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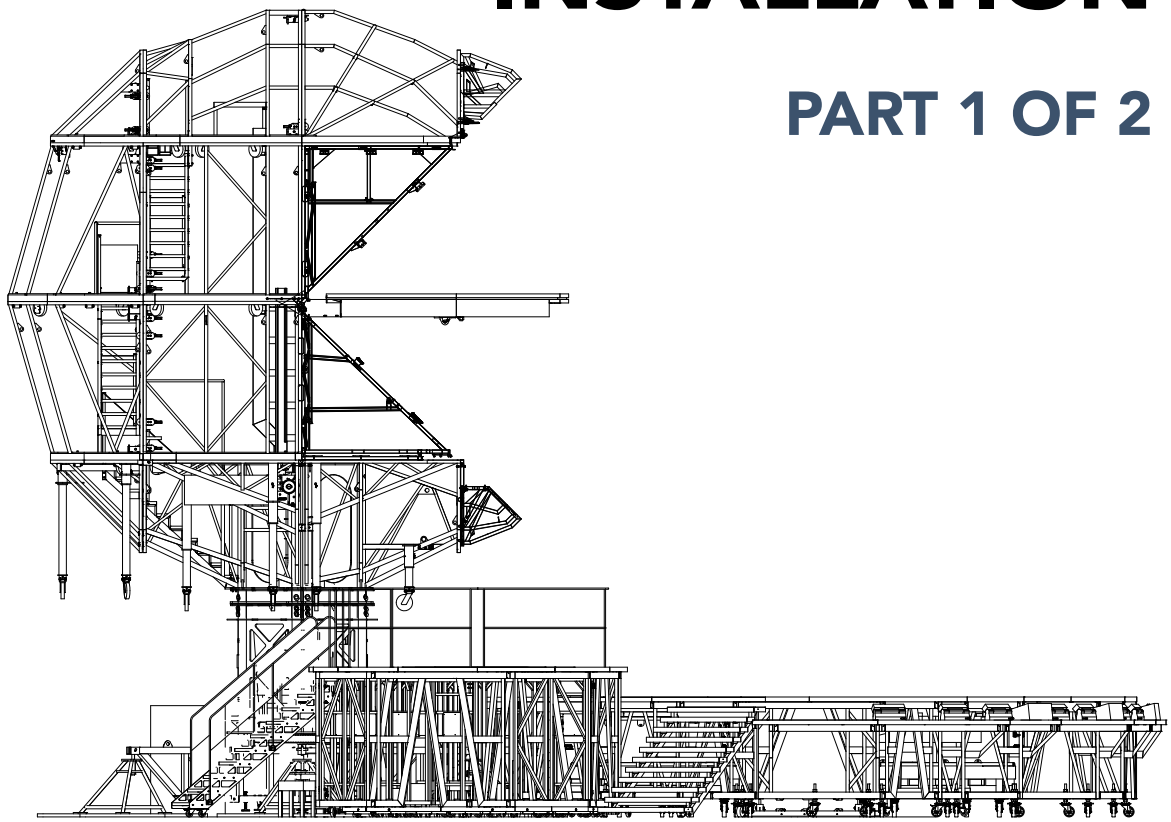
USER MANUAL

TAKE THAT 2019
GREATEST HITS TOUR
MACHINERY INSTALLATION

PART 1 OF 2



This product is intended for professional use only.
Read this entire document before installing, operating or using the product.

ORIGINAL INSTRUCTIONS

User Manual Part Number: 18PRP16 Release V2 - Part 1 of 2
Release Date: March 2019

Original Instructions
Take That 2019 - Greatest Hits Tour - Machinery Installation
Release V2 - Part 1 of 2
Release Date 2019-03

Other functions or configurations not described in this document may be available. However, this fact shall not constitute an obligation to supply such functions or configuration with a new product or when servicing.
We have checked that the contents of this document correspond to the product described.
There may be discrepancies, nevertheless, no guarantee can be given that they are completely identical to the product.
The information contained in this document is reviewed regularly and any necessary changes will be included in the next edition.
We welcome suggestions for improvement.
Brilliant Stages intends this document, whether printed or electronic, to be provided in its entirety.

NOTE: This user manual comes in two parts. This is part 1 of 2.

1.1 GENERAL INFORMATION

WARNING

Before installing and commissioning the machinery installation, you must read all safety instructions and warnings carefully, including all of the warning labels attached to the equipment.

CAUTION

Make sure that the warning labels, signs and markings are kept in a legible condition and replaced if they are missing or damaged.

1.2 READ IT FIRST

It is extremely important to read ALL of the safety information and instructions provided in this manual, and any accompanying documentation before installing and operating the products described herein.

Read all cautions and warnings during installation and use of this product.

Keep this user manual for future reference.

WARNING

This product is designed for professional use and to ONLY be used by a competent person.

CAUTION

In the eventuality, the contents included in the instructions are not sufficiently clear or apparently incomplete, it is mandatory to get in contact with Brilliant Stages Ltd using the contact details as listed in this user manual.

IMPORTANT: The user shall thoroughly read this and any accompanying manuals. The user shall familiarise him or herself with all of the safety information and instructions provided in this user manual, as well as in manuals of other products used for the installation, handling and operation of the product.

NOTE: Refer to the Contact section for information to get in touch with Brilliant Stages.

1.3 CONTACT

Brilliant Stages Ltd
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Langthwaite Business Park,
South Kirkby, Wakefield,
West Yorkshire
WF9 3AP,
United Kingdom

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1.4 USE FOR INTENDED PURPOSE ONLY

The equipment may be used only for the application stated in the manual, and only in conjunction with the devices and components recommended and authorised by Brilliant Stages.

WARNING

If the user feels that this manual has left any questions unanswered or that the answers provided within this manual are unclear, it is the user's responsibility to consult Brilliant Stages.

1.5 IDENTIFICATION

BRILLIANT STAGES

This user manual pertains only to the product with the serial number as shown below:

Product Name: Take That 2019 - Greatest Hits Tour

Machinery: Sphere and Travelator Lift

Serial Number (User Interface): NIS-MK2.2-18752-030

The user interface serial number has been assigned as the sphere and travelator machinery installation serial number.

NOTE 1: The machinery installation's Declaration of Conformity will use the same number.

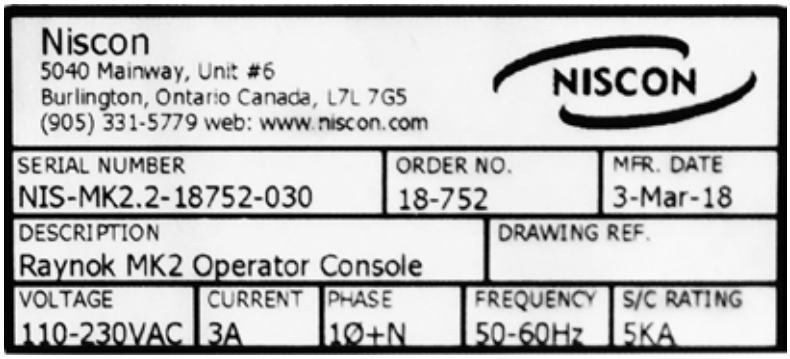

Figure 1: User Interface ID Plate.

NOTE 2: The piano lifts are independent stage machinery and have a separate ID Plate and serial number.

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3.1 SYMBOLS

DANGER

Indicates an imminently hazardous situation, which, if not avoided, will result in death or serious injury.

WARNING

Indicates a potentially hazardous situation, which, if not avoided, could result in death or serious injury.

CAUTION

Used with the safety alert symbol indicates a potentially hazardous situation, which, if not avoided, may result in minor or moderate injury.

Used without a safety alert symbol indicates a potentially hazardous situation, which, if not avoided, may result in property damage.

3.2 COMPETENT PERSON

In relation to this user manual, a "competent person" should have sufficient practical and theoretical knowledge and experience to carry out his or her duties, and who is aware of the limits of their own competency, expertise and knowledge.

The competent person shall have the following characteristics:

- Physical and psychological fitness to use the product, good vision and hearing, lack of dizziness when working at a certain height, no discomfort or disabling illness; absence of drug or alcohol-related disorders; mental equilibrium; calm and self-control, even under pressure or stress.
- Sense of responsibility; manual skill; common sense; accuracy; coordination of movements and reflex.
- In-depth knowledge of application and its limits, intended use, foreseeable human misuses and what is not allowed.
- Knowledge of binding and voluntary legislation that regulates health and safety in the workplace.
- Knowledge of the rules and laws governing safety in the workplace.
- Knowledge of practices and working techniques in the environment where the product is installed.
- Technical knowledge of the product, the overall system (electrical equipment, safety devices, referral system, etc.) and its supporting documentation to ensure optimal use of the system in order to carry out the necessary daily checks and identify any defects.
- Ability to read an electrical diagram and training to perform the necessary electrical work.
- Ability to read a wiring diagram and qualifications to perform the necessary connections.

- Ability to handle and lay the cables as prescribed by the manufacturer of the cable and the pre-use rules.
- Knowledge in operating principles and experience in setting safety-related devices (limits, safety switches, enabled devices, E-STOP stations, etc.).
- Knowledge of procedures for putting the product in service and out of service.
- Knowledge of procedures for starting up the machine and servicing it.
- Knowledge and practice in the use of the planned control system, proven by a specific training certificate.
- Experience in the use and adjustment of protective devices.
- Experience in the use and adjustment of the limit switches.
- Technical knowledge of lifting operations, machinery installations for use in staging in the entertainment industry, related components used and the basic concepts of physics related to them.
- Knowledge of lifting technique, of phenomena and components normally used.
- Ability to select and use appropriate lifting accessories in machinery installations for use in staging in the entertainment industry in relation to loads and operations to be carried out (chains, hooks, slings, shackles, etc.). A competent person MUST KNOW the principles of rigging.
- Knowledge of gesture signals and radio communication modalities to perform lifting operations under normal or emergency conditions effectively, and without danger for both and for others.
- Knowledge of the different types of load-bearing lines terminals (sleeves, cable lugs, etc.), how to install them according to the instructions and good practice documents available and the ability to evaluate the correct execution
- Ability to create an anchor point as designed and to evaluate the proper execution according to the instructions and regulations available.
- Ability to operate the machine and assembly of machinery (precise and timely execution of manoeuvres, optimum use of controls and correct interpretation of reports, correct load and distance evaluation.
- Competence in assessing a load's suitability to be lifted and its state of maintenance.
- Capacity for installation, inspection and maintenance of load-bearing parts in accordance with the instructions and available good practice documents. The competent person must also have adequate knowledge of other people's tasks in the environment the product is located in.
- Operation skills for machinery, machine operation duties and relevant equipment, (including: prompt and precise execution of the manoeuvres, optimal use of control devices and have the ability to correctly interpret the indicators (correctly evaluate the loads and distances).

3.2.1 MACHINERY INSTALLER

Read this user manual before beginning the set-up and commissioning of the unit(s).

- Correct use of all work items and tools (supplied by the machinery installer or manufacturer) in accordance with the training and instructions received to enable the safe use of these items.
- Always ensure there is a good communication between the operators and spotters.

- Always wear PPE such as high visibility vests, hard hats and safety footwear during installation, commissioning and the uninstall process.
- Always carry out a visual inspection of plugs and leads before connecting them to the power supply.
- Before initiating any machinery movement, request a move with the spotters and do not operate the unit until a clear OK GO return signal has been received.
- Make sure the hazard zone is free of the machinery's general users during the commissioning of the machinery.
- During the commissioning of the SPHERE, only a competent person (fitted with a DMH and E-STOP pendant) is authorised by the machinery operator to stay inside of the SPHERE's hazard zone to inspect the safety of the movement.
- Read the risk assessment and be familiar with the allocated hazards and identified risk reduction measures.

3.2.2 MACHINERY OPERATOR

Read this user manual before beginning the setup and commissioning of the unit(s).

- Correct use of all work items and tools (supplied by the machinery installer or manufacturer) in accordance with the training and instructions received to enable the safe use of these items.
- Always ensure there is a good communication between the operators and spotters.
- Always wear PPE such as high visibility vests, hard hats and safety footwear during installation, commissioning and the uninstall process.
- Always carry out a visual inspection of plugs and leads before connecting them to the power supply.
- Before initiating any machinery movement, request a move with the spotters and do not operate the unit until a clear OK GO return signal has been received.
- Make sure the hazard zone is free of the machinery's general users during the commissioning of the machinery.
- Read the risk assessment and be familiar with the allocated hazards and identified risk reduction measures.

3.2.3 MACHINERY GENERAL USER

- Read this user manual before beginning the load-in / load-out process.
- Always wear hard hats, safety footwear and high visibility vests when working within the machinery's hazard zone.
- Notify your department head of any areas of concern with Health & Safety arrangements; even when no immediate danger exists, so that appropriate remedial action can be taken.
- Co-operate with the people responsible for Health & Safety on behalf of the client and with the Machinery Installers or Machinery Operators.
- Make sure the hazard zone is free from people while the machinery is moving.
- Keep hazard zone free from obstacles and/or equipment while the machinery is moving.
- Hanging equipment on the machinery is ONLY permitted when it is based on an approved rigging plot that is provided to the Machinery Installer.
- During machinery commissioning do not stand inside, around or in the proximity of the hazard zone.

3.2.4 CLIENT

Read this user manual.

- Provide a safe working environment and appropriate sterile areas for the company to operate in.
- Provide the local crew with the company's risk assessments, method statements and suitable information to enable them to carry out the required tasks.
- Inform the Health & Safety Manager and Operations Director to ensure that they are aware of all potential hazards, which may affect the project, and that suitable and sufficient risk assessments and control measures are in place.
- Provide workers with suitable welfare facilities and ensure that any local factors, such as weather or environment, are factored into the working practices and breaks while including the provisions of suitable clothing, warming facilities and drinking water.
- Ensure that any changes in the project that may affect the accuracy of the risk assessments are reported to the Health & Safety Manager and Operations Director, and that these changes are reflected in the risk assessments for the tasks.
- Ensure that all floors, site emergency exits and traffic routes are kept free from obstructions at all times.
- Ensure that the ground will sustain the loads imposed by the machinery installation.

DANGER

Changes or modifications of the scenic movements, set or equipment installed, might compromise the integrity of Brilliant Stages risk assessment with consequent potential "loss of suitability" of the risk reduction measures implemented by the manufacturer/designer.

The machinery manufacturer cannot foresee risks originated by an improper use of the machinery or a disregard of the safety information other than assessed in the risk assessment and this document.

Other uses or improper interaction with the machineries within the hazard zones are considered a "voluntary misuse" rather than a foreseeable human misuse.

3.3 INTENDED USE

The different parts of the machinery installation have multiple intended uses. Please see the following list below:

Sphere Rotation:

UC-LSH1

The machinery's intended use is to move (rotation only) decorations, equipment or persons, while people are in the hazard zone, or the full and clear visibility of the hazard zone cannot be guaranteed.

Sphere Upper D:

UC4

The machinery's intended use is for the movement and suspension of decorations or technical equipment during set-up, stage preparation, installation, assembly, lifting operations

and showtime scenic movements of technical equipment that move with persons in the hazard zone, typically as part of a performance or rehearsal.

Sphere Lower D:

UC-LSL6

The machinery's intended use is to change the height or shape of the stage floor, orchestra pit or auditorium floor with programmed or manual scenes, and lifting actors while people are in the hazard zone or the full and clear visibility of the hazard zone cannot be guaranteed.

Travelator Lift:

UC-LSL6

The machinery's intended use is to change the height or shape of the stage floor, orchestra pit or auditorium floor with programmed or manual scenes, and lifting actors while people are in the hazard zone or the full and clear visibility of the hazard zone cannot be guaranteed.

Travelators:

UC-LSH5

The machinery's intended use is to move (horizontal track only) decorations, equipment or persons on top on/off stage or into/from the auditorium with a programmable control, while people are in the hazard zone or the full and clear visibility of the hazard zone cannot be guaranteed.

Piano Lift:

UC-LSL5

The machinery's intended use is to change the height or shape of the stage floor, orchestra pit or auditorium floor with programmed or manual scenes, and

lifting actors while people are in the hazard zone or the full and clear visibility of the hazard zone cannot be guaranteed.

CAUTION

CAUTION: In case of performer motion, always check there is a rescue plan in place and that it has been tested.

NOTE: The product is machinery designed for the entertainment industry and it is not intended to be used for other applications.

In the entertainment industry, we intend the industry for which the product/machinery, machinery installations and machinery control systems to be used in places of assembly, staging and production facilities for events and theatrical productions.

Such facilities include: theatres, multi-purpose halls, exhibition halls; film, television and radio studios; concert halls, schools, bars, discotheques, open air stages and other rooms for shows and events.

3.4 SAFETY INSTRUCTIONS

3.4.1 INSTALLATION

Read this user manual before beginning the installation process.

- Always check the user manual before proceeding with the installation.
- Always carry out a visual inspection of plugs, cables and switching devices before connecting them to the power supply.
- Secure the working area for assembly to prevent anyone from entering without being informed about the possible dangers.
- Make sure the hazard zone is free from unauthorised people during the installation of the machinery.
- Always ensure there is a good communication between the installers and operators or riggers.
- Always wear PPE such as high visibility vests, hard hats and safety footwear during installation, commissioning and the uninstall process.

DANGER

To keep the product stable, it is critical that the legs are in a tripod position or the two legs are spread outwards and that a floor pad/spreader is underneath them.

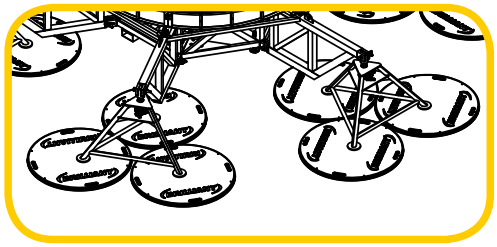


Figure 2: Closeup of the tripod leg.

DANGER

Work on the product by untrained personnel or failure to comply with warnings can result in severe personal injury or serious damage to the product.

3.4.2 INTEGRATION AND COMMISSIONING

Read this user manual before integrating or commissioning this unit.

The Sphere, Travelator Lift and Piano Lift must ONLY be integrated with Brilliant Stages equipment or equipment approved by Brilliant Stages.

LIST

- Brilliant Stages Drives
- Brilliant Stages Safety Modules
- Brilliant Stages Control Modules
- Raynok MK2 - Operator Console

NOTE: The integration of the product with any control system module(s), user interface(s) or safety module(s) different from those described above, may compromise the output of the product machinery risk assessment.

The product is designed to be integrated in machinery installations combined in an assembly of machinery configurations.

A specific integration risk assessment should be made by a competent or qualified person in order to identify any additional risks not foreseen by the designer and pertinent to the machinery installation. As a consequence of the integration risk assessment, protective measures should be implemented to reduce additional risks.

DANGER

Carefully read the safety information related to the putting the product into service.

3.4.3 INTEGRATION SAFETY:

- Scenic motion generates extra hazards, e.g. during shows. This can possibly occur in low light situations with the operator's view blocked by scenery or blinded by some lights. The integration risk assessment shall elaborate on how to deal with all the hazards that arise in a particular show.
- The operator shall have visual contact at all times with the product.
- Continuous visual contact may be accomplished by the user alone or with spotting colleagues at different corners of the stage, and by staying in contact with each other, possibly with an emergency stop or DEADMAN's handle in their hand. Depending on the product, infrared cameras can also help the user to maintain visual contact with the moving Sphere, Piano Lifts and/or Travelator Lift.
- In order to put the product into service, the following hazards related to the machinery installation must always be considered, estimated and evaluated. Please note this is only a list of the MINIMUM hazards and that there may be others.

Mechanical - approach of moving elements to a fixed part | crushing
Mechanical - approach of moving elements to a fixed part | severing
Mechanical - moving elements | drawing-in or trapping
Mechanical - instability | slipping, tripping or falling
Mechanical - acceleration, deceleration | slipping, tripping or falling
Mechanical - gravity and stability | crushing
Mechanical - kinetic energy | being thrown
Mechanical - angular parts | impact
Electrical - power failure | crushing
Electrical - power failure | slipping, tripping or falling
Ergonomic - access | crushing and shearing
Improper use - hazards due to improper operation | crushing, slipping, tripping or falling

Protective measures should be implemented to reduce risks related to the identified hazards.
Complementary guards and protective devices must:

- be of robust construction;
- be securely held in place;
- not give rise to any additional hazard;
- not be easy to bypass or render non-operational;
- be located at an adequate distance from the hazard zone;
- cause minimum obstruction to the view of the hazard zone;
- enable essential work to be carried out on the installation and/or replacement of parts for maintenance purposes by restricting access exclusively to the area where the work has to be done, if possible without the guard having to be removed or the protective device having to be disabled.

WARNING

This information and guidance is not extensive!!! The safety information has only considered the minimum integration requirements.

3.4.4 OPERATION

Read this user manual before operating this unit.

- Always ensure there is a good communication between the installers and operators or riggers.
- Always check that the scheduled lifting and motion operations are in line with the manufacturer's intended use.
- Always check if there are any safety-related reasons why the scheduled lifting and motion operations should not be performed.
- Before initiating any machinery movement, request a move with the spotters and do not operate the unit until a clear OK GO return signal has been received.
- In case of performer motion, always check there is a rescue plan in place and that it has been tested.
- During machinery commissioning make sure that the hazard zone is free from any unauthorised persons.
- During motion operations, keep the hazard zone free from any obstacles and/or equipment.

DANGER

DO NOT exceed the maximum equipment load values. Overloading the product/machinery may result in damage to the system, other property damage, serious injury, or death.

DANGER

DO NOT operate the product/machinery unless you learn and practise the principles of safe machine operation contained in this user manual.

WIND SPEED [m/sec]	SPHERE	UPPER D	LOWER D	TECH BUNKER	MAIN STAGE	LIFTING STRUCTURES
0-5	No action required.	No action required.	No action required.	No action required.	No action required.	No action required.
5-10	Movement shall be monitored.	Movement shall be monitored.	Movement shall be monitored.	Movement shall be monitored.	Movement shall be monitored.	Movement shall be monitored.
10-15	Should be installed with caution. Structure to be secured/ braced during installation. Movement shall be monitored.	Should be installed with caution. Structure to be temporarily braced during installation. Movement shall be monitored.	Should be installed with caution. Structure to be temporarily braced during installation. Movement shall be monitored.	Should be installed with caution.	Should be installed with caution.	Should be installed with caution. Structure to be temporarily braced during installation. Movement shall be monitored.
>15	Should not be installed. If installed, movement shall be monitored and access should be forbidden.	Should not be installed. If installed, movement shall be monitored and access should be forbidden.	Should not be installed. If installed, movement shall be monitored and access should be forbidden.	Should not be installed.	Should not be installed.	Should not be installed.

Figure 3: Wind Management Strategy.

3.4.5 PRE-OPERATION INSPECTION

It is the responsibility of the user/operator to perform a pre-operation inspection and routine maintenance. The pre-operation inspection is a visual inspection performed by the operator prior to placing the product in service.

The inspection is designed to discover if anything is apparently wrong with a machine before the operator performs the function tests.

The pre-operation inspection also serves to determine if any routine maintenance procedures are required. Only routine maintenance items specified in this manual may be performed by the operator

3.4.6 TRANSPORTATION

Sphere:

- The Sphere's frames should be transported in nine trucks.
- Each truck must be clearly labelled with which parts they are transporting.

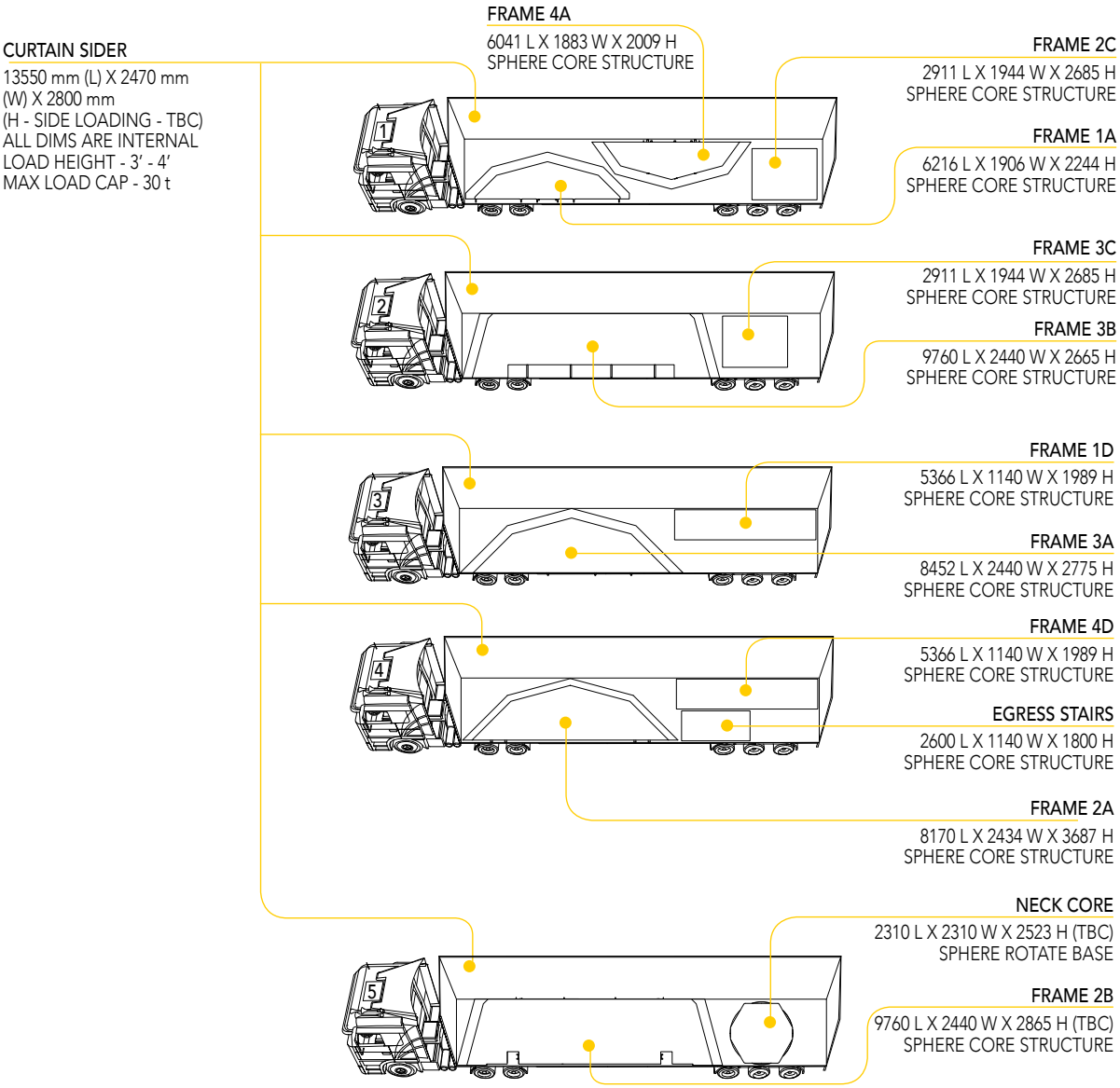


Figure 4: The trucks where the sphere's main elements will be transported.

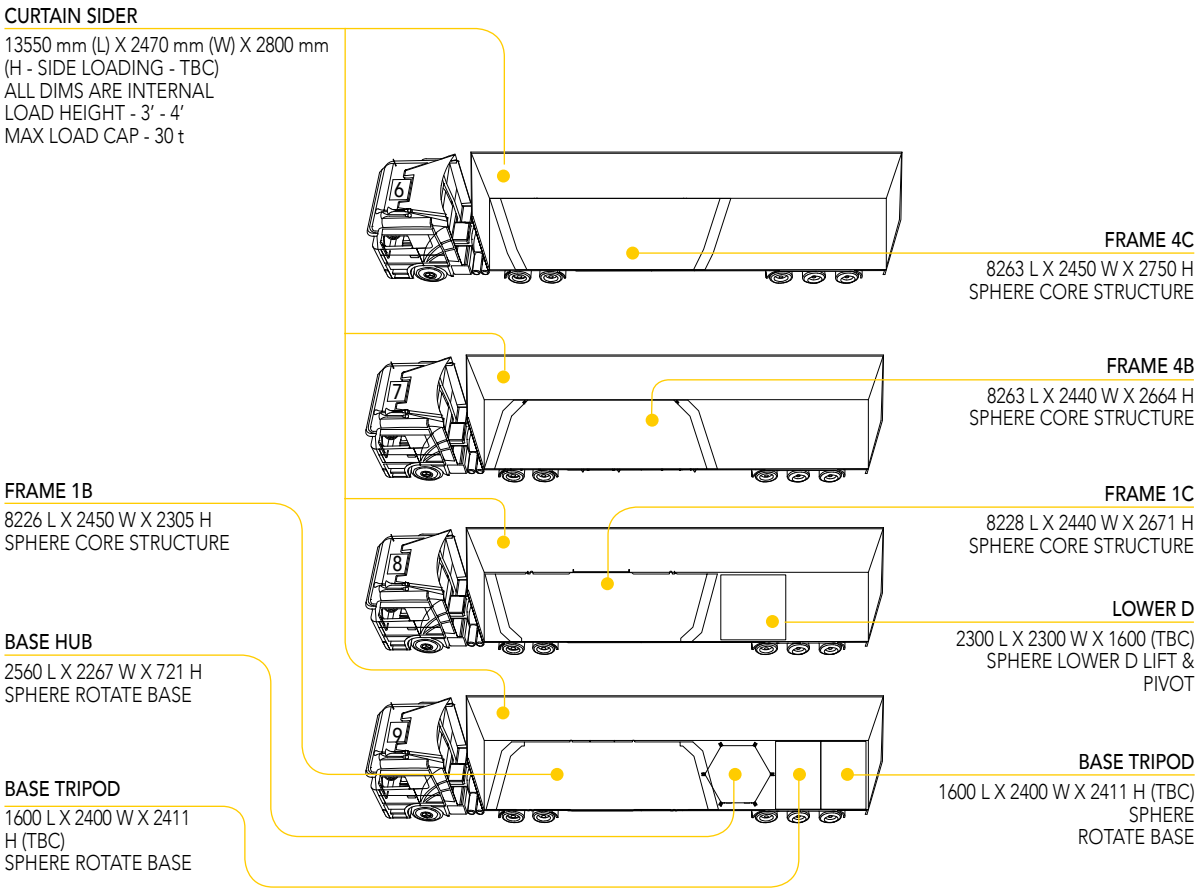


Figure 5: The trucks where the sphere's main elements will be transported.

Travelator Lift:

- The travelator lift (2 x Electric Scissor Lift - Type B) must always be transported on a cart.
- When lifting the lifts, use a forklift and lift the product with the forks located in the sleeves under the base of the product.

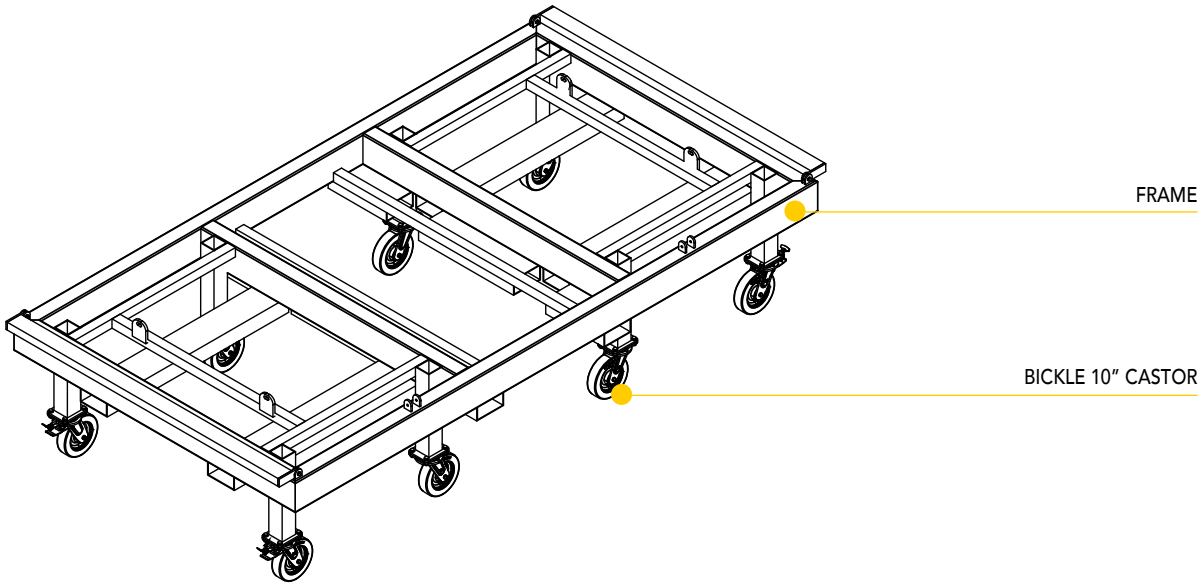


Figure 6: View of the cart used to transport the Travelator Lift.

Piano Lift:

- A cart must always be used to transport the piano lift.

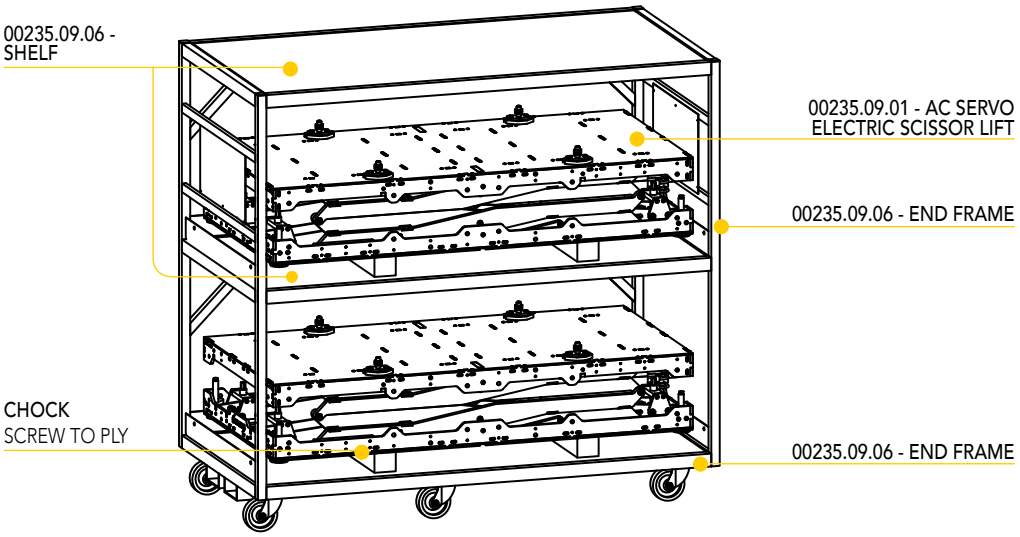


Figure 7: View of the cart to transport the Electric Scissor Lift - Type A for the piano lift.

- Once it is constructed, the piano lift must be placed on its lifting mechanism which also acts as a dolly.

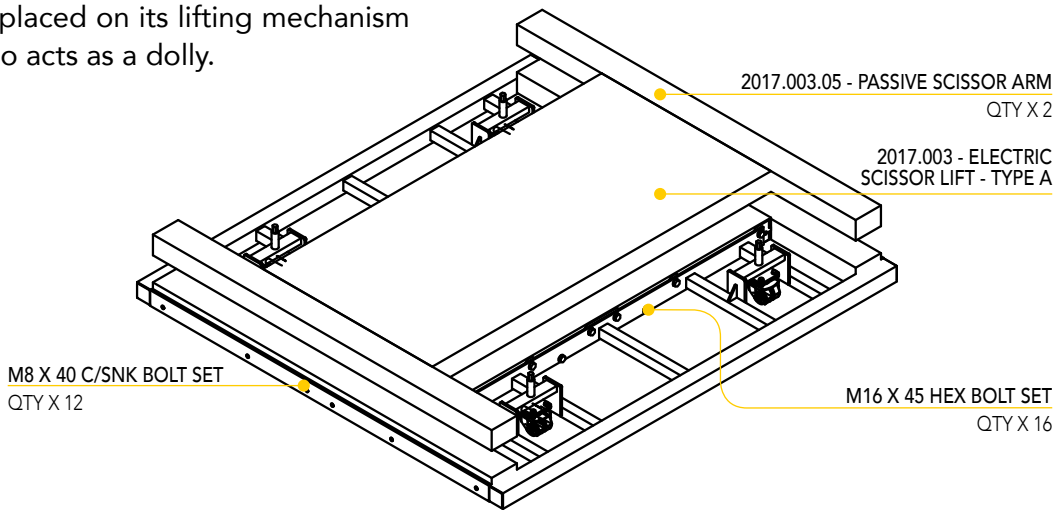


Figure 8: View of the piano lift's mechanism which also acts as a dolly for transportation.

CAUTION

HANDLE WITH CARE! Ensure the H&S procedures are ALWAYS followed when handling the product to avoid personal injury and/or damage.

DANGER

Forklift lifting operations must ONLY be done by a trained and qualified person.

3.4.7 STORAGE

Store in a clean and dry location free from direct sunlight or corrosive fumes.

Store within an ambient temperature range of -10 °C to +40 °C.

Store within a relative humidity range of 0% to 90% and in a non-condensing environment.

DO NOT store in an area with rapid changes in temperature. It may cause condensation and frost.

3.4.8 DAMAGED MACHINERY HAZARDS

DO NOT use a damaged or malfunctioning product.

Conduct a thorough pre-installation and operation inspection of the product, and test all functions before placing it in service. Immediately tag and remove from service any damaged or malfunctioning machinery.

Be sure all maintenance has been performed as specified in this manual and the appropriate service manual.

Be sure all ID plates and decals are in place and legible.

3.4.9 RECOMMENDED PPE

- Always wear PPE such as high visibility vests, hard hats and safety footwear during installation, commissioning and the uninstall process.
- Always wear hard hats, safety footwear and high visibility vests when working within machinery's hazard zone.
- Wear suitable clothing for the working environment.
- Wear spectacles/goggles, shields, visors if working with hazards such as: flying particles, dust, splashing substances, harmful gases, vapours, aerosols, and high intensity radiation-from welding operations, lasers, transilluminators and strong heat sources.
- If dealing with chemical hazards or possible injury to the hands wear gloves that are suitable to the working environment. However, not all working situations will require gloves.
- Gloves should be checked routinely for leaks and rejected gloves destroyed immediately.

3.5 DON'TS

DO NOT allow lifting/motion operations unless carried out by competent or qualified person.

DO NOT attach lifting equipment other than to the indicated lifting points.

DO NOT climb down from the platform when it is raised.

DO NOT place or attach fixed or overhanging loads to any part of this machine other than what allowed by the manufacturer.

DO NOT place ladders or scaffolds in the platform or against any part of this product/machinery.

DO NOT place loads outside of the Piano Lift, Travelator Lift and Upper D platform perimeters.

DO NOT connect the product/machinery to a power source other than what the manual specifies for this unit.

DO NOT connect the product/machinery to the drive and control units other than those specified in this user manual.

DO NOT power up the product/machinery until the earthing/grounding system is installed.

DO NOT power up the product/machinery until equipotential bonding is guaranteed and tested.

DO NOT power up the product/machinery without the E-STOP stations connected and in position.
DO NOT operate the product/machinery without testing the Hold to Run (DEADMAN) and E-STOP safety functions.
DO NOT attempt to set the UPPER limit switches, unless the machinery is disconnected from the power supply.
DO NOT exceed the maximum specified speed of the machinery motor.
DO NOT modify the values and adjustments of the safety components and functionalities outside the limits provided in this manual, or without the written authorisation of the manufacturer.
DO NOT operate the product/machinery without having a clear view of the hazard zone or reliable communication with someone who does.
DO NOT initiate any movement until ALL protective measures are installed, tested and fully functioning.
DO NOT alter or disable machinery components in any way that could affect safety and stability.
DO NOT place any containers with liquids or any liquids in general on the product/machinery.
DO NOT touch the product/machinery with wet or damp hands or any part of the body that is wet/ damp.
DO NOT store in an area with rapid changes in temperature. It may cause condensation and frost.
DO NOT change any installation procedures unless authorised in writing by a qualified person that is authorised by Brilliant Stages.
DO NOT use any spare parts other than those supplied or authorised by Brilliant Stages.
DO NOT attempt to modify or repair the product unless authorised in writing by Brilliant Stages.
DO NOT use the product/machinery without having carried out the regular inspection as specified by the manufacturer.

DANGER

Changes or modifications of the motion or lifting operations, set or equipment installed might compromise the integrity of the manufacturer risk assessment with consequent potential "loss of suitability" of the risk reduction measures implemented by the manufacturer/designer.

3.6 HAZARD ZONES

Risk of Falling from Height

The following identifies the hazard zones of the Lower D portion of the sphere and the travelator lift:

3.6.1 LOWER D HAZARD ZONES

The hazard zones for the Lower D are when it is horizontal and has a max +/- inclination of 5%, and when it is in motion.
When the Lower D is in motion, people are ONLY allowed in area 8.
When the Lower D is static, people are ONLY allowed in area 8 and area 16.
Nobody is allowed in area 32, unless complementary measures are implemented (handrails, safety nets, fall protection devices, etc.).

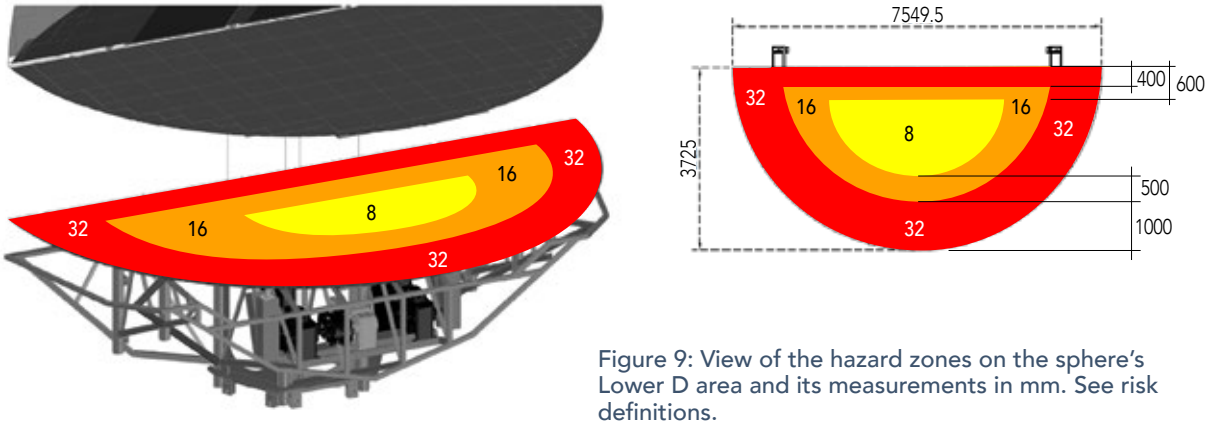


Figure 9: View of the hazard zones on the sphere's Lower D area and its measurements in mm. See risk definitions.

3.6.2 TRAVELATOR LIFT HAZARD ZONES

The hazard zones for the travelator lift are when the lift is above stage level at its max height position, when it is stationary and when it is in motion.

When the travelator lift is in motion, people are ONLY allowed in area 8.

When the travelator is static, people are ONLY allowed in area 8 and area 16.

Nobody is allowed in area 32, unless complementary measures are implemented (handrails, safety nets, fall protection devices, etc.).

NOTE: The three travelators should be at rest until the travelator lift reaches stage level, unless complementary measures are implemented (handrails, safety nets, fall protection devices, etc.).

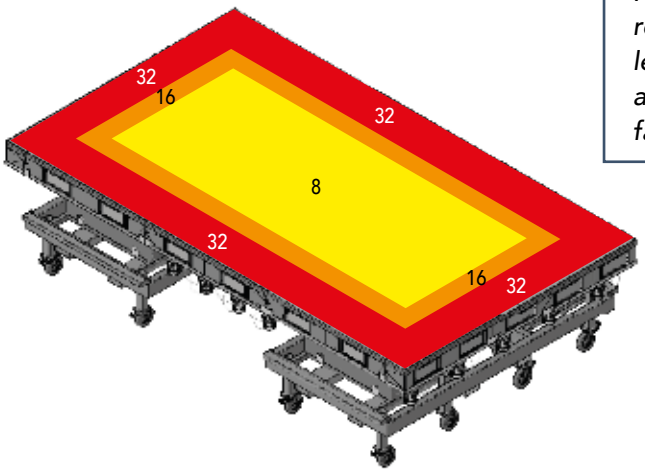


Figure 10: View of the hazard zones on the travelator lift.

3.6.3 RISK DEFINITIONS

8 - Risk Controllable - Low Risk

Risks scored with an 8 can be kept under control with the correct implementation of complementary safety measures (guards and physical protections, signs, warnings, etc.) provided the guidelines included in the installation method statement are followed.

16 - Risk Controllable - Medium Risk

Risks scored with a 16 can be kept under control with a combination of safety functions and the correct implementation of complementary measures. However, the access to the hazard zone must be justified by a specific safety-related motivation, and people exposed to the risk should have a highly proven possibility of avoidance.

32 - Risk Not Acceptable

People present in hazard zone 32 are exposed to risks that can lead to fatal injuries if not assessed and further reduced or mitigated. Although generally the probability of occurrence is medium, the residual risk cannot be considered tolerable.

3.7 SAFETY INTERACTION WITH MACHINERY

3.7.1 LEVELS - INTERACTION AND SAFETY MACHINERY COMPONENTS

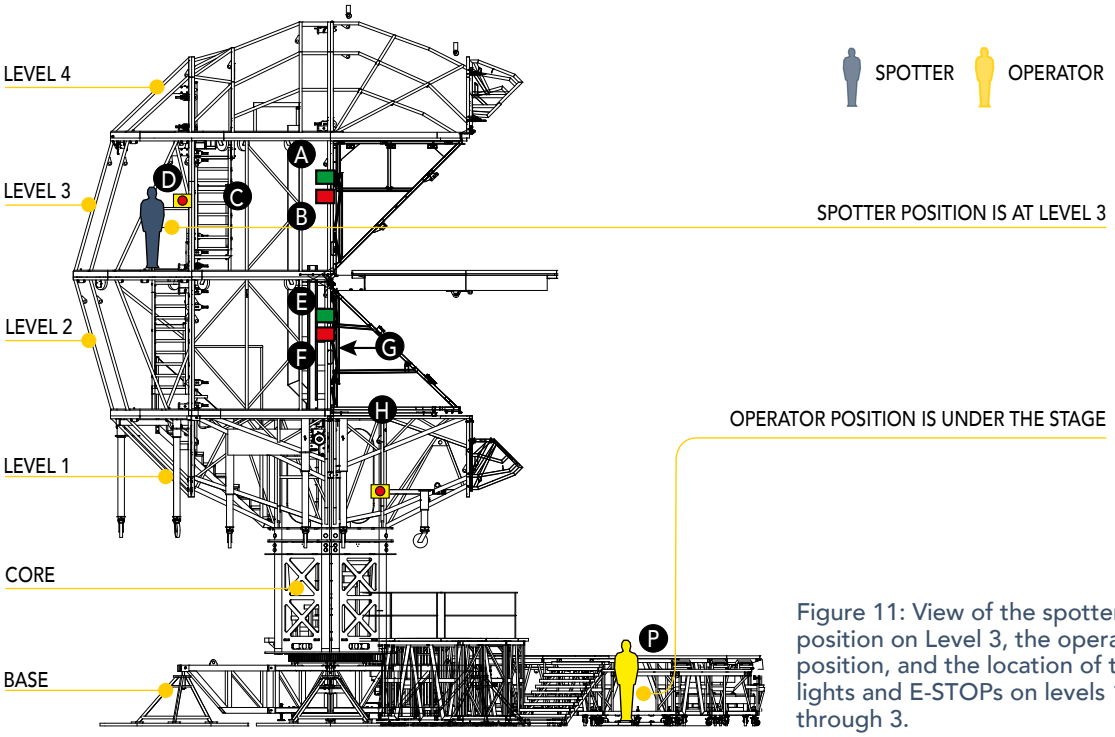


Figure 11: View of the spotter's position on Level 3, the operator's position, and the location of the lights and E-STOPs on levels 1 through 3.

Level 3

A - Green light will show that the Lower D is at Level 3.

B - Red light will show that the Lower D is not at Level 3. If both lights are ON or both lights are OFF, the equipment is malfunctioning.

C - A spotter will use a DEADMAN handle to disable the Upper D when people are behind the Upper D platform or standing on any of the 3 door platforms.

C - The spotter should have direct or indirect visibility to both sides of the Upper D platform.

D - An E-STOP in Level 3 is available in case of emergency. The E-STOP will stop the Lower D and Upper D axis.

P - The operator can control and can safely disable the Lower D and the Upper D.

WARNING

Always verbally confirm that all performers are cleared from the Upper D before enabling the DEADMAN handle.

Level 2

E - Green light will show that the Lower D is at Level 2.

F - Red light will show that the Lower D is not at Level 2. If both lights are ON or both lights are OFF, the equipment is malfunctioning. The area should be made secured from pinching points and searching conditions.

G - In the event the door is opened, the Lower D machinery will stop.

H - If the Lower D is in the Level 3 position and the door is opened, there should be a platform to stand on.

P - The operator can control and can safely disable the Lower D.

WARNING

Always verbally confirm before opening the door or accessing the Lower D on Level 2.

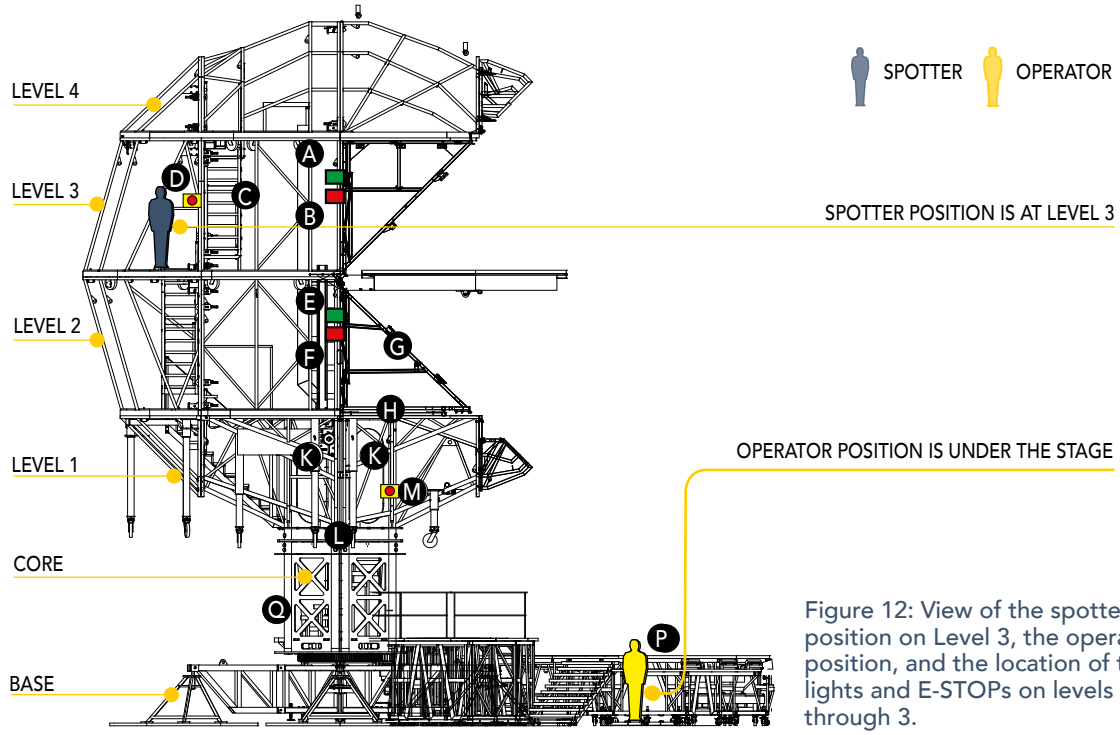


Figure 12: View of the spotter's position on Level 3, the operator's position, and the location of the lights and E-STOPs on levels 1 through 3.

Level 1

K - Net or covers should be in place to cover the walls of the stairs.

L - During normal operation, no one is allowed to enter Level 1 other than through the staircase. Disconnect the machine before accessing the area underneath the Lower D.

M - An E-STOP in Level 1 is available in case of emergency. The E-STOP will stop the Lower D axis.

P - The operator can control and can safely disable the Lower D.

WARNING

Always verbally confirm before accessing the area underneath the Lower D.

Core

Q - The access to the sphere is restricted to some personnel and the operator should be informed when someone enters or exits the sphere. The personnel inside of the sphere should be accounted for at any given time.

Q - In the event of any that the doors open, the rotate machinery will stop. The guiding cables inside of the staircase should not be twisted. Notify the operator if you detect anything strange with the cable management.

WARNING

Always verbally confirm before trying to enter or exit the sphere.

3.7.2 MOTION - INTERACTION AND SAFETY MACHINERY COMPONENTS

Rotate the Sphere

The sphere cannot be accessed when the rotating machinery is moving.

In the event that any of the doors open, the rotate machinery will stop.

The operator can control and can safely disable the rotate machinery.

WARNING

Always verbally confirm before trying to enter or exit the sphere.

Tilting the Lower D

The Lower D must ensure axis synchronisation when lifting performers.

When there are no performers on the Lower D platform, the spotter in Level 3 may allow tilting by temporarily overriding the axis synchronisation.

The spotter in Level 3 should have direct or indirect visibility to the Lower D platform area.

The operator can control and can safely disable the Lower D.

WARNING

Always verbally confirm before overriding the Lower D axis synchronisation.

Raising/Lowering the Lower D

The Lower D must ensure axis synchronisation when lifting performers.

The performer(s) should be clear of the hazardous area around the Lower D. Refer to the figures in Section 3.6.1 Lower D Hazard Zones for more information.

The operator can control and can safely disable the Lower D.

Walking from Lower D to Travelator Lift

The operator will use a DEADMAN handle to disable the machinery until the performers are clear of the high risk areas of the Lower D and travelator lift.

The rotate machinery is disabled when the travelator lift is above 2.4 m from the stage door.

WARNING

Always verbally confirm before walking between the Lower D and the travelator lift.

Raising/Lowering the Travelator Lift

The performer(s) should be clear of the hazardous area around the travelator lift.

The operator can control and can safely disable the travelator lift.

To detect pinching points, the travelator lift's edges between the stage and the lift platform are protected by a rubber band Safe Edge.

The rotate machinery is disabled when the travelator lift is above 2.4 m from the stage door.

The travelators are disabled when the travelator lift is above 0.010 m from the stage door.

Raising/Lowering the Piano Lifts

The piano lifts are each controlled by a local control unit that can only be safely disabled by each respective operator.

When the lifts are not in use, the local control units must be kept in a safe place to prevent unauthorised access.

To detect pinching points, the piano lift edges between the stage and the lift platform are protected by a rubber band Safe Edge.

3.8 OVERRIDES OF SAFETY FUNCTIONS

In the eventuality that an axis cannot move because of the unintended behavior of a safety function, override local control units are available for all axes.

Refer to the Local Control User Manual for information on how to operate the machinery.

3.8.1 UPPER D (SL / SR)

2x yellow override box required.

All necessary personnel must clear the Level 3 area and the Lower D platform area.

The two axes must be moved simultaneously using independent local control units. Failing to move each axis simultaneously could cause a mechanical integrity failure.

The operators might choose to override the local safety functions to operate the machinery into a safe state.

3.8.2. LOWER D (US / DS)

2x yellow override box required.

All necessary personnel must clear the Level 2 area and the Upper D and Lower D platform area.

Some mechanical constraints might prevent the Lower D from moving freely. The operator must consider those constraints before executing a movement.

The operators might choose to override the local safety functions to operate the machinery into a safe state.

WARNING

The DMH shall not be taped over or overridden in any circumstances.

3.8.3 ROTATE

1x blue override box required.

All necessary personnel must clear the sphere.

Some mechanical constraints might prevent the rotate machinery from moving freely; for example the cable management or the collision with other machinery. The operator must consider those constraints before executing a movement.

The operators might choose to override the local safety functions to operate the machinery into a safe state.

WARNING

The DMH shall not be taped over or overridden in any circumstances.

3.8.4 TRAVELATOR LIFT (US / DS)

2x yellow override box required.

All necessary personnel must clear of the lift platform and the area around the travelator lift.

The two axes must be moved simultaneously using independent local control units. Failing to move each axis simultaneously could cause a mechanical integrity failure.

The operators might choose to override the local safety functions to operate the machinery into a safe state.

WARNING

The DMH shall not be taped over or overridden in any circumstances.

3.9 RESPONSIBILITY

Brilliant Stages Ltd declines any liability for damages caused by:

- Improper installation or commissioning which does not comply with current regulations and/or to this manual;
- use of the product by staff that is not adequately trained;
- improper use of the product;
- power supply faults;
- integration of the product with any other products and/or third party safety-related equipment, machinery or other user interfaces not approved or recommended by the manufacturer;
- shortcomings of planned maintenance;
- modifications or non-authorised actions;
- use of spare parts which are not original or not suitable for the model;
- disregard or incorrect application of these instructions, even partially;
- incorrect predisposition of the working area of the product application;
- use of the product that is not in compliance with the national legislation;
- calamities and exceptional events (force majeure).

DANGER

The manufacturer cannot foresee risks originated by an improper use of the product/machinery or a disregard of the safety information other than assessed in this document.

Other uses or improper interaction with the machinery within the hazard zones are considered a “voluntary misuse” rather than a foreseeable human misuse.

4.1 PRODUCT DESCRIPTION

The sphere is one of the main elements of the stage that houses two moving platforms, one of them is a lift to help the artist(s) get onto the stage or from the stage to the travelator lift, while the LED panels connected to its outer structure act a video wall for the audience.

The two platforms located in the mouth of the sphere move in different directions. The bottom platform (Lower D) tilts from 4 degrees horizontally, and moves vertically up and down, so it can be levelled with the travelator lift when it is in the maximum UP position. The top platform tilts from 45 degrees vertically to allow the artist(s) to access the Lower D platform.

The sphere is a 10 m LED structure that can rotate 180 degrees (90 degrees left and 90 degrees right) with a rotator mechanism that is located on its base. The structure itself weighs 25 t and contains three sets of stairs, a rack and pinion system to rotate the structure and a Serapid system to move the platforms.

The main stage is integrated with a travelator lift in the centre and two piano lifts on the right and left side of the stage.

The piano lifts will travel from arena floor to stage level only, and the travelator lift will travel from stage level to above stage level only.

Between the main stage and the sphere, a technical bunker is built to integrate the two elements of the machinery installation

SPHERE DRAWINGS

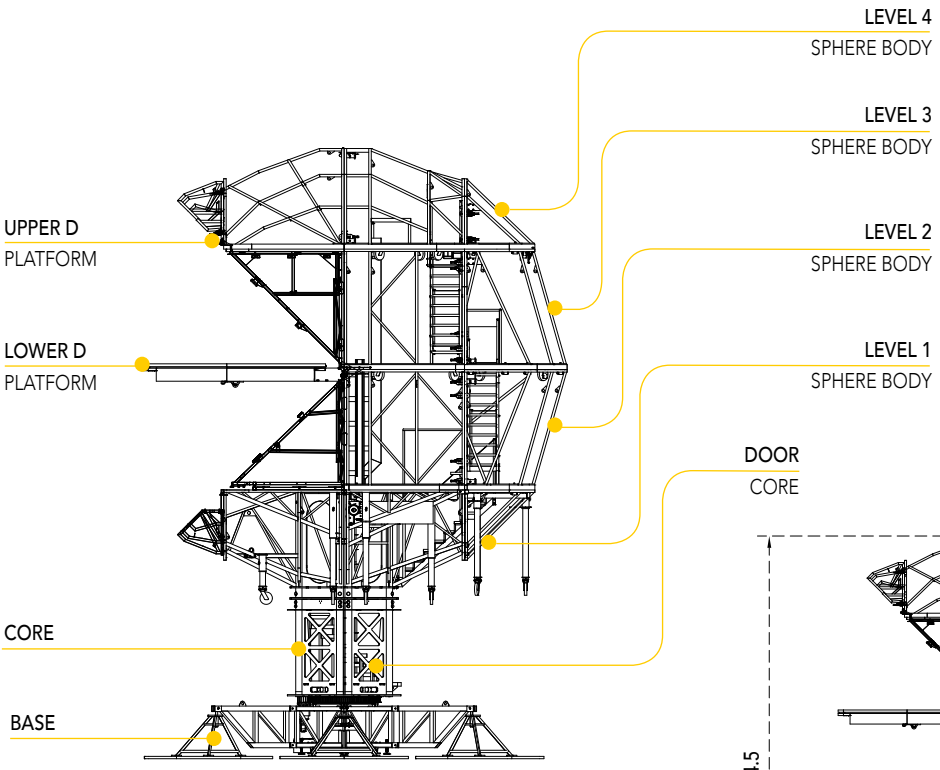


Figure 13: View of the sphere and its main elements.

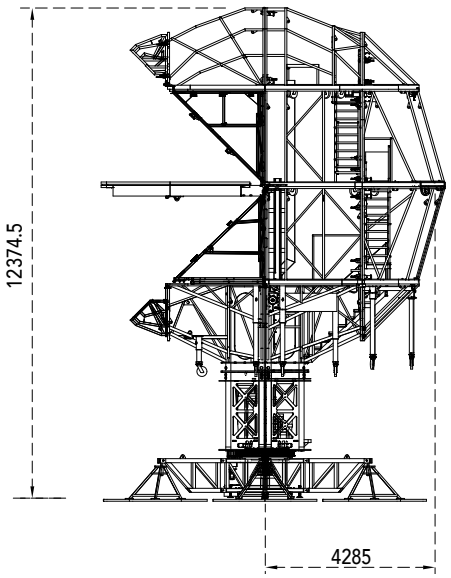


Figure 14: View of the sphere's measurements in mm.

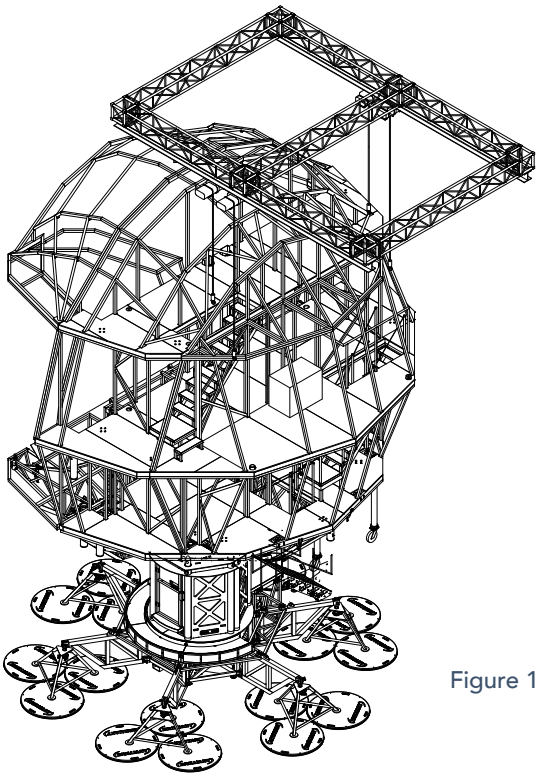


Figure 15: View of the rear side of the sphere.

STAGE DRAWINGS

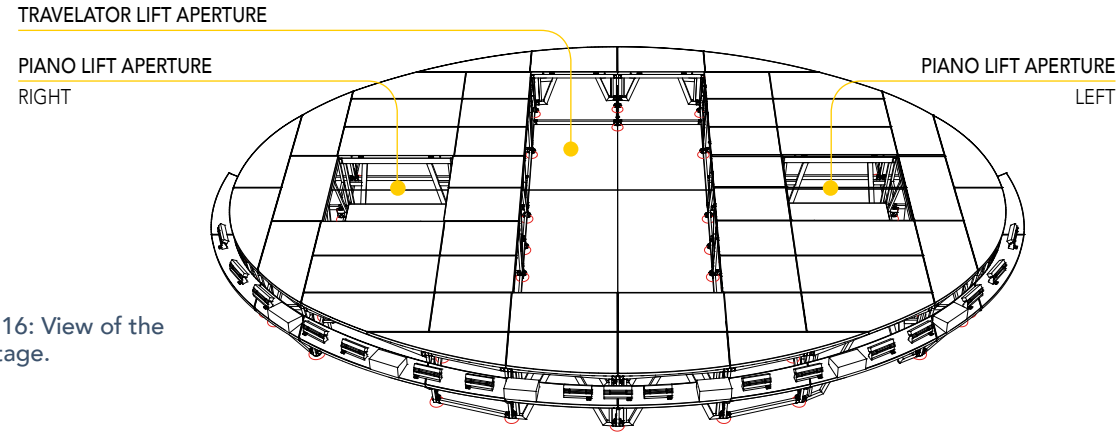


Figure 16: View of the main stage.

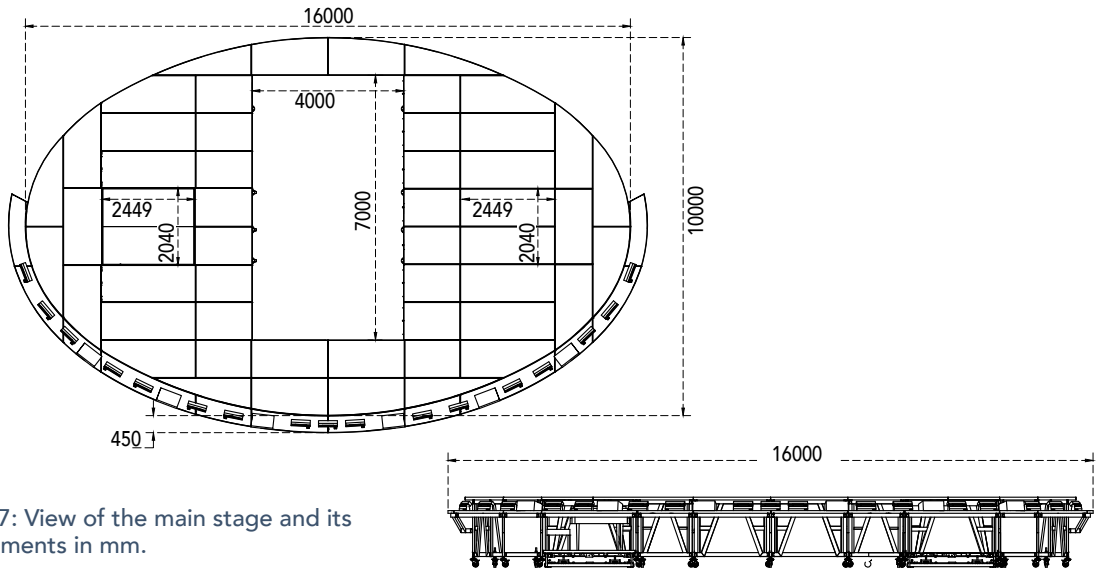


Figure 17: View of the main stage and its measurements in mm.

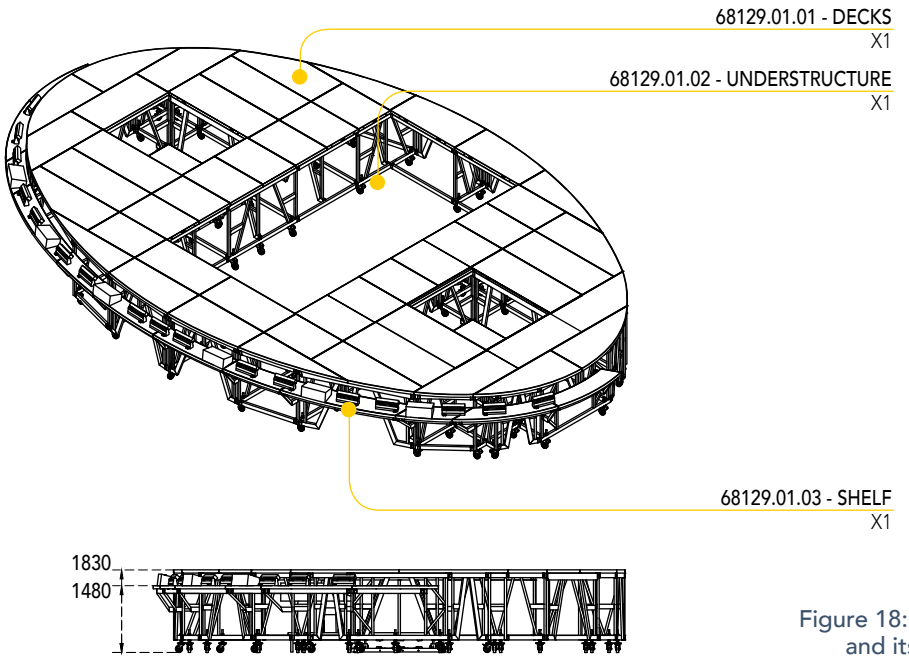
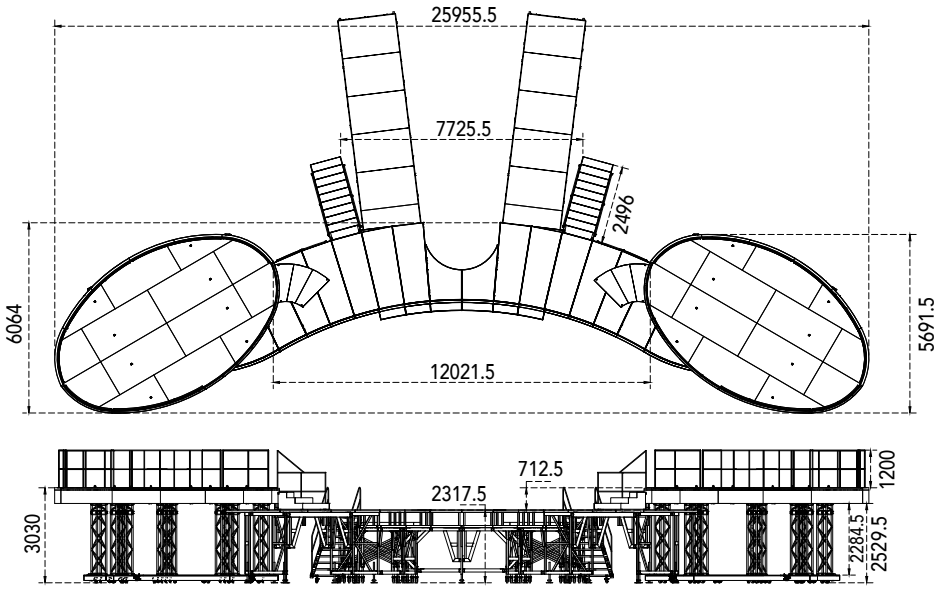


Figure 18: View of the main stage and its measurements in mm.

TECH BUNKER DRAWINGS



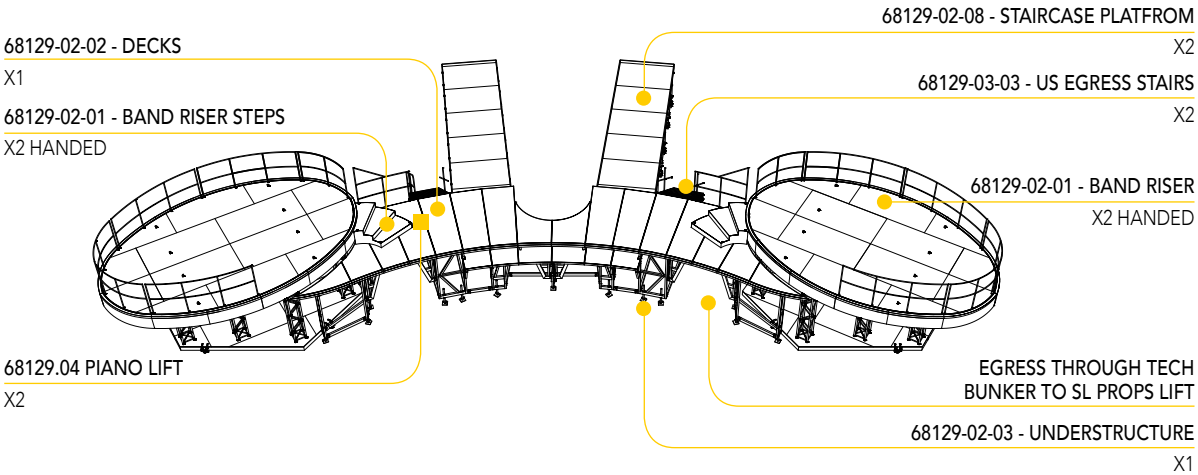


Figure 19: View of the tech bunker and its measurements in mm.

The sphere is comprised of six main areas with the mouth of the sphere being located in Levels 2 and 3. Levels 1 and 4 of the sphere are divided into segments A through D. Levels 2 and 3 are divided into segments A through C. Each area is identified by the level number and segment letter.

Please see the following:

- Base
- Core
- Level 1: 1A, 1B, 1C, 1D
- Level 2: 2A, 2B, 2C
- Level 3: 3A, 3B, 3C
- Level 4: 4A, 4B, 4C, 4D

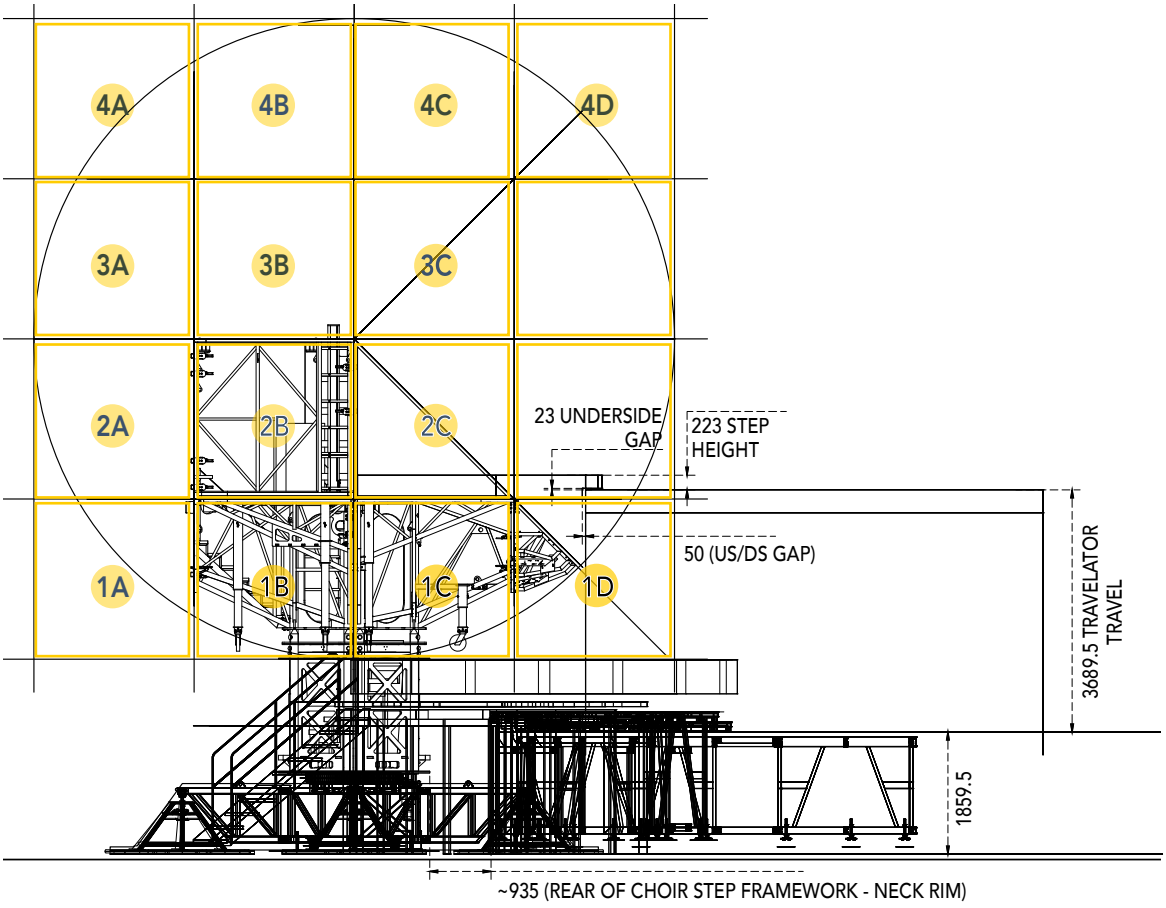


Figure 20: The levels and segments of each part of the sphere.

Figure 21: View of the labels used to identify the different segments of the sphere.

The stage's assembly also incorporates two travelator lifts and a piano lift in the main stage, which is situated in front of the sphere and is connected to the technical bunker.

- Sphere
- Travelator Lift
- Piano Lifts
- Main Stage and Technical Bunker

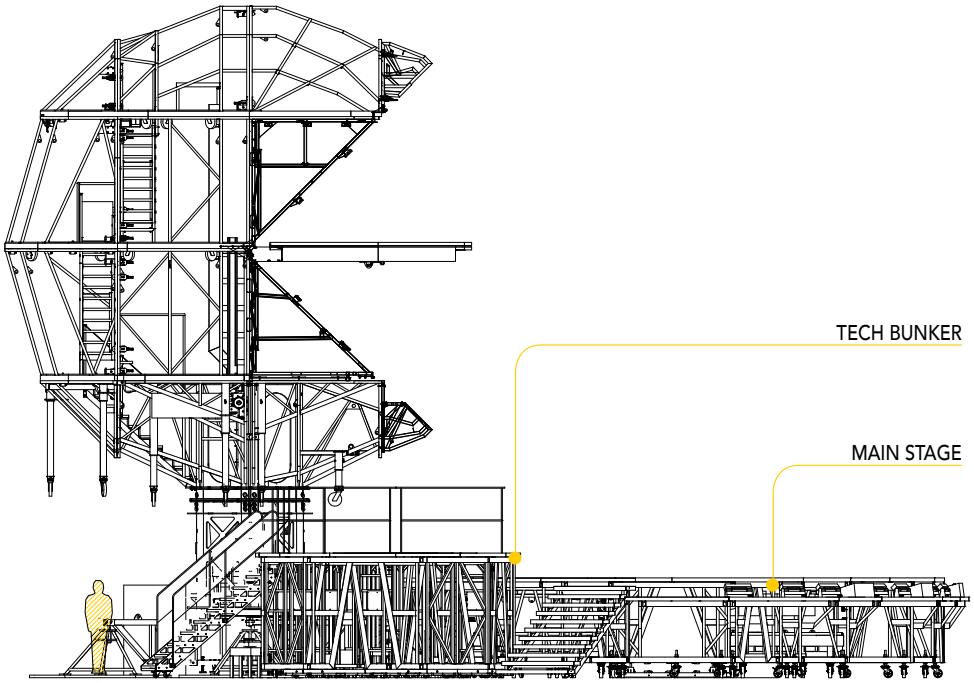


Figure 22: View of the sphere, tech bunker and main stage.

NOTE: For more detail, please refer to the drawings for each section for the travelator lift, piano lift, main stage and the technical bunker.

5.1 SPHERE BASE

The base acts as the structural support for the sphere and houses the rotating mechanism. It consists of:

- The rotating base and core
- Six base outriggers
- Six base tripods and floor pads

NOTE: It is essential that the base and six outriggers are placed on the floor pads in order to keep the structure stable.

DANGER

If the floor pads are not installed or not centered, the entire sphere may lose stability.

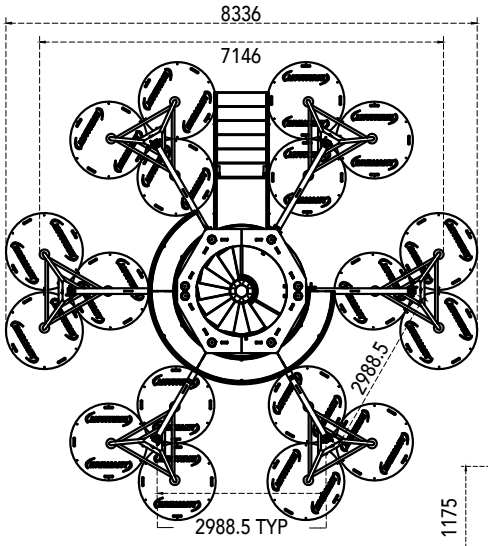


Figure 23: Plan view of the sphere's base and its measurements in mm.

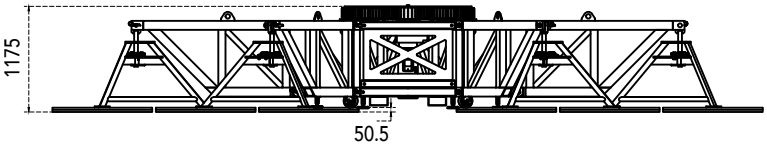


Figure 24: Side view of the sphere's base and its measurements in mm.

On top of the sphere's rotating base is the rack and pinion rotating mechanism and machinery.

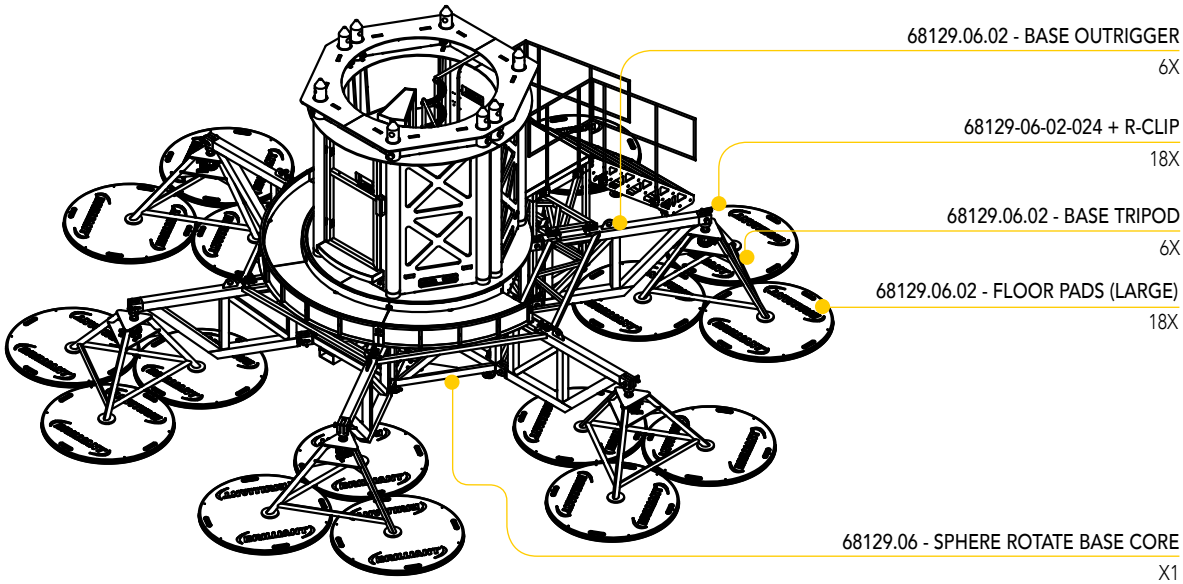


Figure 25: Plan view of the sphere's base.

DANGER

The maximum bearing pressure underneath the spreader plates does not exceed the maximum allowable soil bearing pressure which is equal to 25kPa.

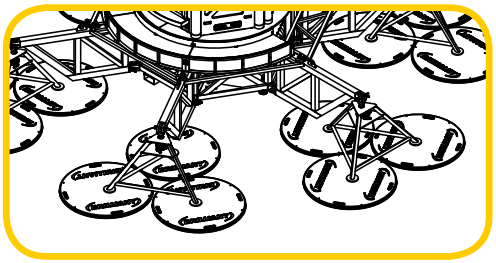


Figure 26: Closeup of the tripod leg.

5.2 CORE

The rotating core is located on top of the sphere base and can rotate the sphere 180 degrees (90 degrees left or right). It is powered by the rack and pinion motorised assembly.

The core connects to the base via the slew ring assembly, which sits on top of the base. Once connected, the slew ring and motor assembly help the core rotate while it's attached to the base.

NOTE: Level 1 of the sphere can be accessed via the first set of stairs located inside of the core. The access to the core stairs is possible from an opening door located upstage, and the core door is fitted with an interlocked door assembly.

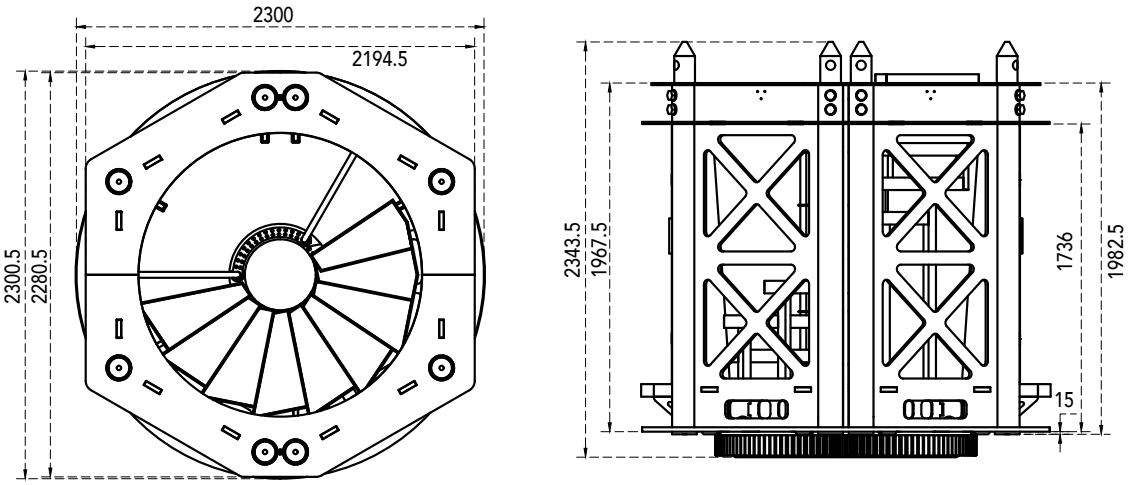


Figure 27: Measurements in mm of the rotating core in the sphere's base.

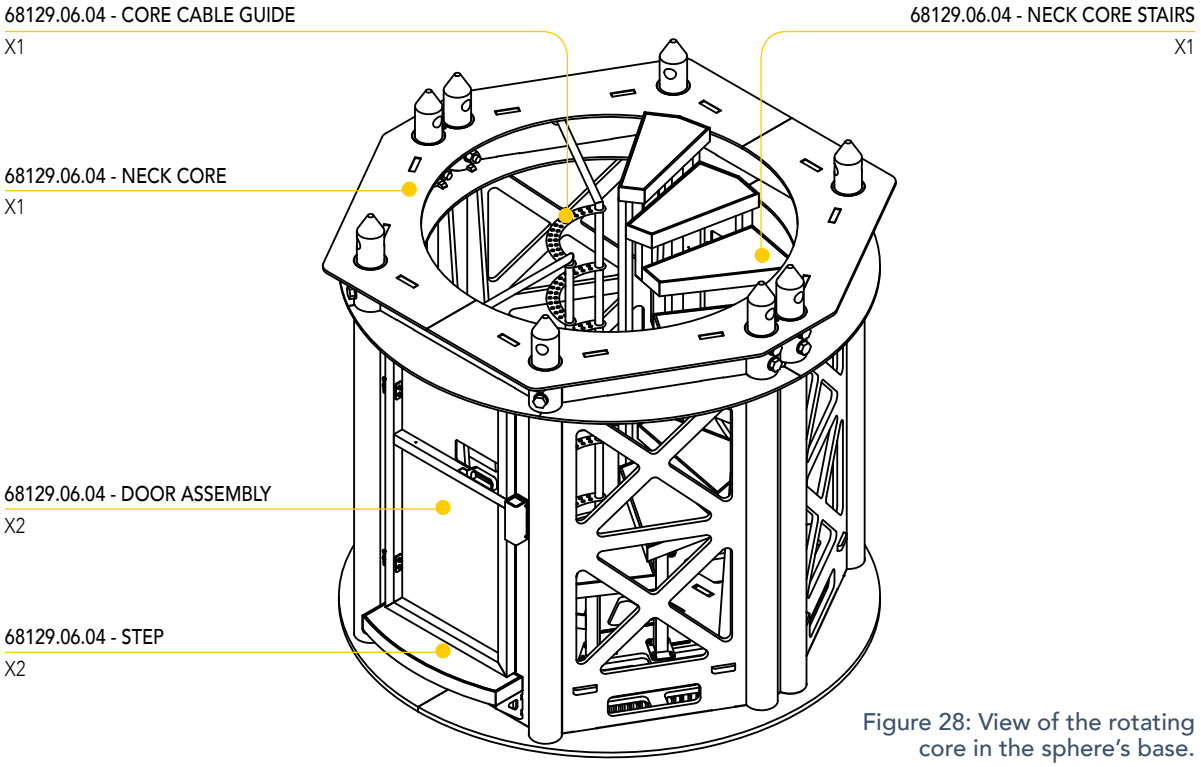


Figure 28: View of the rotating core in the sphere's base.

5.3 LEVEL 1

The sphere is separated into four different frame levels with the first level forming the bottom of the sphere. This level consists of four different sections:

- 1A
- 1B
- 1C
- 1D

5.3.1 LEVEL 1A

The Level 1A frame makes up the US bottom rear portion of the sphere and contains guiding feet to help it move. This part of the frame also supports part of the staircase that artist(s) and technicians will use to reach the upper levels of the sphere.

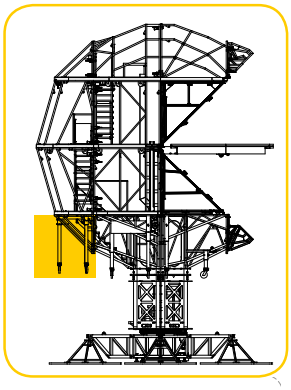


Figure 29: View of level 1A in the sphere.

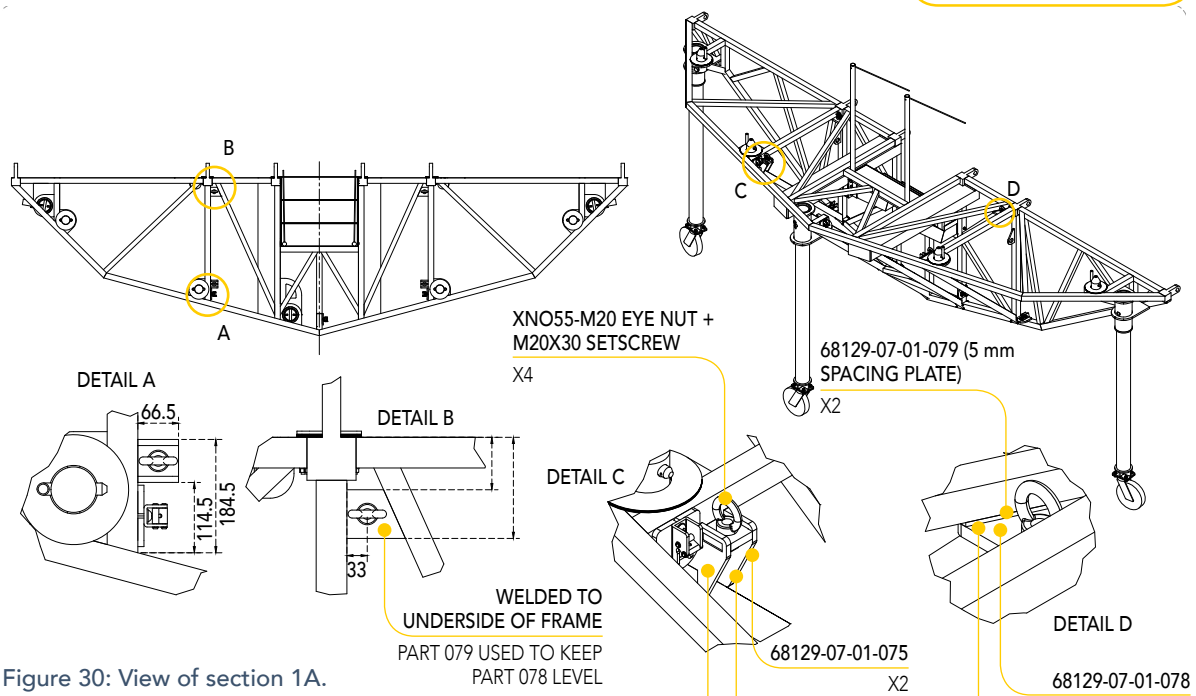


Figure 30: View of section 1A.

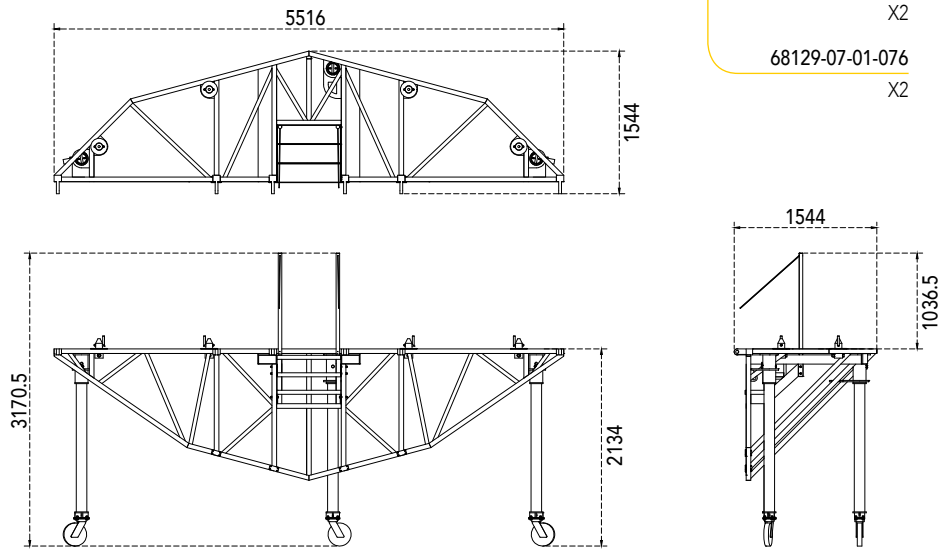


Figure 31: View of section 1A with measurements in mm.

5.3.2 LEVEL 1B

The Level 1B frame forms the US middle of the first level and expands the sphere's core. With the core it supports part of the staircase, houses the Lower D - US Serapid chain assembly and drive system to power it. The frame itself also has guiding wheels like level 1A.

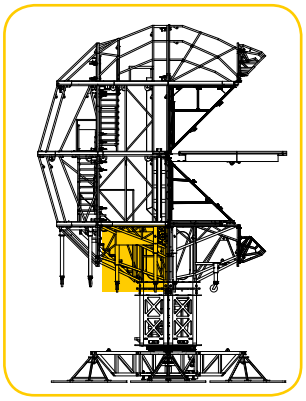


Figure 32: View of level 1B in the sphere.

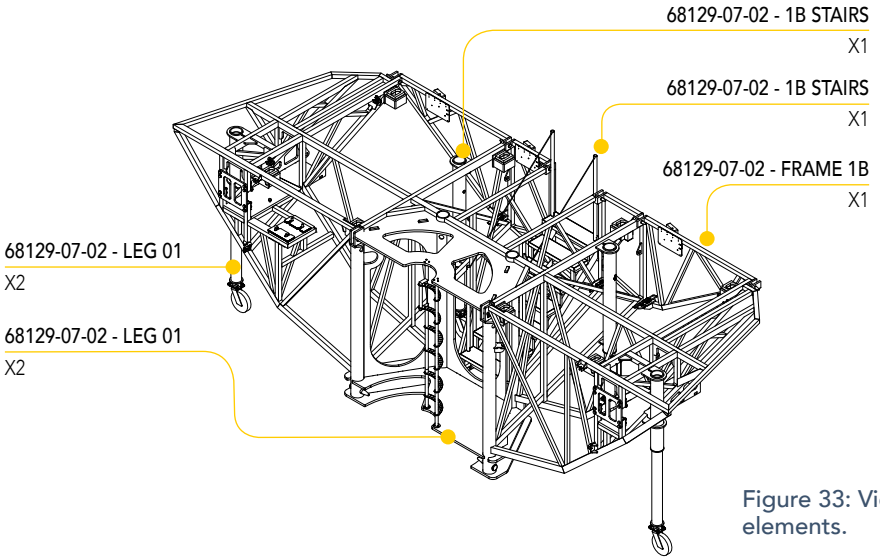


Figure 33: View of frame 1B and its main elements.

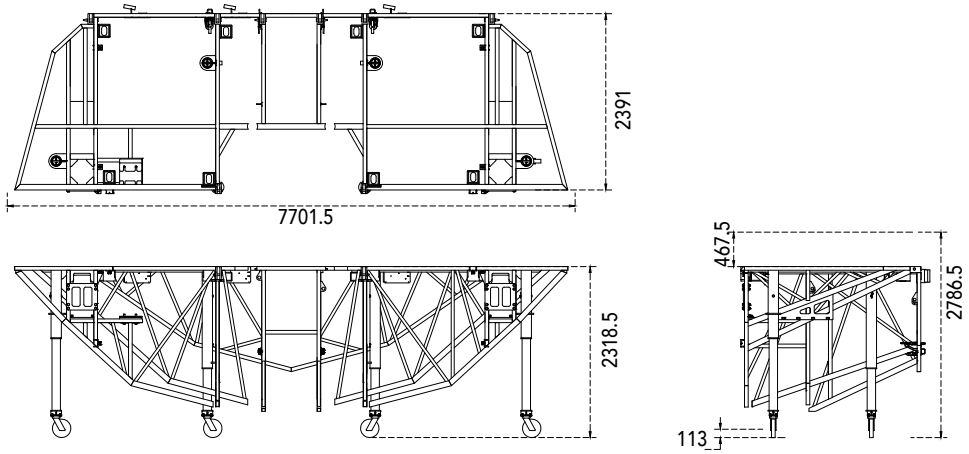


Figure 34: The measurements of Level 1B in mm.

5.3.3 LEVEL 1C

The Level 1C frame continues where 1B leaves off and expands the core and fills in the bottom front DS of the sphere, except for the mouth section which is a part of Level 1D.

The 1C module houses the Lower D - DS Serapid chain assembly and the drive system to power it. Like the previous levels it has guide wheels attached to its frame.

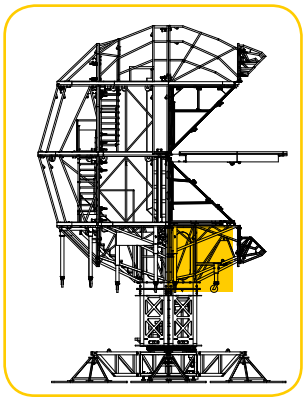


Figure 35: View of level 1C in the sphere.

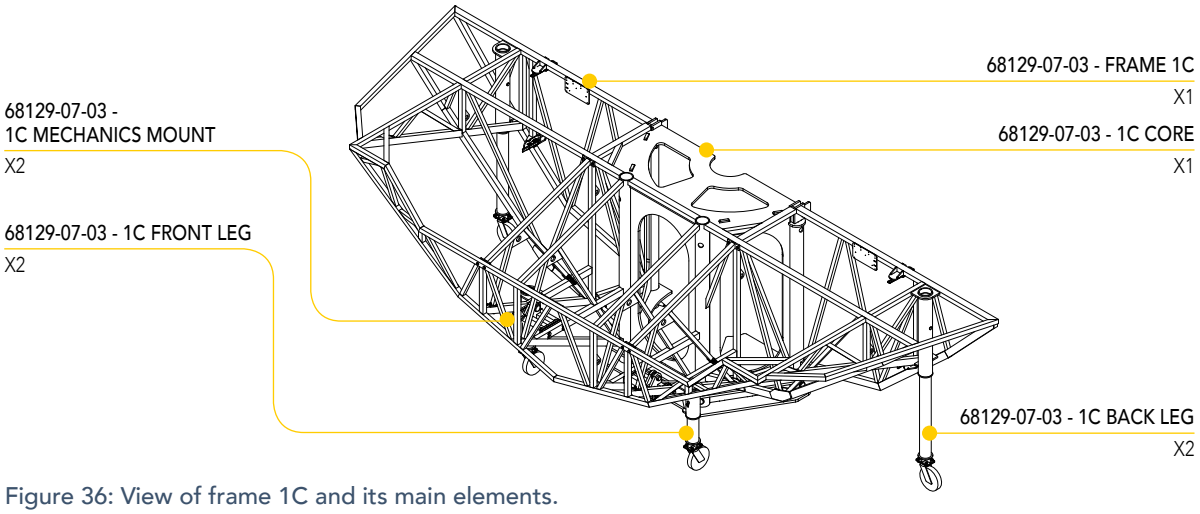


Figure 36: View of frame 1C and its main elements.

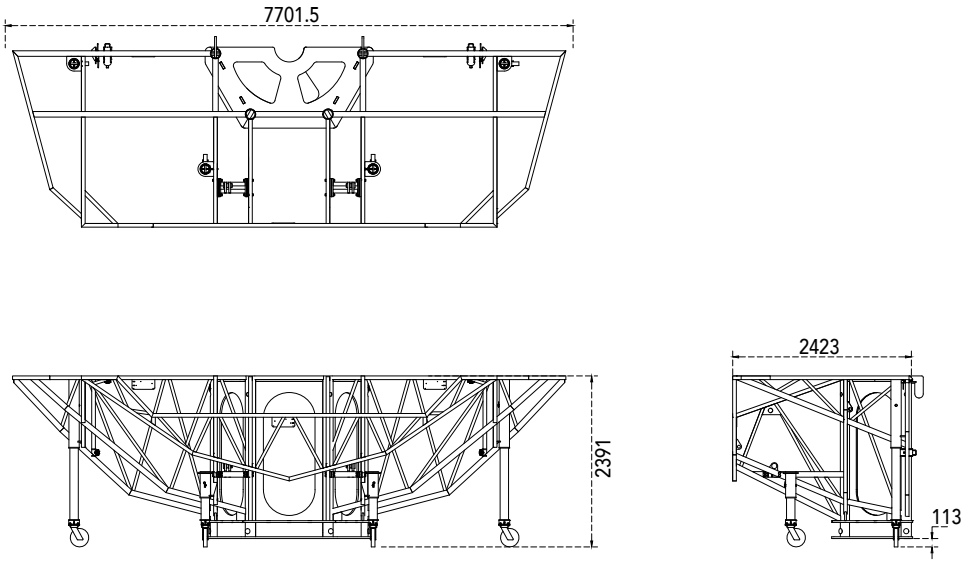


Figure 37: The measurements of Level 1C in mm.

5.3.4 LEVEL 1D

The 1D module acts as the structural element to complete the mount and is only used to support the video panels connected to the outside of the sphere.

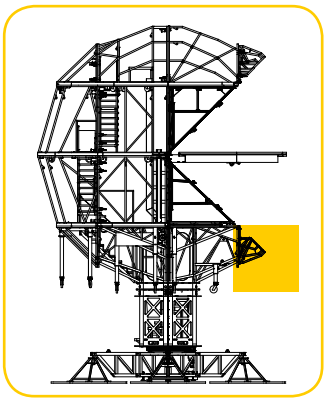


Figure 38: View of level 1D in the sphere.

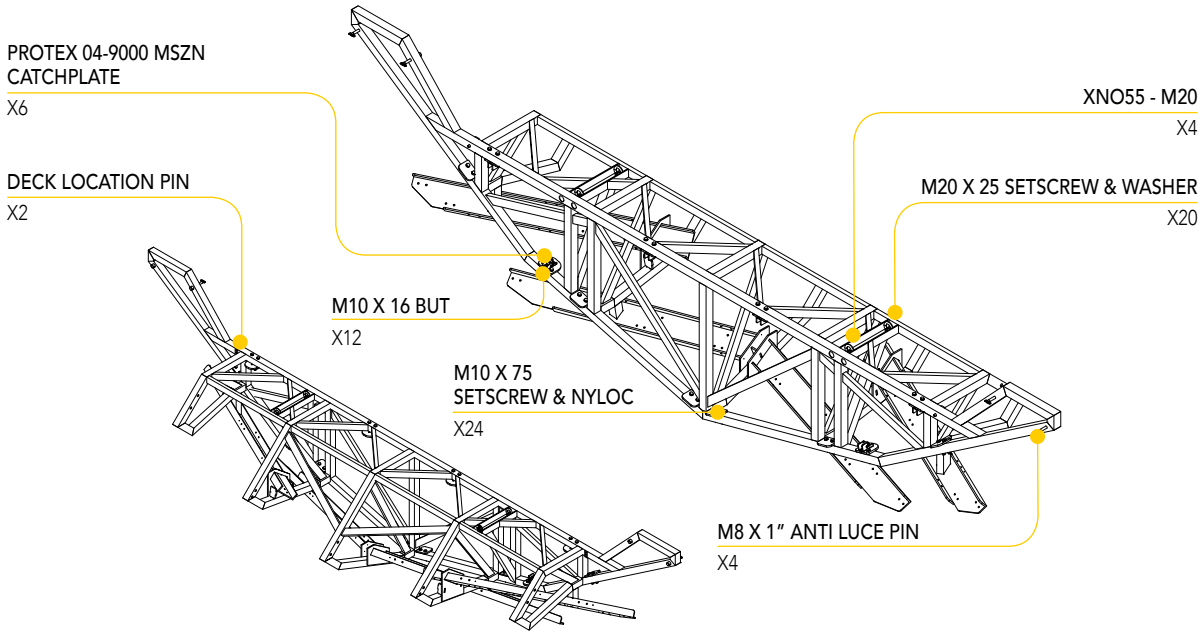


Figure 39: View of frame 1D and its main elements.

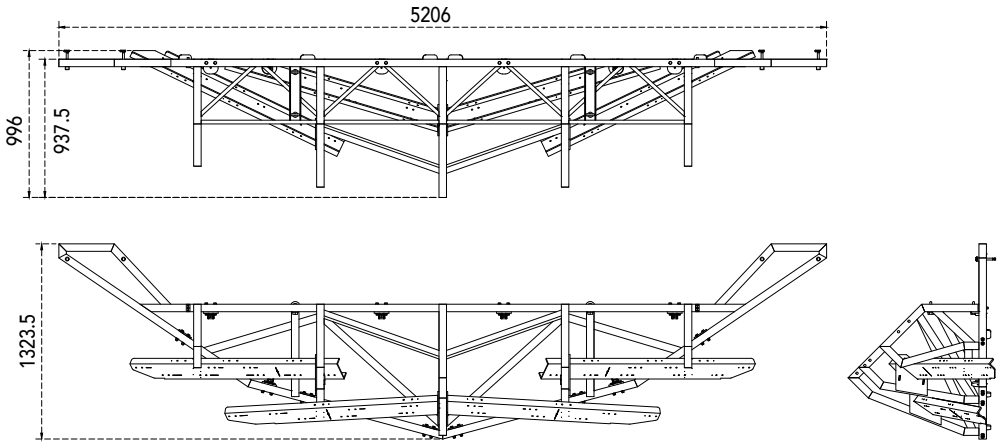


Figure 40: The measurements of Level 1D in mm.

5.4 LEVEL 2

The sphere is separated into four different frame levels with the second level forming the level right above the first level of the sphere. This level consists of three different sections:

- 2A
- 2B
- 2C

5.4.1 LEVEL 2A

Level 2A forms the rear US portion of the sphere and houses the stairs for the second level.

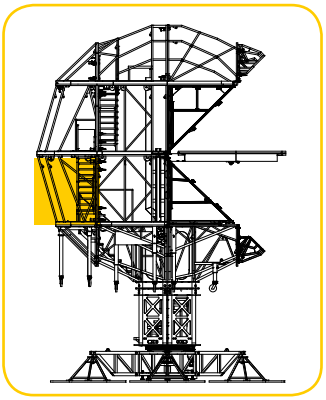


Figure 41: View of level 2A in the sphere.

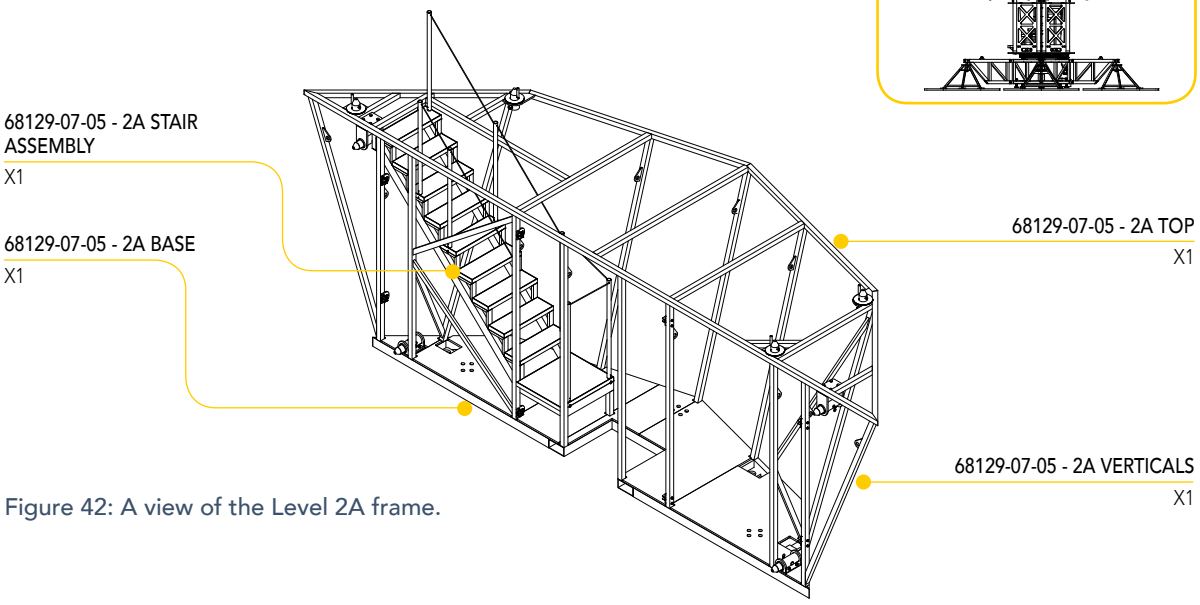


Figure 42: A view of the Level 2A frame.

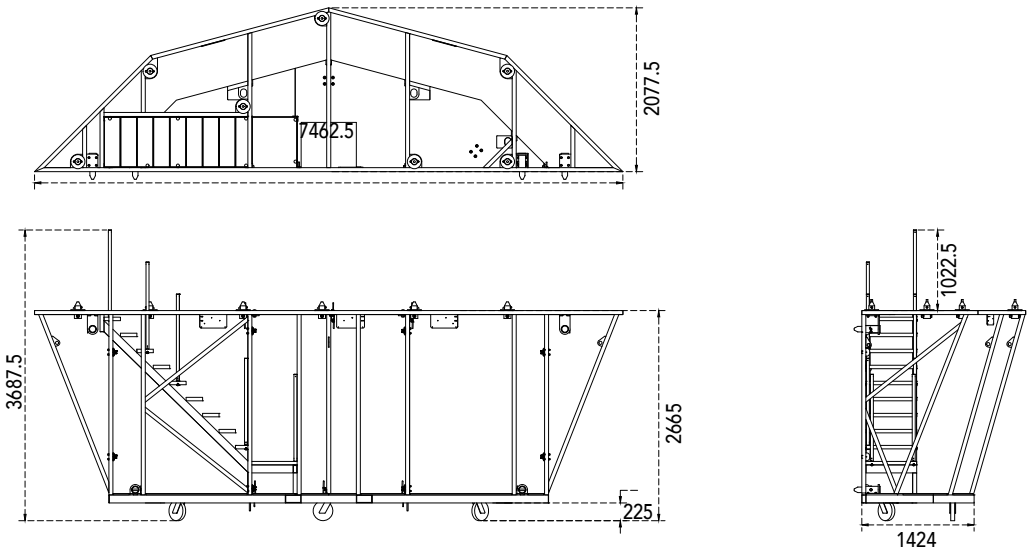


Figure 43: Level 2A and its measurements in mm.

5.4.2 LEVEL 2B

Level 2B consists of the middle portion of Level 2 and houses the mechanisms for the Lower D platform.

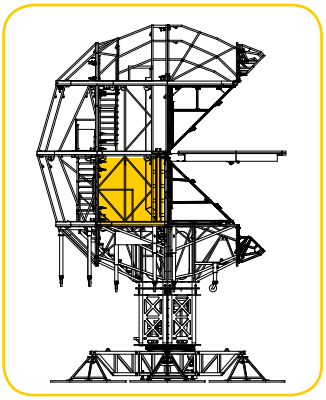


Figure 44: View of level 2B in the sphere.

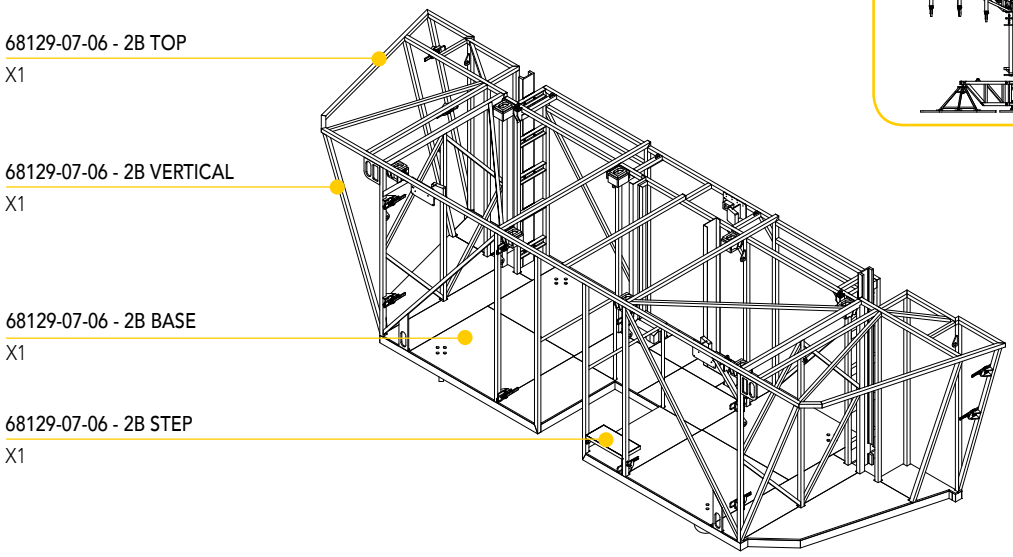


Figure 45: View of Level 2B's frame.

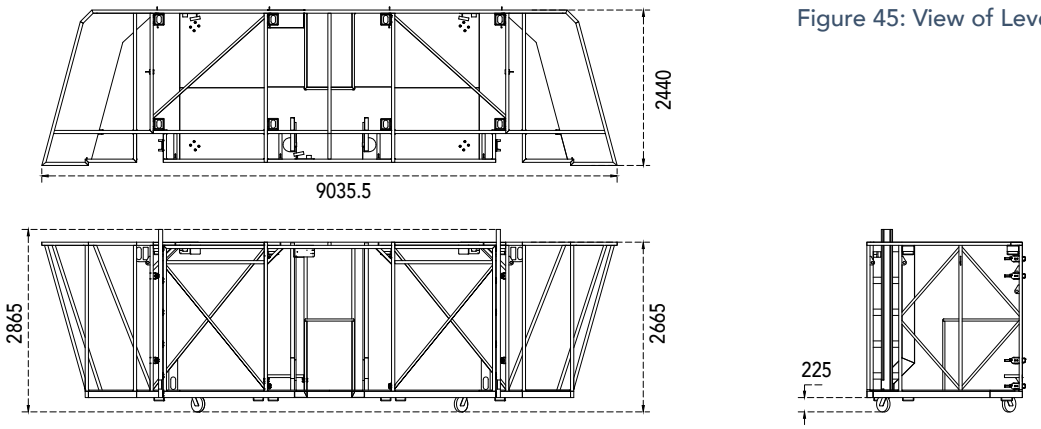


Figure 46: View of Level 2B and its measurements in mm.

5.4.3 LEVEL 2C

Level 2C structures the front portion of the sphere on level 2 and it is where the Lower D platform is installed (see related chapter).

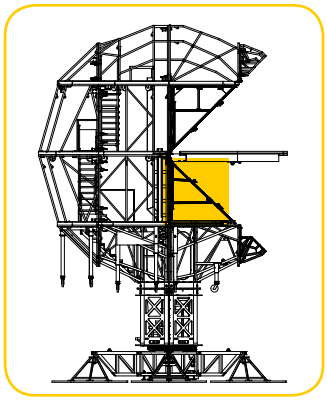


Figure 47: View of level 2C in the sphere.

5.5 LEVEL 3

The sphere is separated into four different frame levels with third level forming the second to last level of the sphere. This level consists of three different sections:

- 3A
- 3B
- 3C

5.5.1 LEVEL 3A

Level 3A forms the US rear portion of Level 3, it is the landing area for the stairs in Level 2A.

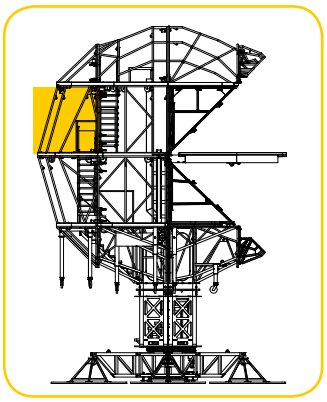


Figure 48: View of level 3A in the sphere.

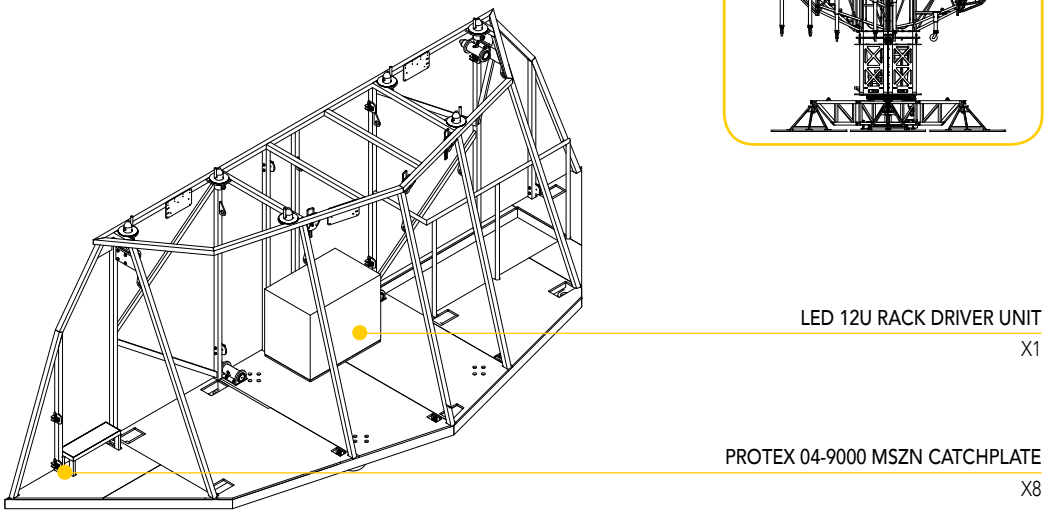


Figure 49 - View of the Level 3A frame.

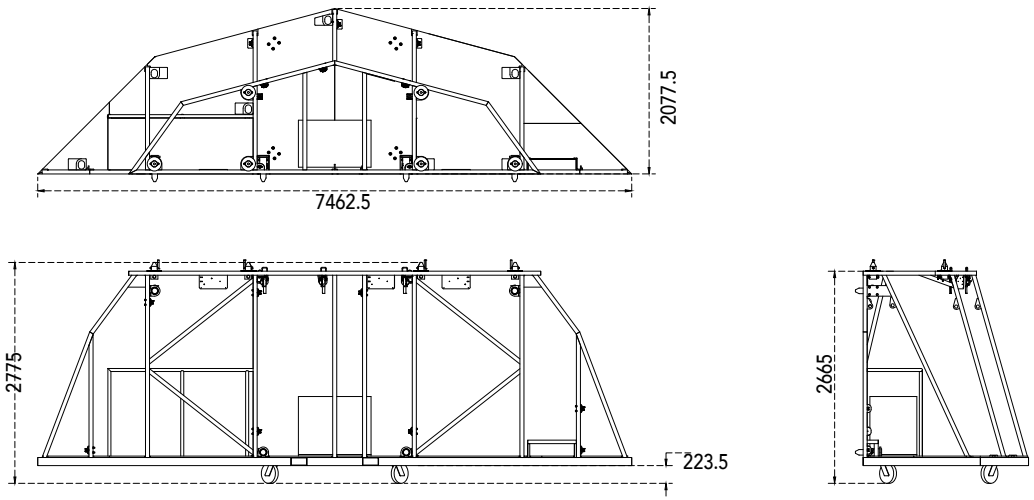


Figure 50: View of Level 3A and its measurements in mm.

5.5.2 LEVEL 3B

Level 3B is the area where the actors can access the Upper D platform through the revolving doors.

The partition between Level 3B and 3C is the Upper D (see related the chapter).

Level 3B also serves as access to the Level 4B and accommodates the last set of stairs and wheels (castors).

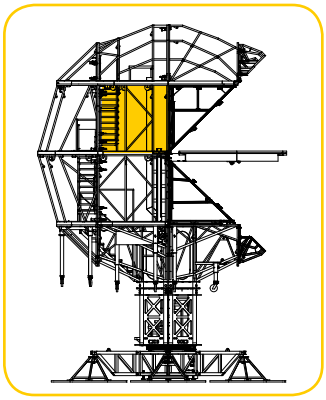


Figure 51: View of level 3B in the sphere.

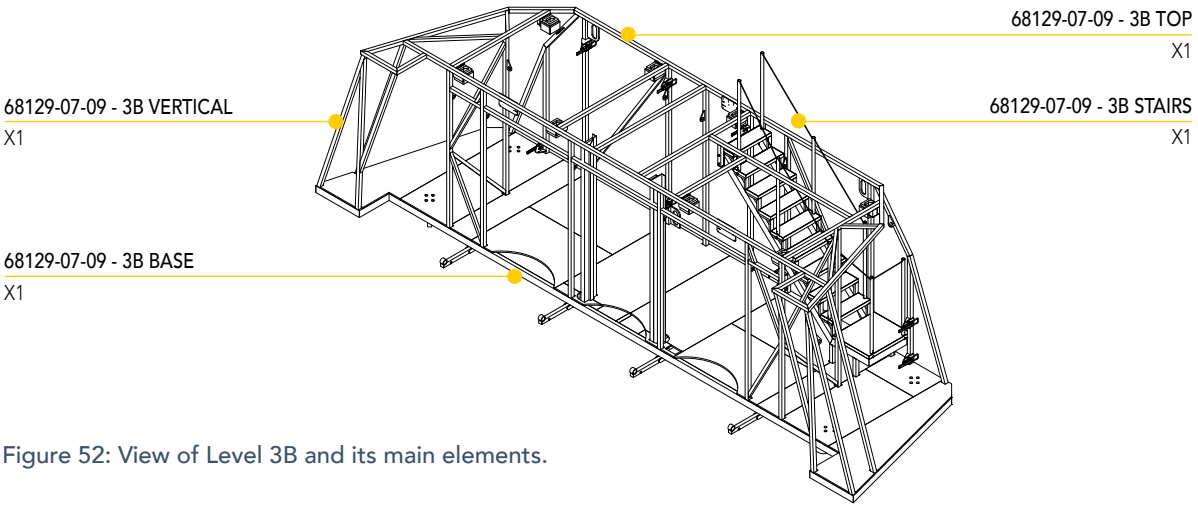


Figure 52: View of Level 3B and its main elements.

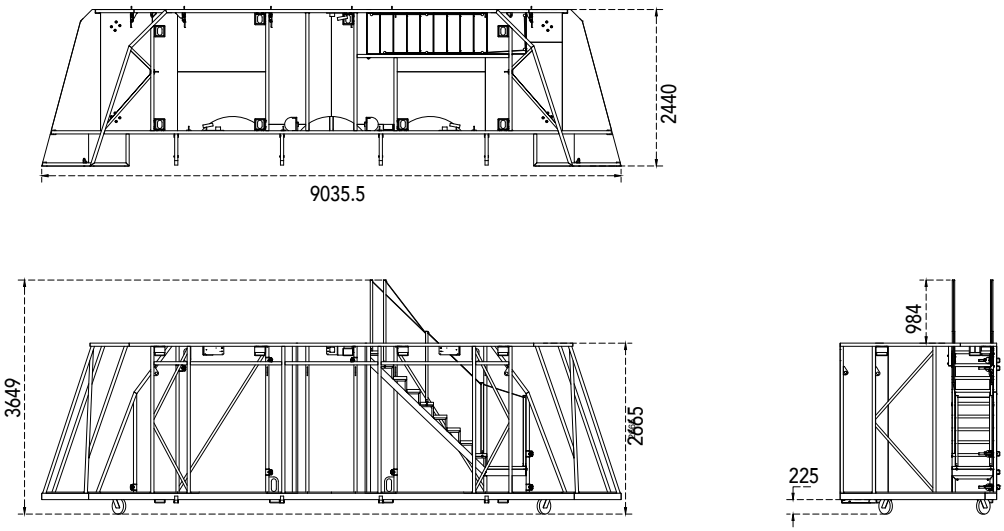


Figure 53: Level 3B and its measurements in mm.

5.5.3 LEVEL 3C

Level 3C is the area where the Upper D is installed (see related chapter).

NOTES

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