to 0,65 times the nominal rope diameter.		N/A
8.10.4	The opening angle of the rope pulleys shall be symmetrical and between 30° and 55°.		N/A
8.10.5	The depth of the grooves shall not be less than 1,4 times the rope diameter.		N/A

8.10.6	Rope run-on points on pulleys shall be made safe to prevent hands and fingers being trapped and shall be provided with covers.		N/A
8.10.7	The pulley groove shall have a smoothness of Ra 6,3 m.		N/A
8.10.8	The maximum angle of fleet shall not exceed 4° from the centre line or shall be calculated in accordance with the geometry of the system.		N/A
8.11	Wire ropes		P
8.11.1	General		P
	The platform shall be suspended by steel wire ropes that shall be galvanized or offer a similar corrosion resistance.		P
8.11.2	Wire rope diameter		P
	The minimum wire rope diameter shall be 6 mm. The secondary wire rope shall have the same or a greater diameter as the suspension wire rope.		P
8.11.3	Wire rope terminations		N/A
	Wire rope terminations shall be formed by means of metal filled sockets, self-tightening wedge type sockets, hand spliced eyes, ferrule secured eyes or any other system with equivalent safety. U-bolt grips shall not be used as a termination where their failure would affect safety.		N/A
8.11.4	Inspection facilities		N/A
	Suitably positioned inspection hatches shall be provided to enable visual examination of steel wire ropes and rope terminations without removal of the ropes or major dismantling of the structural components of the SAE.		N/A
8.12	Auxiliary materials hoists		N/A
	Most SAE installations are used with suspended platforms only. For reasons of safety and ergonomics, it is not recommended that items in excess of 25 kg in weight be handled by persons when working from a suspended platform.		N/A
9	Suspension rigs		P
9.1	General		N/A
	Where suspension rigs are used in conjunction with a demountable platform a safe means of rigging and de- rigging the suspended platform is required.		N/A
9.2	Drive Systems		P
9.2.1	General		P

	Drive systems cover all parts of the installation (i.e. lifting, lowering, slewing, traversing, luffing, telescoping). Hoisting equipment including wire ropes, pulleys and wire rope winders are covered in Clause 8 as well as in this clause.		N/A
9.2.2	Travel limits of drive systems		N/A
9.2.2.1	Mechanical end stops shall be provided and positioned so that they stop the movement of a suspension rig or trolley before reaching any dangerous position and without causing any permanent damage to the suspension rig or track system. End stops shall be through bolted or welded and not rely on friction.		N/A
9.2.2.2	Travel limit switches shall be provided and positioned so that they automatically stop powered movement at the end of travel. Movement shall normally be stopped before contact with the end stops is made.		N/A
9.2.3	Brakes and secondary devices		N/A
	Lifting and lowering drive systems, suspension rigs, and traversing trolleys running on an incline and which can move under the action of gravity alone, shall be provided with a service brake and secondary device to stop any uncontrolled movement.		N/A
9.2.4	Manual drive		N/A
	The maximum force necessary to be applied to the end of a crank in operation shall not exceed 250 N.		N/A
9.2.5	Powered drives		P
9.2.5.1	Powered drive systems shall be designed and arranged in such a way that the A-weighted emission sound pressure level measured at a distance of 1 m from the source is as low as possible, and at least less than or equal to 80 decibels (dB).		P
9.2.5.2	If powered and manual drive systems are provided for the same movement interlocks shall prevent both systems being engaged at the same time.		N/A
9.2.5.3	SAE powered by batteries		N/A
9.2.5.3.1	The control box shall be fitted with an indicator that shows the charging level of the batteries. When the charging level falls to a minimum preset value only movements that enable the operator to reach a position to exit the platform shall be possible.		N/A
9.2.5.3.2	Batteries shall be enclosed inside a ventilated box.		N/A

9.2.5.3.3	Charging of batteries shall only be possible in the parked or other designated position. When the batteries are connected to the power supply an electrical interlock shall prevent any movement of the SAE.		N/A
9.2.6	Telescopic jib systems		P
9.2.6.1	If a failure of the drive system used for the telescoping movement of a jib would cause the suspended platform to fall a secondary device shall be fitted. Any failure of the drive system shall be detected and further movement prevented.		P
9.2.6.2	If more than one wire rope or chain is attached at one point a device shall be provided for equalizing the tension. It shall be possible to independently adjust the tension of each wire rope or chain.		N/A
9.2.7	Chain drive systems		P
	Chain drives shall have a device or system that, in the event of a chain drive system failing, limits the vertical movement of a fully loaded, suspended platform to 500 mm. This requirement shall be met by one of the following:		P
9.2.8	Screw jacking systems		P
9.2.8.1	Secondary devices		P
	Screws shall have a load-bearing nut and if failure or excessive wear of the load-bearing nut would cause a fall of a platform a secondary device shall be provided. The secondary device shall only be loaded if the load- bearing nut fails. Any failure of a load-bearing nut shall be detected and further movement prevented.		P
9.2.8.2	Inspection facilities for load bearing nuts		N/A
	It should be possible to detect the wear of load bearing nuts without major disassembly.		N/A
9.2.8.3	Travel limitation of the nuts		N/A
	Screws shall be fitted with devices at both ends to prevent the load bearing and secondary nuts from leaving the screw.		N/A
9.2.9	Rack and pinion drive systems		N/A
9.2.9.1	Secondary devices		N/A
	If the failure of a rack and pinion drive system would cause a fall of the platform a secondary device shall be provided. Any failure of the rack and pinion drive system shall therefore be detected and further movement prevented. It should be possible to periodically verify the effectiveness of such devices in service.		N/A

9.2.9.2	Rack and pinion guides		N/A
	In addition to the guide rollers, positive and effective devices shall be provided to prevent any driving or safety device pinion from disengaging from the rack. These devices shall ensure that axial movement of the pinion is so limited that a minimum of 2/3 of a tooth width is always in engagement with the rack. They shall also restrain radial movement of the pinion from its normal meshing position by more than 1/3 of the tooth depth.		N/A
9.2.9.3	Inspection facilities of pinions		P
	Suitably positioned inspection hatches should be provided to enable visual examination of pinions without the removal of the pinions or major disassembly of structural components of the SAE.		P
9.2.10	Hydraulic drive systems		P
9.2.10.1	Cylinders		P
	The telescoping sections of hydraulic cylinders shall be designed in such a way that the pistons cannot leave the cylinders. Mechanical end stops shall be provided for this purpose.		N/A
9.2.10.2	Hydraulic Drives		N/A
	Hydraulic pressure shall be available at all drives to fulfil all functions. Loss of hydraulic pressure shall not result in a hazard. If a leak occurs the service brake shall hold the load.		N/A
9.2.11	Pneumatic drive systems		N/A
9.2.11.1	Pneumatic drives		N/A
	Pneumatic drives shall be designed so that ice formation in the system shall be prevented, for example, by using de-icing fluids.		N/A
9.2.11.2	Pneumatic cylinders		N/A
	Pneumatic cylinders shall not be used for load carrying purposes.		N/A
9.3	Permanent suspension rigs		P
9.3.1	Trolley units		P
9.3.1.1	Trolley units can move either:		P
9.3.1.2	Trolley units shall be provided with guide rollers, flanged wheels or other means to ensure the trolley unit stays on the track.		P
9.3.1.3	If a trolley unit deviates from the track or a wheel assembly fails a device shall be provided to prevent the trolley unit overturning.		P

9.3.1.4	Mechanical end stops shall be provided to prevent the trolley unit leaving the track way. All end stops shall be positively connected to the rails/tracks and their connections shall not rely on friction.		N/A
9.3.2	Clearance		N/A
	There should be adequate clearance between the rear of a roof trolley and any adjacent portions of the building or any other adjacent fixed structure to reduce the risk of persons being trapped or crushed. A minimum clearance of 0,5 m width and 1,8 m height is recommended. Where such clearance is not possible other measures shall be taken and information on the risks provided by the manufacturer or supplier of the SAE to the user to guard against trapping.		N/A
9.3.3	Powered traversing		N/A
	The nominal horizontal traversing speed shall not exceed 0,3 m/s measured at the trolley unit and at the platform.		N/A
9.3.4	Jib(s)		N/A
9.3.5	Slewing		N/A
	The service brake shall stop the jib and maintain it in a stationary position taking into account the wind force in service and in the parked position. If necessary, a clamp or similar device shall be provided to attach the jib to the frame of the trolley or to the track way in its parked position (see Clause 6 for calculation).		N/A
9.3.6	Counterweights		P
	When separate counterweights are used to achieve stability of a trolley unit they shall be permanently attached so that it is only possible to remove them by intentional intervention.		P
9.3.7	Covers and guards		P
	The guarding of machinery contained within SAE (e.g. hoist(s), hydraulic power pack, slewing mechanism, control box) shall be designed to guard the equipment and moving parts from accidental contact with persons. Their fixing systems shall remain attached to the guards or to the machinery when the guards are removed.		P
9.3.8	Monorail tracks and traversing trolleys		N/A
	A traversing trolley system on a monorail used as a means of suspension for a platform shall conform to the appropriate requirements of 9.3.1 and with the following specific requirements:		N/A
9.3.9	Fixed and portable davits		N/A

9.3.9.1	If fixed or portable davits are used as the means of suspension of a platform the SAE shall conform to the following requirements:		N/A
9.3.9.2	Portable davits		N/A
	Portable davits which are relocated in one or more working positions shall conform to the following specific requirements:		N/A
9.4	Temporary suspension rigs		P
9.4.1	General		P
	All parts of a temporary suspension rig shall be capable of being reused and re-erected. Components shall not have sharp edges, angles or protruding parts that could cause injury.		P
9.4.2	Physical size and weight		P
	Individual components forming parts of the suspension rig shall be as follows:		N/A
9.4.3	Counterweighted suspension beams		N/A
	This type of beam rests on the roof. The lengths of the inboard and outboard portions are adjustable and clear assembly and rigging instructions shall be fixed permanently to the beam.		N/A
10	Electrical, hydraulic and pneumatic systems		P
10.1	General		P
	Electric systems and components shall conform to EN 60204-1 except where otherwise stated in this standard.		P
10.2	Measures to monitor 3 phase systems		P
	Means shall be provided to ensure that incorrect phase rotation of the power supply cannot result in an incorrect control response.		P
10.3	Main power supply protection		P
	Cable based main power supplies shall be protected by over-current protective devices and by a 30 mA residual current device (RCD).		N/A
10.4	Wire ropes with integrated electrical conductors		N/A
	The conductors shall be not less than 0,5 mm2 in cross-sectional area and shall be adequately insulated and protected. The voltage used shall not exceed 240 V.		N/A
10.5	Spring loaded or motor powered cable reeler		P

	A limit switch or other system should stop the movement of a trolley before the electric cable is completely unwound from the cable reeler. The cable should be provided with a restraining hook to prevent the tension being exerted through the plug and socket.		N/A
10.6	Degrees of protection		N/A
	All electrical equipment shall conform to EN 60529 and when exposed to open air shall have a protection degree of not less than IP54.		N/A
10.7	All safety devices incorporated into SAE shall be designed to be tested in a safe manner.		N/A
11	Control systems		P
11.1	General		P
11.1.1	SAE shall be provided with robust, hold-to-run controls. The possibility of operators wearing gloves shall be taken into account. The minimum diameter of control buttons shall be 10 mm.		P
11.1.2	The direction and the movement of all operations shall be clearly indicated on or near each control using words and/or symbols.		N/A
11.1.3	Controls shall be located on the platform and arranged in a logical sequence.		N/A
11.1.4	Emergency stop buttons that stop the movement of ALL functions and cut the mains power to the roof trolley, suspension rig and/or cradle mounted hoists shall be provided.		N/A
11.2	Emergency stop equipment		P
	Emergency stop equipment shall be designed and supplied in accordance with category 0 of EN ISO 13850 and shall be located at each operator control station and any other places where an emergency stop device might be required. All emergency stop devices shall be operative at all times irrespective of the particular control station being used.		N/A
11.3	Control of jibs		P
	Where jibs move independently of each other the control circuit shall ensure correct movement so that the platform cannot be inclined more than 14° in any direction.		N/A
11.4	Safety related parts of control systems for power operated equipment		P
	The control system shall conform to EN ISO 13849-1. The following information is given in this standard is about safety-related parts:		N/A
12	Verification and certification		P
12.1	Type verification		P

12.1.1	General		P
	Verification of SAE shall be carried out before a machine or series of machines is put into service.		N/A
12.1.2	Design checks		N/A
	The design check shall verify that the SAE is designed in accordance with this standard. It will include a check of the following documents:		N/A
12.1.3	Type Tests		N/A
	Type tests are described in Annexes A, B and C. Tests shall be performed to check that:		N/A
12.2	Manufacturing check		P
	The SAE shall be checked to verify the following:		N/A
12.3	Installation checks for safety critical track supports and fixings		P
	During installation of SAE and their associated track and track support systems checks shall be made to confirm that all aspects of the system have been correctly installed in accordance with the specification, drawings and relevant technical data.		P
12.4	Verification of BMU systems on site		N/A
	Verification of BMU systems shall be carried out on site by the manufacturer or authorized representative on the complete installation in its working configuration.		N/A
12.5	Verification after first assembly of TSAE on site		N/A
	The objective is to carry out an examination and perform tests as appropriate to confirm that the TSAE has been correctly assembled, fulfils the particular performance requirements and that the safety devices are operating correctly.		N/A
12.6	Hybrid systems		P
	Where a TSP is suspended from a permanently installed suspension rig it is the responsibility of the supplier of the TSP to ensure that the total suspended load (TSL) imposed by the TSP on the suspension rig does not exceed the WLL of the rig.		P
13	Marking of SAE		P
13.1	General		N/A
13.1.1	Signs and plates		P
	One or more clear and durable signs or plates shall be mounted on all platforms and suspension rigs giving the following information:		N/A

13.1.2	All types of SAE		P
	Designation of machine as SAE conforming to this standard;		N/A
13.1.3	BMUs incorporating dedicated platforms		P
	RL of the platform and the maximum number of persons;		P
13.1.4	BMUs incorporating demountable platforms		P
	The self-weight, RL (i.e. the TSL) and maximum number of persons;		N/A
13.2	Manual hoists		N/A
	diameter and specification of wire rope to be used.		N/A
13.3	Powered hoists		P
	power supply information if the prime mover is a hydraulic motor or cylinder (i.e. working pressure when lifting the WLL (bar), fluid flow (dm3/s), motor rated speed (rpm) and cylinder travel speed (cm/s)).		P
13.4	Secondary devices		N/A
	triggering speed (m/min) if applicable.		N/A
14	Accompanying documents		P
14.1	General		P
	Instructions shall conform to EN ISO 12100:2010, 6.4.5 and include information about the static and dynamic tests performed on the SAE. The instructions shall be either 'Original Instructions' or a 'Translation of the Original Instructions' in which case the translation shall be accompanied by a copy of the original instructions.		P
14.2	Manuals		P
14.2.1	General		P
	The manual shall include instructions about the following where applicable:		P
	a general description of the equipment;		P
14.2.2	Information relating to transport and handling of the SAE:		P
	Total mass of the equipment and of the main parts which can be dismantled for transport;		P
14.2.3	Information relating to the installation, commissioning and reassembly of the equipment:		N/A

	Where track and restraint systems are used discussions shall take place between the interested parties to determine the optimum design;		N/A
14.2.4	Information relating to the SAE itself		N/A
	The limitations of use (e.g. FEM group of structure and mechanism, operating height, wind speed in service and out-of-service and temperature range);		N/A
Annex A	Platform type-tests		P
A.1	General		N/A
A.2	Maximum deflection type-test		P
A.3	Tests of cantilevered platform		P
A.3.1	Maximum deflection type-test		N/A
A.3.2	Stability type test		N/A
A.4	Static test of the platform		N/A
A.4.1	General		N/A
A.4.2	Horizontal deck		P
A.4.3	Sloped deck		N/A
A.5	Dynamic test of the platform		N/A
A.6	Ultimate load type-tests		N/A
A.7	Strength type-test of the decking		N/A
A.8	Strength type-test of the guardrail		N/A
A.8.1	Horizontal static test		N/A
A.8.2	Vertical static test		N/A
Annex B	Hoist and secondary device type-tests		P
B.1	All types of hoists and secondary devices		N/A
B.1.1	Static test		N/A
B.1.2	Dynamic test		N/A
B.1.3	Strength type test		N/A

B.1.4	Testing the operation of fall arrest device		N/A
B.1.4.1	General		N/A
B.1.4.2	Force measurement apparatus		N/A
B.1.4.3	Test procedure		N/A
B.1.4.4	Test results		N/A
B.1.5	Secondary brake type test		N/A
B.1.5.1	General		N/A
B.1.5.2	Operating mode		N/A
B.1.5.3	Test results		N/A
B.1.6	Hoist lifting load limit tests		N/A
B.2	Manual operated hoists		P
B.2.1	In service operation test		N/A
B.2.2	Endurance type test		P
B.2.3	Wire rope type tests		N/A
B.3	Power operated hoists		N/A
B.3.1	Endurance type test for hoists		P
B.3.2	Overload detection device type tests		N/A
B.3.2.1	Type testing of overload devices should be carried out by the manufacturer of the device and a certificate issued.		N/A
B.3.2.2	The test includes a functional test to test the tripping limit. Functional testing of the tripping limit of the overload device should be performed in accordance with the following procedure:		N/A
B.3.2.3	A strength test shall be performed in accordance with the procedure described in B 3.2.2 but with the RL and the WLL multiplied by 1,6. During this test the overload device(s) shall operate in accordance with the manufacturer's instructions.		N/A
B.3.3	Electrical type tests		N/A
Annex C	Suspension rig type-tests		P
C.1	Trolley unit		P
C.1.1	General		N/A

C.1.2	Static test		N/A
C.1.3	Dynamic test		N/A
C.1.4	Electrical type test		N/A
C.2	Other suspension rigs		N/A
Annex D	Guidance on the presentation and interpretation of loads imposed by SAE structures		N/A
D.1	General		N/A
D.2	General notes for roof mounted suspension rigs		N/A
D.3	General notes for monorail support brackets and davits:		N/A
Annex E	Maximum permitted horizontal displacement of platform		P
E.1	General		P
E.2	Sample calculation - 60 m without restraint:		N/A
Annex F	Guidance on the requirements for wireless control systems		N/A
F.1	General		N/A
F.2	Control limitation		N/A
F.2.1	Activation of the transmitter should be indicated on the transmitter and should not initiate any movement of a BMU.		N/A
F.2.2	The receiver should provide output operating commands to the control system only when it is receiving frames containing the right address and correct command.		N/A
F.2.3	The main contactor should only be energized (i.e. controlled to the “on” state) by at least one correctly received frame without any operating commands but containing a start command.		N/A
F.2.4	To avoid inadvertent movements after any situation having caused the SAE to stop (e.g. power supply fault, battery replacement or lost signal condition), the system should only output operating commands resulting in any SAE movement after the SAE operator has returned the controls to the “off” position for a suitable period of time (i.e. it has received at least one frame without any operating commands).		N/A
F.2.5	Whenever the SAE is de-energized all operating command outputs for SAE movements from the receiver should cease.		N/A
F.3	Stop		N/A

F.3.1	The part of the wireless control system to perform a safety function is a safety related part of the SAEs control system, as defined in EN ISO 13849-1:2008, 3.3.1. This part of the wireless control system should be designed in accordance with Table 14 of this standard or higher for safety performance as defined in EN ISO 13849-1.		N/A
F.3.2	The control system should initiate a stop of all SAE movements when no valid frame has been correctly received within 0,5 s.		N/A
F.4	Serial data communication		N/A
F.5	Use of more than one operator control station		N/A
F.6	Battery-powered operator control stations		N/A
F.7	Receiver		N/A
F.8	Warnings		N/A
F.9	Information for use		N/A
Annex G	Design requirements for rail tracks, monorail tracks and support systems		N/A
G.1	Scope		N/A
G.2	Characteristic loads and forces for rail tracks and rail track support systems		N/A
G.3	Basis for structural analysis		N/A
G.4	Materials		N/A
G.5	Ultimate limit states		N/A
G.5.1	General		N/A
G.5.2	Recommended values for partial safety factors (f)		N/A
G.5.3	Resistance of cross-sections of steel structures		N/A
G.5.4	Resistance of bisymmetrical members of steel structures		N/A
	a)Crushing:		N/A
	b)Crippling:		N/A
	c)Buckling of the web:		N/A
G.5.5	Resistance of bottom flanges of I or H steel sections to wheel loads		N/A
G.5.5.1	Ultimate limit state		N/A
G.5.5.2	Serviceability limit state		N/A

G.6	Wheel/rail contact		N/A
G.6.1	General		N/A
G.6.2	Condition for load case 1		N/A
G.6.3	Condition for load case 2a, 2b and 3		N/A
G.7	Rail track support system		N/A
G.8	Serviceability limit states		N/A
G.9	Elastic critical moments and forces for plain rolled I and H sections		N/A
G.9.1	Elastic critical moment for lateral torsion buckling of members in bending		N/A
G.9.1.1	General		N/A
G.9.1.2	Uniform bending		N/A
G.9.1.3	Non-uniform bending		N/A
G.9.2	Elastic critical force for buckling of members in compression		N/A
G.10	References		N/A

Attachment 1 – Photo Documentation

Photo.1

Photo.2

< End of Test Report >