GOVERNING BODY OF THE SOLAR DECATHLON EUROPE

energy endeavour FOUNDATION

solar decathlon europe 21»22

...goes urban!

WUPPERTAL GERMANY

rules

version 2.4

18_05_2022

Supported by:

BERGISCHE UNIVERSITÄT WUPPERTAL

Federal Ministry for Economic Affairs and Climate Action

on the basis of a decision by the German Bundestag

TABLE 1. LIST OF CHANGES.

VERSION	RULE	PAGE	NOTES
2.4	14	30	Updated Table 6.
2.4	17.3	34	Updated Rule 17.2, Sub-Contest 3.2: All available points... exceeds the generation.
2.4	17.5	36	Updated Rule 17.5
2.4	22	52	Sub-Contest 8.8: ... and ...
2.4	44.1	89	Deleted: "The SDE21/22 Organisation draws.... in this contest."
2.4	51.7	131	Inserted: "Teams must participate... SDE21/22 Event Calendar."
2.4	51.8	133	Table 39: Site Operation Coordinator

Please note: SDE21/22 Competition refers to House Demonstration Units (HDU) to replace the notion of 'house'.

The information included in the present document may change!
Details or complementary information will be added in the future. All modifications will be clearly indicated in updated editions of the SDE21/22 Rules.

Revised contents in the text are coloured blue.
[**Note**: In each version, only the changed content related to the currently valid Rules version is coloured.]

contents

introduction

Solar Decathlon

Initiated in 2002 by the United States Department of Energy, the Solar Decathlon (SD) is a university-level student Competition for resource-responsible and energy-efficient architecture and engineering in the building sector. Approximately twenty university Teams compete in the design, construction and management of innovative dwellings powered by renewable energy. The prototypes are brought to the Competition site and assembled in approximately 14 days. The site becomes an open forum and exhibition, where the dwellings are operated, demonstrated to the public and evaluated by a Jury of renowned international adjudicators.

Solar Decathlon Europe

The European editions of the Solar Decathlon Europe (SDE) were hosted by the Spanish government in Madrid in 2010 and 2012, and by the French government in Versailles in 2014. The SDE19 edition took place in Szentendre, Hungary. Stewarded by the Energy Endeavour Foundation (EEF), under a shared European vision of sustainable, energy efficient, resource responsible and affordable building, the SDE21/22 Competition will be hosted in Wuppertal, Germany.

Solar Decathlon Europe 2021 (in 2022)...goes urban!

SDE21/22 will be the first time that the Solar Decathlon Europe 'goes urban'! The SDE21/22 Competition is organised by a local partnership headed by the University of Wuppertal in Germany. The partnership includes academic institutes from various faculties and disciplines, the Wuppertal Institute, the Neue Effizienz, the urban initiative Utopiastadt, the local utility WSW, and the city of Wuppertal. The Federal Ministry of Economic Affairs & Energy provides major funding to run the Competition as part of its initiatives to work towards a climate-neutral building stock in Germany by 2050.

Solar Decathlon Europe 2021 (in 2022) Rules

The Solar Decathlon Europe Rules are designed to meet the SDE21/22 objectives and to promote a fair and interesting Competition. The Rules for the Solar Decathlon Europe 2021 (in 2022) are based on the previous versions of the Competition. However, there are changes in the Contests and Deliverables, reflecting the dual challenge of developing whole building concepts as well as designing, building and operating the House Demonstration Units (HDU). All entries must face the challenge of the transformation path towards a climate neutral building stock. This path consists of architecture and building-related measures such as efficiency improvements and on-site use of renewables as well as measures on the urban energy infrastructure. This SDE21/22 Rules document describes what each Team needs to know to be competitive in the Solar Decathlon Europe. It includes five sections:

- **Section 1.0 General Rules**
  Includes Rules related to the general aspects of the Competition, describing the SDE21/22 Organisation, the participating Teams, the site, the housing units, the final phase of the event, and the general conditions.
- **Section 2.0 Contests**
  In this section, the SDE21/22 Contests and sub-Contests are defined, including scoring distribution, the Contests evaluation criteria and the different procedures.
- **Section 3.0 Deliverables**
  This includes detailed information concerning all the documents, drawings and other materials that the Teams must submit to the SDE21/22 Organisation along with the submission dates and format requirements.
- **Section 4.0 SDE21/22 Building Code**
  This Code primarily exists to protect the Teams and public health and ensure safety.
  Compliance with the SDE21/22 Building Code is a prerequisite for participation in the Competition.
- **Section 5.0 Appendixes**
  This contains complementary information to the Rules.

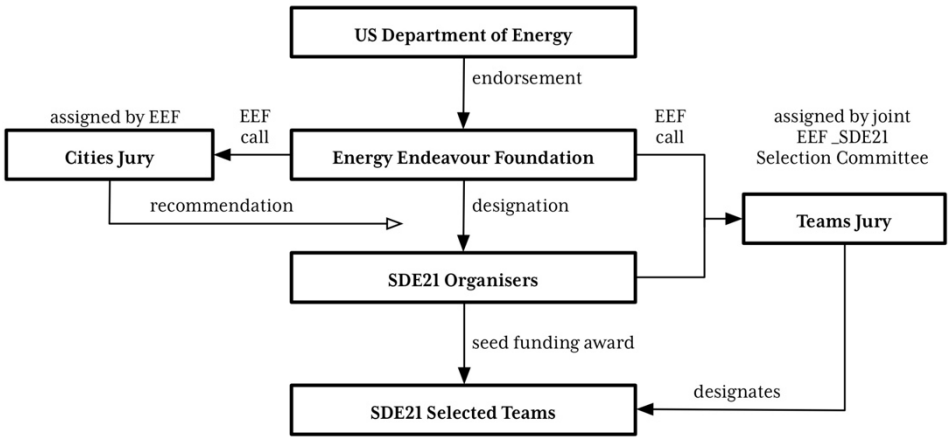
section 1.0_ general rules

RULE 1 _ SDE21/22 ORGANISATION

1.1 SDE Authority

The stewardship of Solar Decathlon in Europe has been assigned to the Energy Endeavour Foundation (EEF) by the United States Department of Energy (US DOE). The EEF has organised a juried Call for Cities which results in the designation of a bidding municipality as Host City for the SDE in 2021. The SDE21/22 Organisation (SDE21/22 Organisers and the EEF, endorsed by DOE) will elect a Jury to select Teams responding to the SDE21/22 Call for Teams. See Chart 1.

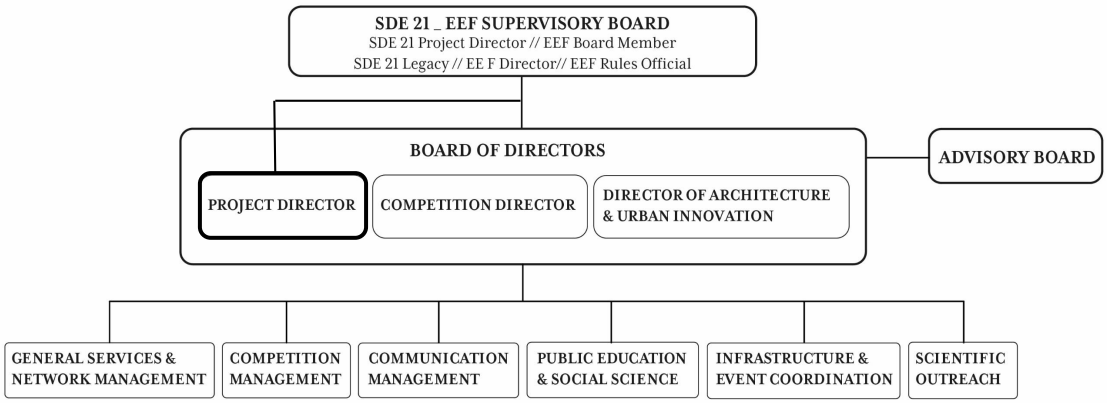
CHART 1. SOLAR DECATHLON EUROPE AUTHORITY.



1.2 SDE21/22 Organisation Chart

The SDE21/22 Organisation is structured as follows:

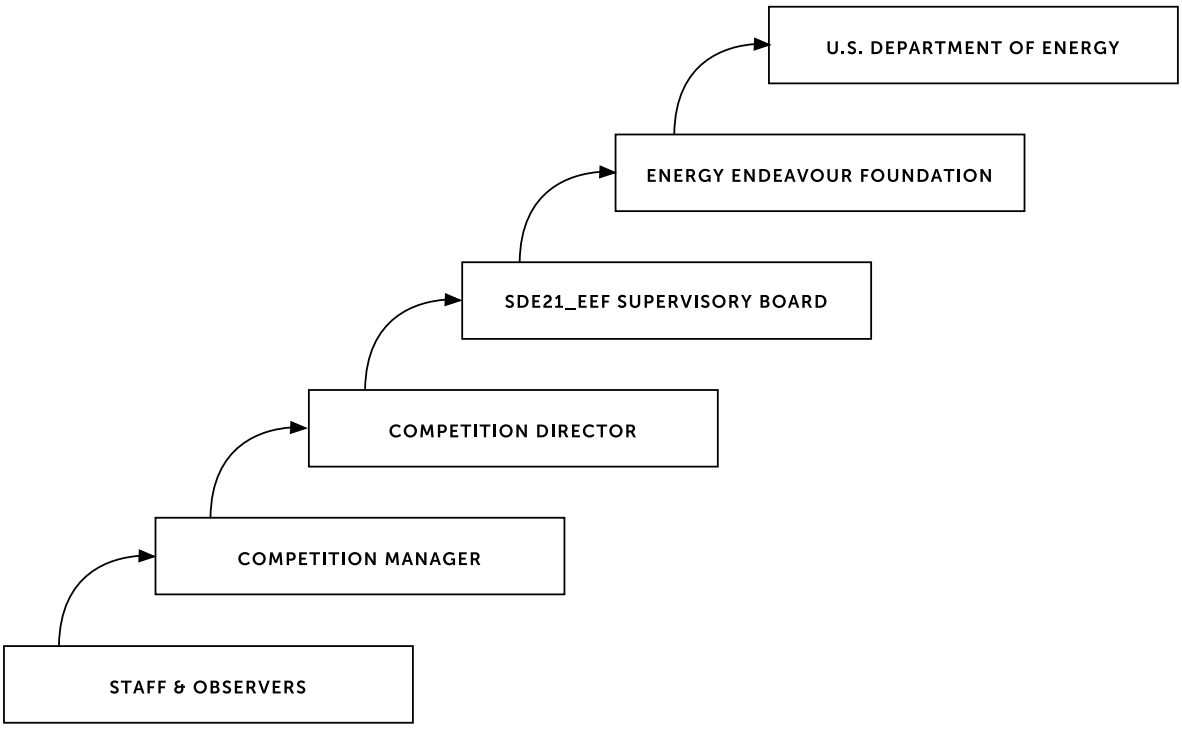
CHART 2. ORGANISATION CHART.



1.3 Decision Chart

For the SDE21/22 edition, the following authority structure will be used for making decisions and solving problems:

CHART 3. AUTHORITY DECISION CHART.



RULE 2 _ ADMINISTRATION

2.1 Precedence

If there is a conflict between two or more versions of the Rules, the most recent version of the Rules takes precedence.

2.2 Violations of Intent

A violation of the intent of a Rule is considered a violation of the Rule itself.

2.3 Effective Date

The latest version of the Rules posted on the SDE21/22 Workspace Area for Teams (SDE21/22 WAT) and dated for the year of the event are the Rules in effect.

2.4 Official Communication

It is the Team's responsibility to stay continuously updated on all official project communications. Official communication between the Teams and the SDE21/22 Organisers will occur through one or more of the following channels:

a) SDE21/22 Workspace (SDE21/22 WAT)

Workspace Area for Teams (SDE21/22 WAT): is the main communication tool for Competition Teams. Appendix A for the SDE21/22 WAT will be issued with future versions of the SDE21/22 Rules. The SDE21/22 WAT is the key communication platform between the SDE21/22 Organisation and Teams. The SDE21/22 WAT is a secure educational website, which is accessible only for participating Teams. All Team members must be registered.

The primary functions of SDE21/22 WAT will be to:

- Post and receive all official communications;
- Update all Team and event Calendars;
- Request and receive information or clarifications;
- Submit questions;
- Upload and download files.

Appendix A will provide further information for the SDE21/22 WAT.
SDE21/22 WAT location (URL): https://moodle.sdeurope.uni-wuppertal.de/

b) Building Energy Competition & Living Lab Knowledge Platform

This international web-based knowledge platform is provided to add and secure information from new competitions and Teams: https://building-competition.org/. This platform runs under the Annex 74 within the Energy in Buildings & Communities Programme of the International Energy Agency IEA and in close cooperation with the SDE21/22 Organisation. Teams will upload material on request as part of regular Deliverables in the final phase of the Competition. Public visibility of documents will be blocked until the end of the Competition.

c) Email

For expediency and to protect confidentiality, the SDE21/22 Organisers may choose to communicate with Teams via Team members' email addresses and the SDE21/22 WAT email (sde21wat@uni-wuppertal.de). The content of the communications sent to this email address will remain confidential, unless the Team grants permission to the SDE21/22 Organisation to divulge the content of these communications to the other Teams. However, most official communication will occur via the SDE21/22 WAT.

d) Conference Calls

SDE21/22 Organisation may invite the Teams to participate in a conference call.
Invitations and instructions for participation in conference calls will be provided via the SDE21/22 WAT.

e) Meetings

- **Before the Event**
  Workshops will permit the Teams and SDE21/22 Organisers to have in-person meetings.
  Notification of the date and agenda of these workshops will be made via the SDE21/22 WAT.
- **Before the Assembly Phase**
  SDE21/22 Organisers will meet with the Teams to discuss Health and Safety and Site Operations.
- **During the Event**
  Morning meetings are held on a daily basis throughout the event at SDE21/22 Solar Campus. It is mandatory that at least two Team members assist at these meetings, preferably the Faculty Advisor and the Student Team Leader. Other Team officers may also assist, for example Safety Officers, Contest Captains or Communication Coordinators. Team members can express any doubt, need or information at the meetings. Attendees are responsible for sharing the meeting information, decisions and announcements with the other Team members.

f) Postings at Headquarters

During the event, a bulletin board (or other venue for posting information) may be established at event headquarters. Teams will be notified via the SDE21/22 WAT if such a venue is established and the purpose for which it has been established.

2.5 Decisions on the SDE21/22 Rules

The decisions on the Solar Decathlon Europe Rules are interpretations of the SDE21/22 Rules contained in this document. The Energy Endeavour Foundation appoints Rules Officials who work with the SDE21/22 Organisers to maintain the integrity of the SDE Competition through the SDE21/22 Rules. SDE21/22 Organisers may ask for changes or clarifications to the SDE21/22 Rules by making an official request to the Rules Officials. When the Rules Officials make a decision that may, in their opinion, directly or indirectly affect the strategies of all Teams, the Rules Officials will add the decision to the Solar Decathlon Europe Rules. The SDE21/22 Organisers will then notify the Teams of the changes via the SDE21/22 WAT.

[**Exception:** if such a notification would unfairly reveal the strategies of one or more Teams, the SDE21/22 Organisers may, depending on the circumstances, refrain from notifying the decision to all Teams.]

2.6 Self-Reporting

Teams shall self-report definite or possible Rules infractions that have occurred or may occur. The Rules do not address every possible scenario that may arise during the Competition. Therefore, a Team considering an action that is not explicitly permitted by the Rules should ask a Rules Official for an official decision before proceeding with the action. If the Team does not ask for an official decision, it puts itself at risk of incurring a penalty. The Competition Director and Competition Manager will act with discretion when determining the penalty for a Rules infraction. Rules infractions observed by Rules Officials and SDE21/22 Organisers, i.e., not self-reported by the Team, may be subject to more severe penalties than self-reported Rules infractions.

2.7 Penalties & Bonus Points

a) Rules Infractions

Teams committing Rules infractions are subject to one or more of the following penalties, depending on the severity of the infraction:

- Point penalty applied to one or more Contests;
- Disqualification from part of, or all of, one or more sub-Contests;
- Disqualification from the Competition.

[**Note:** Disqualification from the Competition requires prior notice to the Team and an opportunity for the Team to make a written statement on its behalf.]

b) Late or Incomplete Submission

Point penalties will also be applied to Teams not fulfilling all the Deliverables' requirements:

- for late submission: from 15 min after the deadline till 48 hours after - up to 0.5 points;
- from 48 hours after the deadline until 1 week later - up to 2.0 points;
- for contents missing more than 5 % of the content required missing - up to 2.0 points.

[**Note:** In case any participating Team delivers beyond 1 week after the deadline or/and with more than 25% of the content required missing, the SDE21/22 Organisation reserves the right to apply a larger penalty, considering the special conditions of each particular case.]

c) Infractions during the Assembly / Disassembly Phases

During assembly period, penalty points will be applied to Teams not respecting:

- Safety on construction site (see Rule 44 _ Site Operations Plan, Rule 45 _ Health & Safety Report and Documents, Rule 50 _ Building Codes and Rule 51 _ Health and Safety);
- Construction site cleaning and waste management (See Rule 4.9 _ Site Cleaning & Waste Management).

d) Daily Tasks during the Competition Week

Teams must do all the daily tasks following the Event Calendar. Penalties will be assigned to the Teams if they do not comply with this requirement. Teams must report to the Competition Manager if they have any problem that makes it impossible to do the daily tasks.

e) Penalty Referee

An individual, appointed by the SDE21/22 Organisation, will examine and assess the Team's infraction, and propose to the Competition Manager corresponding penalties with respect to the Rules. Based on the agreement with the SDE21/22 Organisation, the Penalty Referee shall determine the severity of Rules infractions, classify them as minor or major, and report them to the Competition Manager. The Penalty Referee shall be independent of the SDE21/22 Organisation and shall have a nationality other than the nationality of the competing Teams.

f) Applying Penalties

The Competition Manager is solely authorized to apply point penalties or disqualify a Team from the Competition or from part of, or all of, one or more Contests or sub-Contests for Rules infractions.

g) Penalties Notification

The Competition Manager shall notify all Teams via the SDE21/22 WAT when a penalty has been applied toward any Team. The notification shall include the identity of the Team committing the infraction, a brief description of the infraction, including its severity, and the nature of the penalty, giving the Teams the opportunity to protest (see Rule 2.8 _ Protests). Penalties points related to safety, construction site cleaning and waste management will be announced day by day to each Team.

h) Respect of the Assembly Plan

The SDE21/22 Organisers have the authority to determine bonus points to apply at the end of the assembly period. Teams may gain a bonus of up to 5 points according to their H&S plan and documents. For more details, refer to the Building Code section. Teams with buildings that pass all inspections on time will receive a bonus of 10 points.

2.8 Protests

Official written protests may be filed by Teams for any reason during the Competition event. A filing fee of up to 10 points may be assessed to the Team filing the protest if the protest is deemed by the protest resolution committee to be frivolous. Teams are encouraged to communicate with the Rules Officials in an attempt to resolve issues and complaints before resorting to the protest process. Protests should be filed only if the Team and the Rules Officials are not able to resolve the issues. Protests must be submitted between 9 a.m. and 7 p.m., and within 24 hours of the action being protested. The final opportunity to file a protest is 5 minutes following the conclusion of the final sub-Contest on the final day of the Competition weeks.

[**Exception:** The results of one or more sub-Contests may be announced during the final awards ceremony. The results of sub-Contests announced during the final awards ceremony may not be protested. The protest shall be submitted to the Competition Manager in a sealed envelope. It shall include the name and signature of the Faculty Advisor, the current date and time, an acknowledgement that a 10-point filing fee will be assessed, a clear description of the action being protested, and a succinct description of the protest.]

Protest Procedure:

The protest resolution procedure is as follows:

- The Competition Manager convenes the Protest Resolution Committee.
- The Competition Manager submits the sealed envelope containing the Team's written protest to the Protest Resolution Committee. Unless the Competition manager is called by the committee to testify, he is not permitted to read the protest until after the Protest Resolution Committee has submitted its written decision.
- The Protest Resolution Committee opens the envelope and reads the protest in private. SDE21/22 Organisers and Team members are not authorised to attend the Committee's private deliberations. The right to counsel by SDE21/22 Organisers or Team members is not authorised.
- The Protest Resolution Committee notifies the Competition Manager if it would like to call any individuals for testimony. The Competition Manager notifies individuals called for testimony. The Committee may call the Competition Manager for testimony.
- Testimony is provided by individuals called by the Committee.
- The Protest Resolution Committee notifies the Competition Manager of its decision and indicates how many points shall be assessed as a filing fee. The decision of the Protest Resolution Committee is final, and no further appeals are allowed.
- If the decision involves changes to a Team's score or a refund of some, or all, of the filing fee, the Competition Manager notifies the Scorekeeper of the changes, and the Scorekeeper applies the changes to the scoring server.
- The Competition Manager posts a copy of the written protest and decision on the SDE21/22 WAT.

RULE 3 _ PARTICIPATION

3.1 Entry

The project is open to Colleges, Universities, and other post-secondary educational institutions. Entry is determined through a proposal process. All proposals are reviewed, scored, and ranked. Based on the quantity and quality of proposals, a limited number of eighteen Teams will be selected for entry in the SDE21/22 Competition. A maximum of eight units (HDU) may be left on the Solar Campus to become part of a living lab. Universities that have taken part in previous editions of the Solar Decathlon worldwide are welcome to submit their proposal to participate in the Solar Decathlon Europe 2021 (in 2022). However, as unit projects from previous editions of the Solar Decathlon will not be admitted, Teams will have to submit a new design proposal.

3.2 Team Officers & Contact Information

Each Team must provide contact information for the Team Officers listed in Table 2 Team Officers and must keep the contact information current through the duration of the project. If a Team's internal officer titles do not exactly match those listed in Table 2 each Team shall still provide the contact information for the person fulfilling each of the areas of responsibility described (See Definitions in appendix b). Teams must provide the contact information for one person only in each officer position; this individual is responsible for forwarding information to any 'co-officers,' as necessary.

An individual may have multiple officer titles. The requested information must be included in the Press Kit (please refer to Rule 30.1b _ Press Kit for further details). The Solar Decathlon Europe 2021 (in 2022) is intended to be a primarily student-run project. The only Team officer who must be a faculty member is the Faculty Advisor. The structural and electrical engineers may be a post-graduate student, faculty member or working professional. It is highly recommended to fill other Team officer positions with students.

TABLE 2. TEAM OFFICERS.

TITLE	NAME
Faculty Advisor	
Project Manager	
Project Architect	
Project Engineer	
Structural Engineer	
Electrical Engineer	
Student Team Leader	
Health & Safety Team Coordinator	
Safety Officers	
Site Operations Coordinators	
Contest Captain	
Instrumentation Contact	
Communications Coordinator	
Sponsorship Manager	

3.3 Safety

Each Team is responsible for the safety of its operations, and each Team member and crew shall work in a safe manner at all times during the project. See Rule 51 _ Health and Safety for further information.

3.4 Conduct

Improper conduct will be not tolerated. Improper conduct may include, but is not limited to, improper language, unsportsmanlike conduct, unsafe behaviour, distribution of inappropriate media, plagiarism or cheating.

3.5 Use of Likeness, Content & Images

Team members and Team crew agree to the use of their names, likenesses, documents, audio-visuals and/or graphics, in any communication materials issued by the SDE21/22 Organisation (EEF & SDE21/22 organisers), partners, event supporting institutions and event sponsors. For the Competition dissemination, the SDE21/22 Organisation, event supporting institutions, and event sponsors may use the Teams' information (content and images). Please refer to the SDE21/22 Graphic Chart & Brand Manual. The SDE21/22 Organisation and event sponsors will make all reasonable efforts to credit the sources of content and images, although they may be published without credit. All materials provided by Teams to the SDE21/22 Organisation including, but not exclusively, the mandatory Deliverables, must belong to the participating Teams, or the Team must have been authorized by owners of materials subject to intellectual property regulations, such as background music or third-party images. Therefore, the Teams must submit the SDE21/22 Dissemination Authorization (available through the SDE21/22 WAT) signed by the Faculty Advisor.
[**Exception:** If a Team submits content or images that it would like to be kept confidential, it should make that request, with an explanation, in writing to the recipient of the content or images. Every effort will be made to honour requests for confidentiality. All confidentiality requests expire at the date of the end of the SDE21/22 Competition.]

3.6 Withdrawals

If a participating Team, during the project development, considers withdrawing from the Competition due to any reason, they must communicate it to the SDE21/22 Organisation before making its final decision. The SDE21/22 Organisation will try to help the Team through any problem. However, if the Team pursues to withdraw from the Competition, they must notify their decision to the Competition Director with a letter signed by the Faculty Advisor. All written withdrawals complying with the previous items are final. Depending on the stage of work the Organisers have the right to request returning the full or shares of the base Team funding received from the Organisers. Details will be addressed in the funding contract.

RULE 4 _ SDE21/22 SOLAR CAMPUS

4.1 SDE21/22 Solar Campus Specifications

SDE21/22 Solar Campus specifications will be communicated through the SDE21/22 WAT, including a detailed plan drawing, indicating its limits, accesses, lots, and circulation areas. The perimeter of SDE21/22 Solar Campus will be limited by indicating access, allotted lots, established limits and internal paths. The SDE21/22 Organisers will provide general lighting of SDE21/22 Solar Campus, as well as the supply of water, waste-water removal, workspaces for each Team with Wi-Fi connection, access to private cafeterias and public toilets.

4.2 Civil Liability

Each Team is financially responsible for any damage it causes on and to the Competition site. Insurance issues are defined in the Team contract. Therefore, Teams must contract Compulsory Insurance for SDE21/22 Solar Campus.

4.3 Lot Conditions & Attribution

The lots size is 18.0 m by 18.0 m. In order to unload/load trucks and place cranes, an Operations Area of 18.0 m by 10.0 m will be available next to each lot during assembly/disassembly phases. Once the SDE21/22 lot attribution is defined by a drawing lots process, the SDE21/22 Organisers will notify the Teams of the specific conditions for each lot. Teams must design and plan all their site operations accordingly. For exceptional reasons beyond the SDE21/22 Organisation, the lots size may vary. On the SDE21/22 Solar Campus, lots' perimeters will be clearly defined and signposted. Teams may not go beyond these limits under any circumstances. Lots must be cleaned and re-established to their original conditions once the assembly and disassembly process is over.

As storage, unloading, assembly and disassembly will take place inside the lot's limit during the established period of time, each Team will use part of their lot for storage and unloading during the Assembly and Disassembly Phases. The Operations Area will have to be freed during the Competition. The SDE21/22 Organisers will provide all Teams with a secondary storage area for materials and equipment not in use during the Competition.

4.4 Footing

Typically, low-impact footings with neither ground excavation nor penetration shall be used to support all unit (HDU) and site components located on the Competition site. Therefore, Teams have to provide repartition plates and removable footings systems. As vertical elevation change may exist across the lot design, each Team should plan for adaptable footings systems (e.g. hydraulic jacks, sandboxes, adaptable scaffolding ...) in order to absorb differences between 40 and 60 cm. Footings shall be designed to comply with the soil bearing pressure criteria specified in the SDE21/22 Building Code. Further details regarding load bearing pressure are forthcoming. Once the foundation has been laid during the assembly, Teams shall notify the appropriate Inspector in order to verify compliance. The assembly may not continue until this inspection has been passed.

4.5 Assembly Period Video Recording

For safety purposes, audio-visual support for Competition, and communication, cameras will be installed by the SDE21/22 Organisers in order to record the entire assembly period. Images remain property of the SDE21/22 Organisation who can use them for communication purposes and to verify safety. Teams waive all property rights to the SDE21/22 Organisation but have access to images through SDE21/22 WAT in order to produce communication materials.

4.6 Construction Equipment

a) Cranes & Other Auxiliary Machinery

The crane necessary for loading and unloading during assembly and disassembly phases will be provided by the SDE21/22 Organisers. The participating Teams will only have to pay the crane's hourly rental fees in accordance with the costs indicated by the SDE21/22 Organisers. The SDE21/22 Organisers will administer the use of the crane to guarantee its maximum efficiency, attending to the needs of each Team. To facilitate loading and unloading, the elements of the HDU and the materials must be as "pallet-able" as possible. As far as possible, the crane's or alternative means' use will be administered with assigned turns.

The exclusive use of these may be possible in two specific cases:

- With the university's express request, under the SDE21/22 Organisers approval;
- For cranes' use incompatibility.

The exclusive use of the elevating machinery is an option that depends on the Teams' resources and planning. The specialised company chosen by the SDE21/22 Organisers will provide auxiliary resources for the elevation and movement of the units and their constitutive elements (forklift, cherry-picker, scaffolding...). Teams will be offered special rental conditions for material available in a catalogue.

b) Access & Circulation of Heavy Vehicles

- **Meeting Point**
  This is an allocated space close to the SDE21/22 Solar Campus intended for parking heavy vehicles prior their entrance to the construction site. Upon arrival, truck-mounted cranes, trailers, semi-trailer trucks, etc. must be parked in this specific Meeting Point.
- **Access of Heavy Vehicles**
  Vehicles parked in the Meeting Point will be called in, one after the other, to guarantee the orderly entry into SDE21/22 Solar Campus, always through established paths and following the SDE21/22 Organiser's schedule.

- **Entrance Order**
  The SDE21/22 Organisers, in accordance with the Site Operations Plan of SDE21/22 Solar Campus, will determine a strict entry order of the Teams' trucks to access SDE21/22 Solar Campus and proceed to unload. This order will be done considering the trucks' order established in each Team Site Operations Plan. The above-mentioned entry of heavy vehicles will be realised only and exclusively in the specific periods established in the Event Calendar.
  Only light vehicles will access SDE21/22 Solar Campus after this deadline, with the authorization and coordination of the SDE21/22 Organisers.
- **Heavy Vehicles Circulation**
  Vehicles will respect internal circulations which will be laid out for vehicles. Circulation of these vehicles will be generally limited to the designed circulation paths. However, under special circumstances approved by the Site Operations Coordinator, trailers and semi-trailers may be driven on the Competition Site.
- **Vehicles at SDE21/22 Solar Campus**
  Only one vehicle/transport per Team will be permitted at a time on SDE21/22 Solar Campus. Other vehicles/transports must wait for the previous one to leave SDE21/22 Solar Campus. This process will be coordinated between the persons in charge of the Site Operations Plan of the Campus and those in charge of each Team.
- **Small Electric Vehicles**
  Teams are expected to provide and operate an electric-assisted small vehicle such as a cargo bicycle as part of the Urban Mobility Contest. The vehicle has to be parked on the Team's lot. Only one electric-assisted small vehicle such as a cargo bicycle per Team will be permitted. All electricity to run the bicycle has to come from the unit's energy system. The batteries have to be fully charged at the beginning and the end of the Competition. The vehicle must be allowed to drive on cycle paths.

4.7 Electrical Power During the Assembly & Disassembly Phases

Generators are not permitted to power auxiliary equipment and construction lights needed for assembly and disassembly. Electrical power will be available during the assembly and disassembly phases on each Team's lot in a specific Construction Site Box. Provided power will be limited. The electric power consumption during the assembly phase will be monitored.

4.8 Lighting on the Competition Site

Teams are responsible for maintaining the adequate interior and exterior lighting levels during the assembly and disassembly phases. General lighting of lots will be provided by the SDE21/22 Organisers during the assembly, disassembly and grid tied phases. Construction lighting devices remain the responsibility of each Team during assembly and disassembly phases.

4.9 Site Cleaning & Waste Management

a) Site cleaning

Teams are responsible for maintaining their clean construction site, lot and adjacent areas. Teams must respect all the SDE21/22 Organisers' indications in relation to site cleanliness. In cases of doubt, Teams must consult the Site Operation Coordinator.

b) Waste Disposal

During assembly and disassembly, Teams must take their waste products to the disposal areas available on SDE21/22 Solar Campus according to separated wastes collection Rules.

c) Liquid Disposal

The release or disposal of water or other liquids on the SDE21/22 Solar Campus must be realised according to the SDE21/22 Organisers.

d) Penalties Related to Site Cleaning & Waste Management

Depending on the degree of the fault, the SDE21/22 Organisers may apply point or time penalties (stopping the work), or both. Penalties will be applied according to Table 3 Maximum Penalties for Waste Management & Construction Site Cleaning.

TABLE 3. MAXIMUM PENALTIES FOR WASTE MANAGEMENT & CONSTRUCTION SITE CLEANING.

QUALIFICATION OF FAULT	PENALTY POINTS UP TO
Not cleaning construction area	5
Not respecting stock and work areas	5
Incorrect waste thrown in waste disposal	5

4.10 Working System

Each Team has to appoint a Site Operation Coordinator, who will be responsible for coordinating the Team's site operations. (Rule 3.2 _ Team Officers & Contact Information). Assembly and disassembly phases will be clearly indicated in the Event Calendar. During the assembly and disassembly phases, Teams will work during daylight hours.
Exceptions must be cleared with SDE21/22 Organisers, always complying with the working shifts established by the Health & Safety officials. Please refer to Rule 51 for further details regarding working shifts and requirements according to Health & Safety regulations.

4.11 Transport

Every Team is responsible for the transport of its unit, the unit's contents, tools and equipment to the Solar Campus. See other logistics issues in Rule 11.5 _ Logistics. Teams will have to consider the dimensional aspects, suggesting the maximum load to be "pallet-able". Small exceptional road transports are permitted. The maximum dimensions of the truck, including the load, must not exceed 4.0m x 3.0m x 22.0m. (height x width x length). The weight may not exceed 40 tons in total. SDE21/22 Organisers suggests that the participating Teams contact transport companies during the development phase of the project to guarantee compliance with the freight transport Rules. Special attention must be paid to Customs regulations by those Teams not from the European Union.
[**Note:** Transportation requirements according to the Host City's local laws will be made available before Team selection.]

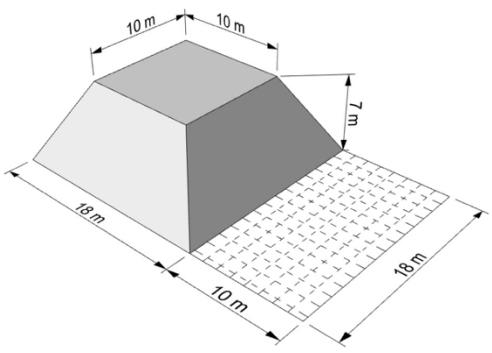
RULE 5 _ SOLAR ENVELOPE

5.1 Solar Envelope Dimensions

To protect a neighbour's right to the sun, the housing unit and all site components on a Team's lot must stay within the solar envelope shown in Figure 1. The solar envelope shape is a truncated pyramid whose basis measures 18 m x 18 m and whose centred top section measures 10 m x 10 m while located at a 7-meter height. The official height of a site component or set of contiguous site components is the vertical distance from the point of highest grade along the outside perimeter of the site component(s) to the highest point of the site component(s). This height must be clearly indicated in the Project Drawings. Small weather stations, antennas, air vents, or other similar small components may be specifically exempted from the compliance of solar envelope if all of the following conditions are met:

- The Team makes a request to the SDE21/22 Organisation for an exemption.
- The Team can prove to the SDE21/22 Organisation's satisfaction that the component is not significantly restricting a neighbours' right to the sun.

FIGURE 1. SOLAR ENVELOPE DIMENSIONS.



5.2 Operations Area

Next to the Teams' lots will be a space designated as the Operations Area, filled with dashed line grid in Figure 1.
The Operations Area will be only available during the assembly and disassembly phases. During the competition phase, their position will be used as alleys and pedestrian path.

RULE 6 _ PROJECT EXTENTS

The following information addresses only the House Demonstration Unit (HDU) to be built on the Solar Campus.

6.1 Design Approval

a) Structural Design Approval

Each Team must submit structural drawings and calculations for the House Demonstration Unit (HDU) that have been signed and stamped by a qualified licensed professional. By signing and stamping the structural drawings and calculations, the licensed professional certifies that the structural provisions of the Solar Decathlon Europe Building Code have been met by the design, that the structure is safe to be used and visited by the general public, and that it has been constructed as it was designed. The licensed professional must sign and stamp the structural drawings and calculations of the HDU and all site components that might pose a threat to public safety if they fail.

b) Electrical & Photovoltaic Design Approval

Each Team must submit electrical drawings and calculations for the demonstration unit that have been signed and stamped by a qualified licensed professional. They will include the conventional electrical installation as well as the photovoltaic installation. By signing and stamping the electrical drawings and calculations, the licensed professional certifies that the electrical provisions of the Solar Decathlon Europe Building Code have been met by the design, that the electric system is safe be used and visited by the general public, and that it has been constructed as it was designed. The licensed professional must sign and stamp the electrical drawings and calculations of the HDU and all site components that might pose a threat to public safety if they fail.

c) Codes Design Compliance

Each Team must submit a document, certifying compliance for the demonstration unit with the country-of-origin codes, signed by the faculty advisor. By signing this document, the Faculty Advisor certifies that the HDU complies with all the codes of the country of origin, therefore ensuring that the HDU is safe to be used and visited by the general public and that it has been built as designed.

6.2 Maximum Architectural Footprint

a) Footprint

The footprint includes the entire area within the defined building perimeter of the HDU (including the unit HDU itself, the occupation, and the site components higher than 1.0 m) as well as active systems simulating urban systems set outside of the Measurable Area (see Rule 6.3 _ Measurable Area). The architectural footprint cannot exceed 150.0 m2.

b) Terraces

Ground floor terrace (deck, platform, etc.) and site components lower than 1.0 m are not included in the architectural footprint.

c) Open Spaces

'Open space' means patios and other unroofed spaces adjacent to the building perimeter of the HDU. If there are elements of the 'open space' which visually continue the lines or geometries of the HDU, the total area of this 'open space' will be included in the architectural footprint.

d) Observed Footprint

The maximum observed footprint of each component during Jury tours, public hours, or Contests is included in the architectural footprint of record. For example, if a Team deploys a motorized awning during public hours to demonstrate its operability, then the additional footprint attributable to the deployed awning is included in the architectural footprint of record. Teams should anticipate this by integrating the deployed awning area in the 150.0 m2 maximum footprint area.

e) Component Approval

Teams planning to use particular components must submit their proposal to the SDE21/22 Organisation. The SDE21/22 Organisation will evaluate individual proposals and designs and determine if its use does or does not signify a competitive advantage. Consequently, the component will be approved, and establish the area included in the architectural footprint (the entire area projected and/or exclusively its elements).

6.3 Measurable Area

The measurable area, as defined below, shall be at least 45.0 m2, but shall not exceed 70.0 m2 for one-storey units and 110.0 m2 for two-storey units.

- **Measurable Area Definition**
  The Measurable Area is the net floor area within the thermal envelope of the HDU. The thermal envelope boundary must be marked clearly. The purpose of identifying the Measurable Area is to determine the size of the net interior space that will be conditioned and measured as a floor area. The 'Measurable area' is the covered and constructed area from which walls, columns, stairwells, shafts, high spaces below 1.80 m and cabinets or other storage or technical elements built from floor to ceiling are subtracted. All primary living areas shall be located within the measurable area.
- **Reconfigurable Features**
  If the HDU has convertible or moveable components, the maximum and minimum measurable areas during live presentations or shown in printed media presented by the Team during Jury visits, public exhibits or Contests counts towards the maximum and minimum measurable areas of record respectively.
- **Two-story Housing Units**
  The largest of the two floors shall not exceed 70.0 m2 of measurable area. Concerning general public (including disabled persons) access to possible 2nd floor, the regulations of the Host City applies. (See Rule 50 _ Building Codes)

6.4 Entrance & Exit Routes

The main entrance may be placed on any side of the unit (HDU). However, an accessible route leading to and from the main street of SDE21/22 Solar Campus to and from the main entrance of the unit shall be provided.
[**Possible exception:** Pending the approval of the SDE21/22 Organisation, Teams on 'corner lots' may modify the exit route so that it empties onto a 'cross street.' Teams requesting this option shall provide an alternate site plan in the Construction Documents that shows an exit to the cross street. The alternate site plan will be considered if the Team receives a corner lot]

Teams shall clearly illustrate and label the entrance and exit routes between solar envelope 'property lines' and unit (HDU) entrance/exit in the project drawings and the Competition Site. Teams are responsible for providing a walkable surface from their lot limit to the starting point of their ramp(s) and stairs.

6.5 Project's Minimum Requirements

To participate in the 10 Contests of the Competition, Teams' projects must include, at minimum, the following:

- Appliances. See Rule 22 _ Contest 8: House Functioning for specific details;
- Workstation, desk or table to work or study at home with a computer (desktop or laptop);
- Interior public area for dinners (See Rule 22_ Sub-contest: Dining for further details);
- Interior public areas of the unit (at least living room and kitchen) shall be open to Public Exhibit; complying with Accessibility requirements (See Rule 50);
- Bedroom or a bed area;
- Accessibility requirements (See Rule 50);
- Interior and Exterior Lighting (See Rule 12.7 _ Interior & Exterior Lighting).

6.6 Competition Prototype Alternates

Teams must present House Demonstration Units adapted to Wuppertal's climate conditions in the Competition time (June) for the Competition. All modifications compared to the design competition must be clearly indicated as such in the various documentation materials.

RULE 7 _ ENERGY

The energy supply of the whole building concept must reflect the energy infrastructure at the district of the chosen city (provided sites in Wuppertal or those in the Team's selected city). Teams are free to elaborate sources of energy other than solar, such as ground, ambient or waste-water heat, to develop the site-specific energy concepts for the design challenge. In the case of Teams working with sites from their own country, the energy infrastructure has to be described.

The general intention is carbon neutrality for the annual balance of the operational energy and any form of feed in energy. Carbon factors for all situations are expressed as equivalent emissions with Table 4 and based on the EU28 electricity mix reference scenario for 2030 [1]. Consumed and feed-in electricity is counted with the identical factor. In the case of other energy carriers, the applied carbon factors must be communicated to the Organisers for general consistency. In the case of biomass or biofuels as energy source (carbon neural sources), limited availability has to be taken into account by drastically decreased energy demand.

TABLE 4. EMISSION FACTORS FOR NATURAL GAS & POWER GRID.

	EMISSION FACTOR IN CARBON EQUIVALENTS
NATURAL GAS	241 g/kWh$_{end}$
AC POWER GRID	200 g/kWh$_{el}$

Despite the options derived for the energy infrastructure in the design challenge, the House Demonstration Unit (HDU) must be all-electric only. Therefore, the Rule below applies independently from the energy concept of the design project and its energy infrastructure. The energy and ventilation infrastructure in the demonstration unit may not be fully compatible with the design challenge in cases such as large-scale thermal storage, combined heat and power units, central ventilation heat recovery etc. This affects the domestic hot water (DHW) delivery, as active space heating or cooling is not part of the investigation in the monitoring Contest (passive mode only). An adapted system solution must be installed and justified for DHW and ventilation. Space heating systems might be installed in the demonstration units but do not work during the Competition weeks. The heat delivery component of the system must be installed (radiators, floor heating panels, air-to-air head exchangers etc.) to visualise the approach, allowing for a post-competition connection to a central heating system (living lab). Cooling systems are not allowed. The sections described below and on the following pages apply only for the demonstration unit on the Solar Campus during the grid-tie assembly but not during the stand-alone assembly.

7.1 Energy Sources

Global solar radiation incident upon the lot and the energy in small primary batteries (see 7.4 Batteries for limitations) together with energy from the Solar Campus grid are the only sources of energy that may be consumed in the operation of the demonstration unit. Electricity from the grid and its equivalent carbon emissions, associated with the operation of the demonstration unit, should be offset by an equal or greater amount of feed-in credits. For safety reasons, the use of hydrogen (production, storage and use) is not allowed for the demonstration units.

7.2 Campus Grid

The SDE21/22 Organisers shall provide the Solar Campus with an electric power grid that provides AC power (single or three phase) to or accepts AC power from the units. The SDE21/22 Organisers shall provide the necessary service conductors and connect the conductors at the utility access point. A Team must notify the SDE21/22 Organisers if its unit operates with an AC service other than 50 Hz, 230V (phase- neutral). The low-voltage grounding means that the system of the electricity distribution grid on the SDE21/22 Solar Campus follows a TN-C-S configuration. This aspect should be carefully taken into account when designing the grounding methods of the unit and photovoltaic system (see grounding methods requirements in the IEC standard and local regulations mentioned in Rule 50). There will be a General Distribution Box in each of the lots with the necessary protections for the electrical connection to the General Grid of the SDE21/22 Solar Campus. Each Team has the responsibility to reach the General Distribution Box with the conduits.

[1] https://ec.europa.eu/energy/en/data-analysis/energy-modelling/eu-reference-scenario-2016

In any case, conduits will be left in the general connection box of the lots and the connection will be made by an authorized technical expert from the SDE21/22 Organisers. The individual branch must have a section of 3x25 mm^2 or 5x25 mm^2, insulation 0.6/1 kV and be halogen-free. The Team is responsible for calculating the unit electrical grounding necessities. The Teams must provide a lockable distribution with profile half cylinder in the entrance, which is equipped with a supply switch 50A and outlets for: monitoring panel / pumps / elevator / overvoltage protection, 2 or 4-pole, type 1. The SDE21/22 Organisers will execute the grounding system of SDE21/22 Solar Campus with buried plates grounding connection points; in this way, each unit will have one connection point, both for the electrical consumption (AC, alternate current) and for the electrical generation (photovoltaic system).

7.3 PV Technology Limitations

Bare photovoltaic cells must be commercially available to all Teams before the beginning of the final phase of the SDE21/22 Competition (May 2022). Custom-designed PV modules will be permitted, provided that the manufacturer demonstrates that the PV modules have been manufactured in accordance with the relevant applicable standards (e.g. IEC 61215 for crystalline silicon terrestrial PV modules and IEC 61646 for thin-film terrestrial PV modules).

Encapsulated photovoltaic modules must be commercially available to all Teams by the beginning of the final phase of the SDE21/22 Competition (May 2022). Substantial modification of the crystal structure, junction, or metallisation constitutes the manufacture of a new cell and is not allowed.

With respect to the conditions during the competition weeks and the measured Contests, the maximum power of the photovoltaic installations connected to the unit is limited to 3 kW_p. The peak power must be verified with manufacturer data sheets. In order to visualize the PV integration as part of a multi-story building, Teams are stimulated to install more PV than 3 kW_p, but they won't be allowed to connect to the unit more than 3 kW_p of PV panels. The PV system solution of the demonstration unit has to be consistent to the solution suggested for the full design project. The PV installation that will be connected to the unit during the Competition (PV panels, inverters, wiring, etc.) must be clearly indicated in the project drawings, one-line diagram and in the Electrical & PV Chart and checklists (see Rule 47 _ Electrical and PV Design Systems Information). If technologies other than photovoltaics are used for electricity generation, the limit of 3 kW_p (mentioned in the Rule 7.1 _ Energy Sources), applies to the aggregate of electricity generation installations (Photovoltaic and non-Photovoltaic).

7.4 Batteries

The use of primary (non-rechargeable) batteries (no larger than "9V" in size) is limited to smoke detectors, remote controls, thermostats, alarm-clock backups, and other small devices that typically use small primary batteries. For hard-wired battery banks, the building code regulations have to be considered. For those Teams keeping the unit (HDU) on site for the post-competition living, the Organisers will communicate an additional document explaining the installation guidelines in more detail to allow four-season operation.

All hard-wired battery banks have to respect specific electrical requirements, particularly concerning connections with the photovoltaic installation and the grid. The inverter to be used together with the battery bank must be designed for operation in a grid type TN-C-S (see Rule 7.2 _ Campus Grid). This characteristic will be properly justified in the corresponding technical document. With respect to the conditions during the competition weeks and the measured Contest the maximal usable storage capacity of the battery bank is 2,5 kWh. The capacity data must be verified by the manufacturer data sheet for the complete battery or data sheets for all cells.

Batteries in the demonstration unit are intended to buffer PV electricity. It is not allowed to charge batteries with grid electricity. Batteries may have this intention in the energy concept of the full building energy concept for the design competition.

At the beginning, as well as the end of the Competition phase, battery banks must be completely charged. The SDE21/22 Organisers shall approve the use of small "stand-alone" (i.e., non "plug-in") secondary batteries on a case-by-case basis. 'Plug-in' (non-hard wired) devices with small secondary (rechargeable) batteries that are designed to be recharged by the unit's electrical system (e.g., a laptop computer), shall be connected to the demonstration unit's electrical system whenever the devices are located in the unit or on the unit's site. They shall not be recharged in a system outside the unit.

[**Exception:** Devices that are not used in the House Functioning Contest at any time during the Contest week, those only used for public tour communication (such as portable TV screens, notebooks, laptops, tablets), including portable electronic devices used for mobile communication, (such as cell phones), are permitted on site without having to be plugged into the unit's electrical system. However, if a Team uses any of these devices as a remote control of the unit's equipment or systems, or as an active element in the unit's system, penalties can be applied by the SDE21/22 Organisers.]

7.5 Connection of the Houses to SDE21/22 Solar Campus Grid

Once the final electrical inspection (including photovoltaic systems) has been approved, the units will be officially connected to SDE21/22 Solar Campus grid. The Electrical Energy Balance for the operation of the units at the beginning of the Competition will be zero. From the approval of the final electrical inspection to the beginning of the Contests (Contest Weeks), in the electrical panels of the units, only the circuit breakers of the appliances, the independent circuit breaker for the home electronics Contest, and the lighting circuit breakers can be activated. The units officially connected to the grid will not be allowed to use any thermal energy storage active system or conditioning active system until the beginning of the measured Contests during the Contest Weeks.

7.6 Thermal Energy Storage

Thermal energy storage devices located outside of the footprint shall be fully shaded from direct solar radiation.

7.7 Cooling, Humidification & Dehumidification

Active cooling and humidification/dehumidification using thermodynamic cycles are not allowed for the demonstration units nor for the full building designs when considering the Wuppertal district. Systems like these may be considered for the design challenge when the unit is intended for hot and/or humid climates.

7.8 Heat Sink

Dedicated heat sinks are not subject to the requirements of Rule 6.2 or Rule 7.6. A component that may, at different times, perform as either a heat-sink or a heat source shall comply with Rule 7.6. If such a component does not comply with Rule 7.6, it shall comply with Rule 6.2.

RULE 8 _ LIQUIDS

8.1 Containers Locations

Liquids supply and waste containers shall be located outside of the measurable area. Liquids solar storage, hot water, or other thermal storage tanks may be located within the measurable area. Liquids supply and waste tank(s) or container(s) shall be fully shaded from direct solar radiation.

LIVING LAB; Additional requirements in Rule 50.9 - Attachment for Living Lab

8.2 Water Delivery

The procedure and associated requirements for water delivery is as follows:

- The SDE21/22 Organisers will supply non-potable water for the Contest purposes;
- Every Team must have all the necessary means required by the SDE21/22 Organisers to this end;
- Construction Documents must clearly indicate the fill location(s), quantity of water requested at each fill location, container(s) dimensions, diameter of the opening(s) and clearance above the tank(s);
- All openings must be easily accessible. Teams are responsible for distributing water within their units. This includes all necessary pumps, tanks, lines, valves, etc;
- SDE21/22 Organisers will establish the water supply Calendar before the Competition. The supply in any other moment will be under express request, approval and supervision of the SDE21/22 Organisers;
- Moreover, water storages must be completely empty at the beginning of the Competition phase.

8.3 Water Removal

The procedure and associated requirements for water removal is as follows:

- Construction Documents must clearly indicate the removal location(s), quantity of water to be removed from each removal location, tank dimensions, diameter of the opening(s) and clearance above the tank(s);
- All openings shall be easily accessible;
- The water removal will be always under request, approval and supervision of the SDE21/22 Organisers.

8.4 Team-Provided Liquids

A Team may provide its own liquids for the following purposes:

- Personal hydration;
- Food preparation;
- Thermal mass (quantity limited by soil bearing pressure limit and Rule 4.4 _ Footing; see Rule 8.8 _ Thermal Mass for restrictions);
- Hydronic system pressure testing;
- Small volumes of glycol, deionized water, or other working fluids for thermodynamic systems using working fluids other than non-potable water;
- Assembly (e.g., hydraulic fluid), finishing (e.g., paint), and cleaning (e.g., mineral spirits).

8.5 Greywater Reuse

On the SDE21/22 Solar Campus, Teams providing greywater treatment systems may reuse greywater for irrigation and cleaning. Greywater reuse systems shall comply with Rule 9.2.

8.6 Rainwater Collection

A Team may collect rainwater that falls on its site and use it in or as any of the following:

- Irrigation source;
- Water feature;
- Heat sink;
- Heat source (only if it is fully shaded or located within the unit measurable area, or both).

8.7 Evaporation

Water may be used for evaporation purposes.

8.8 Thermal Mass

Teams may use liquids as thermal mass. The thermal storage containers shall be filled and sealed before their arrival on the Competition site and shall remain sealed until they are removed from the Competition site by the Teams. Thermal storage containers shall be isolated, i.e., the contained liquid shall not circulate to other containers or systems.

8.9 Greywater Heat Recovery

Heat may be recovered from greywater as it flows from the drain to the waste tank.
'Batch-type' greywater heat recovery is prohibited.

RULE 9 _ VEGETATION PLACEMENT

9.1 Vegetation Placement

The use of potted vegetation is permitted. All potted vegetation must comply with Rule 4 _ SDE21/22 Solar Campus. Vegetation may be moved around the lot until the beginning of the Contest week, after which it must remain stationary until the conclusion of the Contest week, unless the Construction Documents clearly show how some or all vegetation is designed to be moved as part of an integrated system.

9.2 Watering Restrictions

Greywater, that may possibly contain organisms that may go septic (kitchen sink, dishwasher, ...), shall not be used to water vegetation.

RULE 10 _ MONITORING

A significant part of the Competition scoring involves the measurement of different items and the correct performance of various tasks. The Organisers' monitoring system is responsible for controlling these measurements.
All sensors, wiring, tripods and other necessary material for these tasks will be provided by the SDE21/22 Organisers.
Monitoring is structured in two independent areas: Electrical and Instrumentation.

- Electrical: Electricity metering is mainly responsible for the monitoring of the Contest 'Energy Performance', with all of its sub-Contests;
- Instrumentation: Various sensors are responsible for the monitoring the 'Comfort' and 'House Functioning' Contests, with all of their sub-Contests.

There are two types of monitoring: Continuous Monitoring and Tasks Monitoring, depending on whether the measurements are continuous, or task based. General information on the monitoring is described in each relevant Contest section. Further information regarding the monitoring system of the SDE21/22 Competition will be available through the SDE21/22 WAT, Official Communications, Rules & Related Documentation, Monitoring Contests' Procedures Presentation and Technical Monitoring Procedures Document.

10.1 SDE21/22 Sensor Location & Wire Routing

A summary of the sensor's location and wire routing is provided in this section. Extended information is included in the Technical Monitoring Procedures Document. This document will be available through the SDE21/22 WAT, Official Communications, Rules & Related Documentation.

a) Instrumentation

The SDE21/22 Organisers will supply a list of all the SDE21/22 instrumentation devices necessary for the Monitoring System of the demonstration units. Teams must ensure the possibility to connect the instruments (electricity meters) in the installations (space in the installation racks, wiring schematic, ...) to be able to take part in the monitoring Contests.

b) Sensors Location

The location of sensors is determined by the SDE21/22 Organisers, on the basis of Deliverable #3 Projects Documents.

c) Wire Routing

As sensors will be wired, or wireless, depending on the monitoring concept of the SDE21/22 Organisers, a route for running wires from each sensor location to the data logger is required. The Teams are responsible for providing a wire routing that permits a quick and easy installation and removal of the SDE21/22 Instrumentation wires. This route must be clearly detailed in Construction Documents (Deliverable #4). This easy installation is mandatory to ensure that the unit is monitored in order to enter the Competition. These wires and sensors are installed temporarily for the Contest weeks.

d) Feed-through

All devices used for the monitoring will be located indoors in a specific monitoring panel room, except the irradiation sensor for the PV system. Units must provide feed-through to pass the power and Ethernet wires from the exterior to the interior of that room.

e) Solar Campus Weather Station

The campus will be equipped with a weather station (air temperature, humidity, global radiation, wind, illuminance) for logging the climate data during the Competition phase. Monitored data will be provided together with the monitoring data sets of the units.

f) Instrumentation Plan & Approval

Teams must submit instrumentation drawings showing the location of the SDE21/22 sensors, meters, and the wire routing. Teams must have the Instrumentation Plan approved by the SDE21/22 Organisers to be able to participate in the Final Phase of the Competition. The procedure is as follows:

- **Before the final phase of the Competition**
  Teams will deliver instrumentation plans ID-10, ID-20, and ID-30 with Deliverable #4. In Workshop #2, there will be a workshop on monitoring. With Deliverable #5 the final documents have to be delivered.
- **'In Situ' During the Assembly Period**
  The SDE21/22 Organisers' Monitoring & Scoring Team responsible for the monitoring and scoring system implementation will check the spaces provided for the wiring (channels, paths, holes, etc.). If these construction elements are physically not available as indicated in the approved Construction Documents, penalties can be applied by the SDE21/22 Organisers. Teams will make the adjustments necessary so that the instrumentation system can be safely and robustly installed by the SDE21/22 Organisers. SDE21/22 Organisers will mark the location of the sensors. SDE21/22 Organisers will install the monitoring panel, power it and verify that everything is correctly installed. The SDE21/22 Organisers will wire the sensors to the monitoring panel. The SDE21/22 Organisers will verify the operation of the sensors. Teams are responsible for the integrity of the monitoring system during Competition phase.

RULE 11 _ THE EVENT

11.1 Registration

All Solar Decathlon Europe participants attending the final phase of the Competition must register through the online registration site, which will be available closer to the event. For special cases only, registration will be on-site.
Due to safety concerns, the different categories of participants will have different types of access (such as restricted areas or during restricted times). The following Rules apply to registrants:

a) All Registrants

Each event participant must register individually. Group registrations are not allowed. When registering, event participants must complete all required information and forms before access to the event is allowed.

b) SDE21/22 Organisation, Team Members & Jurors

Will be required to provide a photo that will be kept on file and used for security purposes. In order to avoid delays, the SDE21/22 Organisation encourages using the online registration site and submitting the completed forms, information, and photos prior to the event. Once the SDE21/22 Organisers receives all the information required, forms, and photos, an event security ID will be issued to all individuals and must be visible at all times.

c) Staff & Team Crew

Will be required to provide a photo that will be kept on file and used for security purposes.

d) Visiting Media

Must check in at event headquarters and will be required to provide a photo which will be kept on file and used for security purposes.

11.2 Use of the Solar Decathlon Europe 2021 (in 2022) Logo

All communication materials produced by or in collaboration with the Teams, before, during and after the Competition, must refer prominently to the project as the Solar Decathlon Europe 2021 (in 2022) or SDE21/22 and shall credit the Solar Decathlon Europe as indicated by the SDE21/22 Organisation. This includes all the materials and/or means in which companies and/or institutions refer to their collaboration with one or more Teams by using their logo(s). The SDE21/22 Graphic Chart & Brand Manual includes specific instructions for this use. Please refer to this document. The Solar Decathlon Europe 2021 (in 2022) shall be recognised wherever Teams' logos are used. The possible combinations between SDE21/22 and Teams' logos shall be described in the Team's visual identity manual (see Rule 38.8a _ Team Visual Identity Manual) and must comply with the SDE21/22's Graphic Chart & Brand Manual (available through the SDE21/22 WAT).

11.3 Teams' Sponsors & Supporting Institutions

Teams' Sponsors & Supporting Institutions are a very important aspect of the SDE21/22 Competition. For this purpose, each participating Team may select the companies and/or institutions that best serve the development of their purposes. However, both (the participating Team, and the Team's sponsors and supporting institutions) will comply with the SDE21/22 Rules and look over its fulfilment by third parties. The relationship between SDE21/22 and Teams' sponsors will always be done through the Team's sponsorship contact. The SDE21/22 Organisation will not have direct contact with the Teams' sponsors. Teams' sponsors and supporting institutions may be recognized with text, logos, or both, but the text and logos must appear in conjunction with the Solar Decathlon Europe 2021 (in 2022) logo (SDE21/22), the Energy Endeavour Foundation logo, and the event support institutions and main Event Sponsors. However, all these possible combinations must comply with the SDE21/22's Graphic Chart & Brand Manual (available through the SDE21/22 WAT). Please refer to that document for specific co-branding usage of the SDE21/22 and EEF brands. The Solar Decathlon Europe 2021, and the Energy Endeavour Foundation logos are available through the SDE21/22 WAT and/or http://solardecathlon.eu/sde-graphicchart-brandmanual-logos-download/. The event support institutions and main event sponsors logos will be available through the SDE21/22 WAT. Teams may include the logo of their Teams' supporting institutions and sponsors as follows:

a) Before the Competition

In any documentation, while fulfilling the SDE21/22 Rules requirements regarding use and size.

b) During the Competition on the SDE21/22 Solar Campus

Commercial or technical advertising in the House Demo Unit's (HDU) interior is forbidden, except for the following cases:

- **Panels**
  On the explanatory panels located inside the lot outside the unit, or in the waiting lines and waiting areas.
  Logos must not be bigger than 10% of the total panel surface and must be included inside a vertical or horizontal strip.
  See Rule 12.2 _ House Occupancy, Rule 12.5 _ Public Tour, and Rule 38.8c _ Public Tour Description.
- **Website**
  On the Teams' website and/or other services for mobile devices that Teams may provide,
  included in the Sponsorship's section. Additionally, these may be included inside a vertical or horizontal strip,
  with a maximum size of 10% of the screen's total surface. See Rule 29 _ Team Website.
- **Brochures**
  On the informational brochure, handout or any other object that may be given to the public.
  See Rule 12.2 _ House Occupancy, Rule 12.5 _ Public Tour, and Rule 38.8c _ Public Tour Description.
- **Uniforms**
  On the back of the Decathletes' uniforms. See Rule 11.4 _ Team Uniforms.
- **Components**
  Off-the-shelf components that feature a built-in manufacturer's logo are acceptable and do not need to comply with the SDE21/22 and Team's logo requirements.
- **Vehicles**
  On any vehicle and/or material, only during assembly and disassembly phases.
- **Audio-visual**
  In the Team's audio-visual #2 (see Rule 28.3 _ Audio-visual).
- **House Demonstration Unit**
  Units cannot be named after their sponsors, and units cannot directly refer to their sponsor's corporate identity ('direct reference' is subject to the SDE21/22 Organisers' interpretation).
- **Teams**
  Teams may name specific areas of the unit after their sponsors; however, any reference to these spaces must comply with SDE21/22 branding.
- **Communication Materials**
  Communication materials or other products that exist largely for the recognition of sponsors are prohibited.
  "Other products" include but are not limited to signs, exhibits, posters, plaques, photos, wall art, and furnishings.

11.4 Team Uniforms

- During Contest week, workshops and special events specified by the SDE21/22 Organisers, all Team members present on the Competition site or the site of a special event shall wear uniforms representing their Team;
- Uniforms will help to identify Team's members quickly and easily and will be composed of a series of wearable items;
- On the front part of Teams' uniforms (jacket, shirt, hat or another wearable item), only the combined version of the Team's logo and the SDE21/22's logo may be visible;
- On the back part of Teams' uniforms (jacket, shirt, hat, or other wearable item), Team sponsor logos may be visible only if complying with the logos' Rules requirements;
- A built-in clothing manufacturer logo may be visible on the front or back of the Team uniform, or both or none of them;
- Since the SDE21/22 Solar Campus is a public space, Teams should maintain a dress code required for public areas;
- Each Team will determine its uniforms' colour(s) in Deliverable #2. Two options are to be proposed. In case of a too great similarity between two Teams, the SDE21/22 Organisers will request a second choice. The objective is to avoid visual uniformity and facilitate SDE21/22 communication;
- Uniforms design will be evaluated by the Communication Jury. Please refer to the SDE21/22 Graphic Chart & Brand Manual.

11.5 Logistics

- Each Team is responsible for the transport of its unit, the unit's contents, and all necessary tools and equipment, and shall be responsible for any damage to or loss of such items;
- Each Team is responsible for procuring all necessary equipment, tools, and supplies;
- Each Team is responsible for transportation, accommodations, lodging, food, and beverages (including drinking water);
- Each Team is responsible for making its own reservations and arrangements and for covering all necessary costs.

11.6 Inspections

- Each project shall be inspected for compliance with these Rules and the SDE21/22 Building Code;
- Teams shall notify the appropriate inspector when they are ready for an inspection. When two or more Teams request an inspection simultaneously, the order of inspections shall be determined in a draw;
- Spot checks for compliance shall take place throughout the final phase of the SDE21/22 Competition;
- The Competition Manager shall check each Team's inspection status, as indicated on the Team's official inspection card, to determine which units are eligible to participate in the Contest;
- All final inspections shall be passed by the end of the inspectors' workday for a Team to be eligible to participate in the following day's Contest.

[**Exception:** Jury visits will proceed as scheduled regardless of a Team's inspection status. However, jurors may be aware of the Team's inspection status and may consider it in their evaluations.]

Because open, partially functioning units are preferable to closed, fully functioning ones, the SDE21/22 Organisers will direct the inspectors to require that an unsafe condition be corrected so public tours can occur even if, consequently, the unit (HDU) is ineligible for participation in the Contests.

RULE 12 _ CONTEST PERIOD

12.1 Contest Period

The final phase of SDE21/22 Competition is scheduled for June 2022. The SDE21/22 Organisers will implement a pause between days for public visits and days for monitoring and Jury visits.

12.2 House Occupancy

No more than 20 people in total may be located in the House Demonstration Unit (HDU) at any time during the Contest Period.

During the monitoring periods for the Comfort Contest, a maximum of six people may be in the HDUs to perform the tasks and guide the Jury members through the houses. The exact Comfort Monitoring periods can be found in the SDE21/22 Event Calendar.

- Jurors, Observers, official Competition photographers and journalists, and others with authority to enter a unit (HDU) as an Organiser are admitted in addition to the six people;
- During the Dinner Party, the unit occupancy Rule is automatically suspended. See Rule 22_ House Functioning Sub-contest 8.11;
- The Solar Decathlon Europe 2021 (in 2022) is intended to be a primarily student-run project. Therefore, when the monitoring period for the Comfort Contest takes place and during the Jury visits, Faculty Advisors are not permitted to stay inside the units.
- No attendance is allowed in the HDUs during the experiment of the Performance Gap Sub-Contest. These days are defined in the SDE21/22 Event Calendar.

12.3 House Operators

Only Decathletes are permitted to operate the housing unit and participate in the Contest during Contest week. All Competition-related communications on the Competition site shall be between the SDE21/22 Organisers and Decathletes.

12.4 Late Design Changes

The final project assembled on the Competition site shall be consistent with the design and specifications presented in the Construction Documents. If there are known inconsistencies between the final project and the Construction Documents, the Team is strongly encouraged to document these inconsistencies and submit the documentation to the SDE21/22 Organisers as soon as possible after the inconsistency is known. The SDE21/22 Organisers will then submit this documentation or a summary of the documented inconsistencies to the respective juries and inspectors at the appropriate time. If undocumented inconsistencies are discovered during inspections, the SDE21/22 Organisers will compile a summary of the inconsistencies and submit the summary to the respective Juries at the appropriate time.

12.5 Public Tour

During Contest week, units (HDU) will be open to public tours during the times specified in the Event Calendar. Teams are required to provide an accessible route to all areas of the unit (HDU) and site that are available to the public during exhibition hours. Teams are permitted to distribute only one informational brochure or handout per person. Nevertheless, Teams are permitted to produce different brochures for different target groups. **The handout addressing the general public must be bi-lingual, in English and German languages.** The handout material and its properties, like its recyclability, content and creativity, will be evaluated**.** Teams shall develop signage that complements public tours by informing visitors about the Team project and engaging visitors waiting in line. Only SDE21/22 Organisers-approved vendors may provide food and beverage to the general public on the Competition site. The SDE21/22 Organisers will inform all Teams of the specific location of the access to each lot before the Lot Selection.

Additional requirements

- Although Teams have to design only one route for all public tours, they may plan different explanations for each of the target groups: General public, professionals (architects, engineers, technicians and specialized press), undergraduates, teenagers and children, as well as considering long and short tours, attending to the number of public waiting. Teams are advised to pay special consideration in structuring the different explanations for various Juries.
- Teams will manage the waiting lines during public tours, and therefore design a specific waiting area inside the lot and include corresponding entertainment activity. Information panels and/or equivalent electronic equipment (always using the HDU's energy) may be installed in this area.
- Teams are encouraged to plan their route according to accessibility requirements (see Rule 50 _ Building Codes), trying to avoid any awkward point, such as crossing of ways, narrowing, etc. If avoiding the awkward point is not possible, Teams will have to explain how these points (as well as turns, entrance and exit accesses…) are solved (see Rule 38.8c _ Public Tour Description for further details concerning the information required).
- Public tours and explanations must take into account those people with sensorial or motor disabilities and will design these according to 'Total Accessibility Criteria'. Therefore, Teams must plan all the necessary actions or systems to let

all visitors follow the same tour as the rest of the public, without any information loss; those visitors with disabilities will not be segregated from other visitors, nor given special attention. However, once the public tour and explanations are finished, wheelchairs and strollers/push chairs (and accompanying persons) may have a different exit from the general public.

- During public tours, Teams must provide access to the public areas of the unit (at least living room and kitchen). If the unit has two different levels, and the planned public tours include visiting both levels, access must be granted for disabled people by means of mechanical elements (lifts). Moreover, as it is mandatory to show the rest of the unit (HDU), Teams may make use of other means (such as models, videos, mirrors, drawings, photos, virtual reality solutions) to this end.
- Augmented reality systems and/or any other electronic systems to enrich the public visit are permitted, beyond those provided for people with sensorial disabilities. All auxiliary electric/electronic systems used during public tours (such as screens, beamers, audio guides, fans, music players) must be powered by the unit's energy.
- When planning their communication strategy during the final phase of the SDE21/22 Competition, Teams must consider the following aspects:
  - > Due to the duality of the design project and the demonstration unit, Teams must present and communicate on the lot the full design approach through their architectural model, virtual reality, brochure. This includes the full energy concept and the mobility strategy.
  - > Most of the visitors coming to SDE21/22 Solar Campus will be native speakers of the host country.
  - > Teams are encouraged to plan shading and rain protection areas, elements and/or devices inside their lot for the waiting public.

12.6 Housing Units' Use During Event & Impound Periods

The SDE21/22 Organisers are currently working on the definition of a real-life condition process using prototypes during the Competition (24 hours/day). This process will be determined in the next edition of the Rules. However, each unit can be impounded under the direct supervision of the SDE21/22 Organisers during a specific period of time. Team Members and Team Crew are not allowed to occupy, move, or conduct maintenance on any part of the unit during the Impound.

12.7 Interior & Exterior Lighting

The units must keep all interior and exterior unit lights on during specified periods of time. See the Event Calendar for the specified periods. In case of technical problems, Teams may notify these to the Observer before turning selected lamps on or off, in order to avoid point penalties.

12.8 Safety During the Event

Each Team is responsible for the safety of the general public during the tours of their unit.

12.9 Housing Units Configuration for Jury Tours

Teams shall show the Juries all possible configurations of the unit (HDU) during the Jury tours. Unit configurations that could affect the outcome of Contests but were not seen by the Jury during their tours, are prohibited during Contest weeks. Some examples of reconfigurable features are the following:

- A significant movable component, such as a room, wall, or bed;
- Shading devices, such as retractable awnings or operable shutters;
- Towel-drying locations;
- Window coverings that may obstruct views or reduce light levels.

If there is insufficient time to do a live reconfiguration during Jury tours, Teams may use some other method, such as photographs or video, to show all reconfigurable features in their various configurations. Reconfigurable features that will not actually be reconfigured at any time during Contest week need not be reconfigured during Jury tours. All plug-in or portable appliances that may be used during Contest week shall be in their fully deployed locations and configurations during Jury tours. Also, be aware that Juries may request that plug-in, portable, or hard-wired appliances be turned on so they can evaluate noise levels or other characteristics of the appliances that may not be evident when the appliance is off.

12.10 Teams Activities on the SDE21/22 Solar Campus

Only SDE21/22 approved activities are permitted on SDE21/22 Solar Campus. Teams wishing to hold any kind of activity not specified in the Event Calendar, in their homes, lot or any other area of SDE21/22 Solar Campus, must request the SDE21/22 Organisers for approval. These include any event co-organized by Teams and governments/supporting institutions/sponsoring companies, from official receptions to product presentations. Further information regarding the procedure for requesting approval of the SDE21/22 Organisers is available through the SDE21/22 WAT. The SDE21/22 Organisation has the authority to reject or approve any request and may issue a conditional approval or suggest a change of date or time.

12.11 Impact Assessment & Living Lab

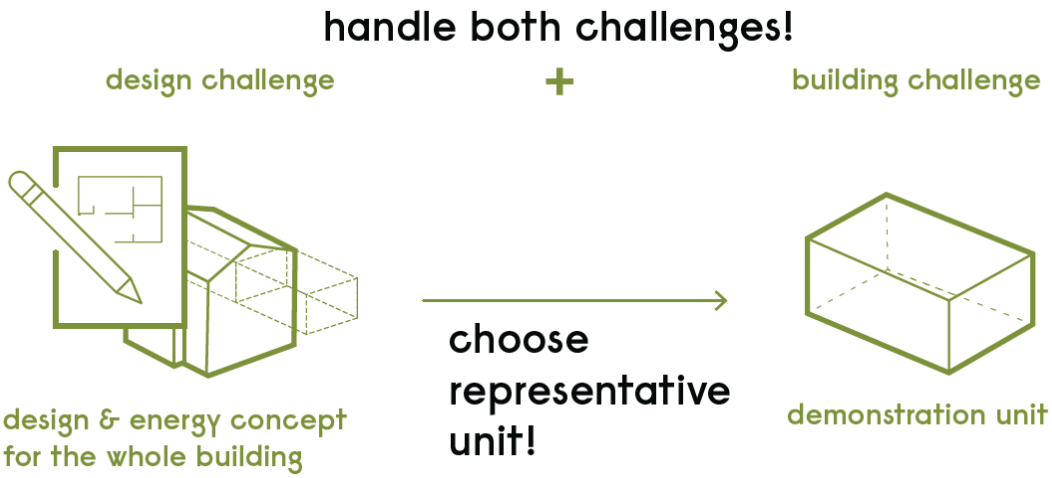
In the aftermath of the disassembly phase, the SDE21/22 Organisers conducts an impact assessment of the SDE21/22 event. The objective of this assessment is to share, extend and implement best practices and lessons learned toward all industry-related stakeholders and sectors: academic, professional, societal, governmental etc. Final Jury evaluations and Teams' final impact assessments will be considered for this purpose. As such, the Teams' impact assessments are of great value, and Teams are urged to follow Rule 39 with great attention. The Living Lab phase will start after the disassembly phase. An activity plan for the living lab and remaining units will start in 2021 with selected Teams.

section 2.0 contests

RULE 13 _ GENERAL CONTEST INFORMATION

The Solar Decathlon Europe Competition consists of 10 separately scored Contests. Each of these Contests in the Competition may consist of several sub-Contests and different assessment criteria. The Team with the highest total points at the end of the Competition wins the Competition. The SDE21/22 Competition consists of the combined approach of the Design Challenge and the Building Challenge.

FIGURE 2. THE DUALITY OF BOTH CHALLENGES IN SDE21/22.



With the exception of the three monitoring-based Contests, all other Contests address both challenges.
The ten Contests of the SDE21/22 are as follows:

TABLE 5. MAIN CONTESTS, POINTS, APPLICATION & EVALUATION.

		SDE21 Challenge		evaluation type	
contests	**total points**	**Design Challenge**	**Building Challenge**	**juried**	**monitored**
Architecture	120	•	•	•	
Engineering & Construction	120	•	•	•	
Energy Performance	120		•		•
Affordability & Viability	100	•	•	•	
Communication, Education & Social Awareness	80	•	•	•	
Sustainability	100	•	•	•	
Comfort	100		•		•
House Functioning	80		•		•
Urban Mobility	80	•	•	•	
Innovation	100	•	•	•	
	1000				

RULE 14 _ GENERAL COMPETITION CRITERIA

Scoring options

In the SDE21/22 Competition there are four different ways to earn points:

- Jury evaluation;
- Task completion;
- Tests;
- Monitored performance.

Participating Teams will have access to all the information related to the monitoring of the units, as well as to the scoring, tables, different measurements results, scoring periods, etc. The public will be continuously informed about the scoring. See Table 6 for an overview of Contests and scores.

TABLE 6. SOLAR DECATHLON EUROPE 2021: POINTS DISTRIBUTION IN DETAIL.

no.	contests	Innovation	total points	sub-contests	points, sub-contest		assigned by	sde21 challenge design challenge	sde21 challenge building challenge
1	Architecture	•	120						
				site integration	20		jury	•	
				building design	60		jury	•	•
				interiour & lighting design	20		jury		•
				solar system integration	20		jury	•	•
2	Engineering & Construction	•	120						
				energy concept	60		jury	•	•
				performance analysis	30		jury	•	•
				life cycle carbon footprint	30		jury		•
3	Energy Performance		120						
				energy consumption	30		monitoring		•
				energy balance	30		monitoring		•
				self consumption	20		monitoring		•
				pv system performance	20		monitoring		•
				grid interaction	20		task		•
4	Affordability & Viability	•	100						
				affordability	50		jury	•	•
				viability	50		jury	•	•
5	Communication, Education & Social Awareness		80						
				communication	40		jury	•	•
				education	20		jury	•	
				social awareness	20		jury	•	•
6	Sustainability	•	100						
				circularity	60		jury		•
				sufficiency, flexibility & environmental performance	40		jury	•	
7	Comfort		100						
				temperature	25		monitoring		•
				humidity	5		monitoring		•
				air quality (CO_2)	20		monitoring		•
				lighting	10		monitoring		•
				sound insulation	10		test		•
				air tightness	10		test		•
				performance gap	20		task		•
8	House Functioning		80						
				appliances	40				•
				refrigeration		5	monitoring		•
				freezing		5	monitoring		•
				washing		5	task		•
				drying		5	task		•
				dish washing		5	task		•
				oven		5	task		•
				cooking		5	task		•
				home electronics		5	task		•
				water	10				•
				hot water		5	task		•
				water balance		5	task		•
				dinner	15		guest evaluation		•
				user friendliness	15		guest evaluation		•
9	Urban Mobility	•	80						
				mobility concept	60		jury	•	
				urban mobility tasks	20				
				provide beverages		10	task		•
				provide for dinners		6	task		•
				retrieve food		4	task		•
10	Innovation		100	5 x 20 points	100		jury	•	•
			1.000		**1.000**				

14.1 Jury Scoring

A multidisciplinary Jury, composed by internationally renowned experts in their respective fields, will use their experience and knowledge for the evaluation of the House Demonstration Units. The scorings will be done following the maximum point distribution per sub-Contest, the evaluation criteria, and the guidelines developed by the SDE21/22 Organisation for these Contests. The Jury constellations will be selected by the SDE21/22 Organisation (SDE21/22 Organisers and the Energy Endeavour Foundation), with consideration for academic and professional histories related to the evaluated Contests. See Table 7 Jury Overview.

TABLE 7. JURY OVERVIEW.

JURY	TIME COMMITMENT FOR DELIVERABLES REVIEW (PER TEAM)	RELEVANT DELIVERABLE FOR REVIEW	TIME COMMITMENT FOR VISITS TO EACH UNIT
Architecture	45 minutes	Drawings, 3-D-Model Architectural Models Architecture Design Report Architecture Brief Report Innovation Report	30 minutes
Engineering & Construction	45 minutes	Drawings, 3-D-Modell Engineering and Construction Report Engineering and Construction Brief Report Innovation Report	30 minutes
Affordability & Viability	45 minutes	Affordability & Viability Report Affordability & Viability Brief Report Innovation Report	30 minutes
Communication, Education & Social Awareness (CESA)	45 minutes	Website, Education Material & Social Media Communication Plan and Press Kit Guided Public Tour and Materials CESA Report CESA Brief Report Speed Peer Review	30 minutes
Sustainability	45 minutes	Sustainability Report Sustainability Brief Report Innovation Report	30 minutes
Urban Mobility	45 minutes	Urban Mobility Report Urban Mobility Brief Report Innovation Report	30 minutes
Innovation		Each thematic Jury gives the points for the innovation in that category from 0 to 20. The Organisers take care of the summary.	

The review will be performed in four phases:

- **First Phase: Documents Review**
  The Deliverables outlined in Table 21 give the Juries the opportunity to study the projects, to familiarise themselves and explore specific technical details. For each Juried Contest a pre-evaluation of the documents will be performed by the SDE21/22 Organisers.
- **Second Phase: HDU Visits**
  The visits take place during the Contest Weeks on the SDE21/22 Solar Campus, giving the Juries the opportunity to visually verify the information previously delivered and raise any question or clarification directly to the Decathletes that the Jury may consider appropriate. Teams can show the audio-visual #3 to the Jury. Audio-visual #3 will be provided to the Jury in advance.
- **Third Phase: Deliberation**
  The deliberation is the process where the different members of the same Jury bring ideas together, sharing their opinions regarding the previous phases.
- **Fourth Phase: Scoring**
  Juries will provide written feedback to each Team explaining the scoring assigned and the evaluation criteria considered.

14.2 Task Completion Scoring

Teams will obtain points for successfully completing the requested tasks. The carrying out of each task will be controlled by an Observer, who will register the results and her/his remarks in the 'Observers' Logs'. The scoring is based on the approach to the goals predetermined in the Contests.

14.3 Test Result Scoring

The Organisers will manage specific measurements of building properties such as air infiltration rate or sound insulation. Results will be announced to Teams and used for scoring.

14.4 Monitored Performance Scoring

During the Contest week, the unit will be continuously monitored, and specific measurements will also be made. The scoring is based on the approach to the goals predetermined in the Contests.

14.5 Awards

During the final phase of the Competition, the following awards will be given to Teams:

a) Overall Awards

During the Final Award Ceremony, the Overall Competition Award will be granted. The Team with the highest total points at the end of the Competition wins the Overall Competition Award. There will also be awards for the Teams with the second and third overall higher scores.

b) Contest Awards

Each of the ten Contests will be individually rewarded. There will be one first, one second and one third awards for each Contest. Juries will award only one Team per position. As an extraordinary circumstance Juries will be able to grant the third place to two different Teams.

c) Out of Competition Awards

In addition to the Contest Awards, other awards or acknowledgments may be granted to Teams with outstanding performance in off-Competition areas. The SDE21/22 Organisers will inform the Teams about these SDE21/22 Out of Competition Awards.

RULE 15 _ CONTEST 1: ARCHITECTURE

Objectives

The objective of this Contest is to assess the beauty, structure, durability and coherence of the design on all relevant levels with respect to the contextualised city/city of intent's climate, the neighbourhood and the identified individual socio-economic environments.

Assessment

The assessment is based on the drawings, the Architecture Design reports, models and/or VR animations as well as the on-site evaluation of the HDU. A Jury of renowned architects will evaluate the Deliverables, as well as the on-site HDU on the Solar Campus.

Criteria

The scoring is separated into four levels from site integration to solar system integration as indicated in Table 6 with these associated points:

- Site integration;
- Building design;
- Interior & lighting design;
- Solar system integration.

Due to the nature of the SDE21/22 edition a convincing consideration of the existing building stock and/or neighbourhood is important as well as the socio-economic scenario addressed for the project. In the case of a Team's specific location from its country of origin, the relevant location-specific information has to be provided to allow the Jury's understanding of the project's intention. A brief explanation of the site and the city/quarter needs to be part of the Architecture Brief Report.

The site integration and the building design include the structural engineering as an integrated part of the architectural approach. The site integration is only evaluated in the context of the whole building design, and the interior design only evaluated for the HDU. The other two categories address the design challenge as well as the building challenge.

Special attention is given to the aspects in how architectural solutions contribute to the general aims of sufficiency, flexibility and the overall environmental performance as specifically evaluated under Contest 6 'Sustainability'. A similar approach is valid for the interface to the "Urban Mobility" under Contest 9.

The drawings, reports, models and HDU have to be complete and able to allow for the reading of the project's architectural language. Design processes should be described with special attention to participation methods, definition of requirements, verification of design with requirements, decision-making and the application of BIM (building information modelling). Innovative approaches or processes are to be highlighted in a separate report.

RULE 16 _ CONTEST 2: ENGINEERING & CONSTRUCTION

Objective

To assess the construction and engineering design and implementation with special attention to the overall building energy concept. The evaluation mainly covers the design challenge. Teams will demonstrate and justify the measures undertaken on the path toward climate-neutral building operation and their interaction. This covers the construction as well as the engineering in interaction with the architecture. The topics of the monitored Energy Performance Contest for the demonstration unit are to be addressed in the report by simulation studies for the building and the demonstration unit as well. The structural engineering is considered as an integral part of the Architecture Contest.

Assessment

The assessment is based on the Deliverables relative to the project, in particular the drawings, the Engineering & Construction reports, the Project Facts template as well as the on-site evaluation of the demonstration unit. A Jury of engineers and/or architects specialized in the different areas of this Contest will evaluate the Deliverables, as well as the on-site demonstration unit.

Criteria

The sub-scoring is based on the following factors:

- the energy concept;
- the performance analysis undertaken to develop and justify the concept;
- the life cycle carbon footprint.

The evaluation of the energy concept covers all measures undertaken to reduce the energy demand of the building. This includes the building design (passive solar, shading, ...), the construction (insulation, ...), the selection of appliances and the energy supply system including its interaction with grids. Domestic hot water supply has to be taken into account with special consideration of the relatively high importance for heat demand in apartment buildings and legionella protection.

The performance analysis is evaluated based on the Contest report and the project facts templates documenting calculations and simulations in a comprehensible form to justify the measures and illustrate possible alternatives. The Jury will consider the depth of the analysis as well as the clarity of the messages. The life cycle footprint assessment translates the Energy Performance analysis to a carbon footprint analysis. The LCA is mandatory for the HDU only. The Jury will identify to which extent the project has the potential to reach carbon neutrality for operation without inadequate increase of material input. The Jury will consider the depth of the analysis as well as the clarity of the methodology used and corresponding messages. Design processes should be described with special attention to definition of requirements, verification of design with requirements, decision-making and the application of BIM (building information modelling). Innovative approaches or processes are to be highlighted in a separate report.
[**Note:** Teams will only successfully receive points in the Comfort Contest, sub-Contest: Performance Gap Evaluation by providing a carefully prepared thermal simulation. Therefore, simulations must be performed for the demonstration unit as well.]

RULE 17 _ CONTEST 3: ENERGY PERFORMANCE

Objective

This Contest addresses the real Energy Performance of the demonstration unit and its PV power system. It allows for the detailed study of a part of the whole building design in real operation and contributes to monitored data in a science-based analysis.

Assessment

The assessment is based on high resolution monitored data by the SDE21/22 Organisers' monitoring system.

Criteria

The assessment is separated into four monitoring sub-Contests and three tasks as indicated in Table 6, including associated scoring.

17.1 Sub-Contest 3.1: Energy Consumption

This Sub-Contest aims to evaluate the electrical energy efficiency of the units fulfilling comfort conditions and functions.

$$E_c = E_S + E_H$$

Where:

- E_C is the electrical consumption [kWh];
- E_S is the consumption of HVAC and DHW and Ventilation [kWh];
- E_H is the consumption of appliances, small consumers electric mobility and lighting [kWh];

All available points will be earned by the house with the lowest energy consumption.

- Reduced points are earned if the calculated house consumption is between the lowest consumption and 2.0 times the average consumption. Reduced point values are scaled linearly;
- No points are earned if the calculated consumption is equal or higher than 2.0 times the average consumption.

17.2 Sub-Contest 3.2: Energy Balance

This sub-Contest will evaluate the cumulated balance of the unit's generation and consumption during the Competition weeks. The result of this sub-Contest is determined using the following formula.

$$E_{eb} = E_G - E_C$$

Where:

- E_{eb} represents the electric energy balance [kWh];
- E_G represents the total AC electricity on site generated by the photovoltaic systems [kWh];
- E_C represents the total electrical consumption [kWh].

Generated power is counted only during the daily intervals within the monitoring periods in which all House Demonstration Units are free of shadowing for direct radiation. The load will be counted continuous during the monitoring periods.

All available points will be earned by the house with the highest energy balance.

- Reduced points are earned if the calculated house energy balance is between the highest energy balance and 0. Reduced point values are scaled linearly;
- No points are earned if the consumption exceeds the generation.

17.3 Sub-Contest 3.3: Self-Consumption

Self-consumption is the proportion of solar energy generated by the building that the building directly uses itself. High self-consumption not only decreases energy transport losses, but further enhances climate neutrality. Therefore, this sub-Contest will evaluate the ability to consume self-generated energy.

$$I_{sc} = \frac{E_G - E_F}{E_G}$$

Where:

- I_{sc} is the self-consumption index;
- E_G represents the electrical energy which is generated on site [kWh];
- E_F represents the electrical energy which is feed into the electricity grid [kWh].

The self-consumption will be determined with high-resolution data of the monitoring system. The load will be counted continuously during the monitoring periods. Batteries are not allowed to be charged with grid electricity during the Competition weeks.

All available points will be earned by the house with the highest self-consumption.

- Reduced points are earned if the calculated house self-consumption is between the highest self-consumption and 0. Reduced point values are scaled linearly.
- No points are earned if the calculated self-consumption is 0.

17.4 Sub-Contest 3.4: PV System Performance

This sub-Contest evaluates the quality of the PV system in real operation. The so-called performance ratio provides the performance of the installation independently of the orientation or inclination of the panel. It typically ranges from 0.7 to 0.9. It includes all losses: temperature, inverter, DC cables, AC cables, battery losses, panel mismatch, shadings, losses at weak radiation, losses due to dust, snow, etc. The performance ratio is defined as:

$$I_{PR} = \frac{E_G}{I_{PV} \cdot A_{PV} \cdot \eta_{STC}}$$

Where:

- I_{PR} is the PV system performance ratio;
- E_G represents the generated electrical energy on the AC side [kWh];
- I_{PV} represents the available irradiation on the module area [kWh/m²];
- A_{PV} is the module area [m²];
- η_{STC} efficiency of the individual solar module under test conditions [-].

As opposed to usable definitions, the generation is counted on the inverters AC side and includes the battery behaviour. In the case of more than one PV system per unit with different orientation and/or inclination (roof plus façade installation) the monitoring concept will be adjusted. The results are expressed as a cumulative performance ratio per installation for a defined period during the Competition weeks. Various weather and operation conditions are to be covered.

All available points will be earned by the house with the highest PV system performance ratio.

- Reduced points are earned if the calculated house PV system performance ratio is between the highest PV system performance ratio and 0. Reduced point values are scaled linearly.
- No points are earned if the calculated PV system performance ratio is 0.

17.5 Sub-Contest 3.5: Grid Interaction

This sub-Contest evaluates how the HDU's work beneficial with the power grid to which they are linked to. It reflects the newly introduced 'Smart readiness indicator' of the 2018 recast of the Energy Performance of Buildings Directive of the EU. Indeed, the power grid contains varying amounts of renewable power throughout the time of the day and the season. 'Energy Flexibility' of a building is the ability to manage its energy demand and generation according to local grid requirements. Energy Flexibility of buildings will thus allow for demand-side management, load control, and thereby demand-response based on the requirements of the surrounding energy infrastructure. This sub-contest focuses on demand-side management and privileged feed-in.

The task requires a BMS (building management system), able to read and process external signals for the operation of the electric systems. Details of the signal interface will be communicated via the SDE21/22 WAT. Manual control alone doesn't lead to gained points in this sub-contest.

All Teams receive a forecast of the Solar Campus grids electricity price function with 15 min. resolution a day ahead of the task performance (csv-file with 96 lines giving time and price in 15 min. resolution). The objective of the task is to recognize and utilize the most favourable consumption and feed-in strategy by demand site management and priories the use of battery-stored solar power. For calculation of the success of the teams measures undertaken, constant average tariffs are assumed additionally and used for calculating the reference for the task day. The success is measured by the savings (consumption costs) or yield (feed-in income) related to the reference.

These relative changes are defined as success indicators:

Consumption flexibility

$$IC_{flex} = \frac{\sum_1^{96}\left(E_{C,grid}\right) * c_{c,fix} - \sum_1^{96}\left(E_{C,grid} * c_{c,var}\right)}{\sum_1^{96}\left(E_{C,grid}\right) * c_{c,fix}}$$

Feed in flexibility

$$IF_{flex} = \frac{\sum_1^{96}\left(E_{F,grid} * c_{f,var}\right) - \sum_1^{96}\left(E_{F,grid}\right) * c_{f,fix}}{\sum_1^{96}\left(E_{F,grid}\right) * c_{f,fix}}$$

Where:

- $I_{c,flex}$ is the consumption flexibility index;
- $I_{f,flex}$ is the fed-in flexibility index;
- $E_{F,grid}$ is the electricity fed into the grid in kWh;
- $E_{C,grid}$ is the electricity consumed from the grid in kWh;
- $C_{c,var}$ is the 15 minutes based price of electricity consumed from the grid in cent/kWh;
- $C_{c,fix}$ is the daily average and constant price of electricity consumed from the grid in cent/kWh;
- $C_{f,var}$ is the 15 minutes based price of electricity feed into the grid cent/kWh;
- $C_{f,fix}$ is the daily average and constant price of electricity feed into the grid in cent/kWh.

The 15-minute resolution energy data for the formula are determined based on high-resolution data from the monitoring system (comparable to contest 3.3). Half of the points are addressing the consumption index and the other half the feed-in flexibility. No points are gained in the case of increased costs (consumption) or decreased yields (feed-in).

Note that battery charging via the grid is not allowed.

The csv table will be sent to the Teams one day before the task by the SDE21/22 Organisers so that it can be imported into the BMS system.

RULE 18 _ CONTEST 4: AFFORDABILITY & VIABILITY

Objective

This Contest assesses the proposal according to its affordability and viability. The SDE21/22 Competition asks the question: Would the project work in real-life in the framework conditions of a defined and realistic socio-economic scenario and housing market? Furthermore, this Contest is evaluated by determining to which extent the project or innovative parts of it can be a scalable blueprint for an urban sustainability transition. Therefore, as a crucial point, the Jury will assess how the project or its elements help to solve urban issues, lower energy consumption and carbon footprint, and ensure or promote diverse neighbourhoods, thus understanding gentrification vs. segregation etc. The evaluation focuses mainly on the design challenge but considers the demonstration unit as well.

Assessment

A Jury of experts and professionals from the housing industry, social-, neighbourhood- and city development will assess the affordability, economic and social viability based the Teams' defined social scenarios and housing market.
The Jury considers the affordability and viability report and performs an on-site evaluation of the demonstration unit.

Criteria

This evaluation is performed with special consideration of the social and economic context of the chosen city, district, neighbourhood and defined group of residents. A clear description of these elements is the basis and crucial aspect of the evaluation. The total score for this Contest will be equality divided into the categories of affordability and viability. The following lead questions guide the Jury evaluation:

Affordability & Economic Viability
Focus on residents

- What are the effects on operational costs (effects on rent levels, electricity, heating, water, etc.) for the tenants/residents and how does this fit the selected social scenarios? To what extent does the proposal provide innovative ways to minimise these costs?
- How likely is it that the proposal would be affordable in the selected social scenarios and the defined housing market?

Focus on property owner/ investor

- What is the accurate construction cost estimate to implement the concept under the chosen circumstances?
- What is the financing plan for the implementation of the concept under the chosen circumstances?
- What elements are included (funding, rental level after proposal implementation, etc.)?
- Is the calculated rental return suitable to the selected social scenarios and the defined housing market?
- How do the energy-related and other innovative features enhance the market value of the unit?
- Is the economic viability framed by suitable operating and business models?

Social Viability

- How does the concept solve specific urban issues?
- What is the project providing for the neighbourhood?
- Which innovations improve the quality of life for the residents, while still being affordable?
- How do the articulation of space and interior design fit to the specific needs and desires of the defined residents?
- How can the proposal (or several social innovations) serve as a blueprint for a roll-out within the neighbourhood and beyond, to lower carbon footprint and lower energy consumption of cities of the chosen kind (scalability)?

RULE 19 _ CONTEST 5: COMMUNICATION, EDUCATION & SOCIAL AWARENESS

Objective

To assess the communication and educational skills of the Teams in their creative, effective and efficient dissemination of SDE21/22 Competition topics; this includes presenting the ideas that describe the work process and identity of the Teams, and the Teams' corresponding projects. It is crucial to adapt messaging to all target groups and audiences within the fundamental sectors of broad-based communication, education, and social awareness (including a wide range of stakeholders, specific academic communities, including younger students, and the general public). This key objective is intended such that all target groups are sufficiently addressed through a high level of effectiveness.

- **Communication**
  Each Team will present an integrated communication strategy, that includes a complete communication cycle (Analysis, Strategic Planning, Operative Planning, Implementation, Assessment/ Controlling). The strategic goals must support the communication for SDE21/22 and the SDE in general. The goals must also include the motivation of stakeholders and audiences from the Teams' cities/countries of origin to visit the SDE21/22 main event.
- **Education and Social Awareness**

Each Team will present and perform separate educational concepts and actions for students and for the general public. Concepts shall include detailed learning objectives, teaching methods and content. The focus on the education of students is the integration of resource-responsibility, innovation and energy literacy into an academic curriculum; this should also extend to teaching at participating faculties and universities in general. Focusing on the general public, including schoolchildren, the central goal is to raise awareness about the event and the necessity of urban (energy) transformation.

Assessment

This Contest is divided into the assessment of communication on the one hand, and education and social awareness on the other. These will be assessed through the results of various actions and tasks linked to the Deliverables and actions related to the SDE21/22 Competition event (activities involving interaction with the public, e.g. public tours). The material submitted for Deliverables (transmission of information through various media and channels ie. audio-visual, electronic, written etc. such as documentaries, media, websites etc...) will be used to assess the progress and calibre of each project. A Jury of experts in the fields of communication and education will award the scores according to Table 6.

Criteria

Quality of Strategies

- How well did the Team's communication/ education concepts, materials and activities work together to convey comprehensive, consistent, and integrated strategies in the three aspects of this Competition?
- How clearly defined are the Team's target audiences and communication/ education goals?
- How effective and efficient are the Team's communication/ education strategies?
- How well do the Team's communication/ education strategies align with the Team's stated goals and objectives?

Quality of Implementation

- How successfully did the Team conduct outreach and education?
- How successfully does the Team incorporate digital communications strategies and products to engage online audiences?
- How effective are the Team's educational and outreach messages about the Solar Decathlon Europe, the Team, and the design concept?

Quality of On-Site Communications

- How informative, interesting, engaging, and audience-appropriate was the Team's personalised tour?
- How effectively does the Team use on-site features, displays, models, or other materials to engage and educate the public?
- How effective is the Team's strategy for accommodating large crowds and long lines?
- How well do the on-site communications materials educate and inform the visiting public and groups of students of different ages?

Quality in all three levels is understood considering these dimensions:

- Level of effort and creative input /_ How much time, money and other creative input did the Team invest in concepts and actions?
- Effectiveness/_ To which degree are pre-formulated objectives achieved by different actions?
- Efficiency/_ What is the relation between the level of effort and the achievement of pre-formulated objectives?

RULE 20 _ CONTEST 6: SUSTAINABILITY

Objective

The Contest is designed to evaluate the improved efforts towards a circular economy. The demands on 'closing loops' with an architectural design are multifaceted, mainly focusing on saving resources, avoiding demolition waste and creating additional values to counter the far-reaching impacts of global warming and overpopulation.

Assessment

The assessment is based on the Sustainability Reports and the drawings together with checklists and calculations provided. The on-site evaluation of the House Demonstration unit complements the process. A Jury of professionals specialized in the different areas will evaluate this Contest.

Criteria

The scoring is separated into the two Sub-Contest 'Circularity' and 'Sufficiency, Flexibility & Environmental Performance' as indicated with Table 6 and their associated points. The construction of the building in both Sub-Contests is evaluated in the context of the House Demonstration Unit (HDU) due to the increased level of detail of construction drawings in the building challenge. Because of the broader context, the design challenge is used to evaluate all other criteria, especially in the Sub-Contest 'Sufficiency, Flexibility & Environmental Performance'.

20.1 Sub-Contest 6.1: Circularity

The Sub-Contest 'Circularity' specifically addresses the evaluation of the loop potential of the major, regular parts of the building. This includes the explanation of the recycling potential of the materials, the detachability of the building components and the durability of the materials. Possible concepts, such as urban mining – the extraction of building resources from anthropogenic deposits – and concepts for the End-of-Life are also in demand in this Contest.

A tool for estimating the circularity based on a so-called 'Urban Mining Index – UMI', will be provided by the SDE21/22 Organisers via the SDE21/22 WAT. The Urban Mining Index is a system for quantitatively measuring and evaluating the circulation consistency of building constructions and buildings in new construction planning.

For this purpose, parameters were defined which reflect the materials and construction, but also the economic efficiency of selective deconstruction, which is a requirement for the recovery of single-variety recyclable materials. The building materials to be led in a circular way, with their share in the mass of all materials used in the building, quantify the overall result: the 'Urban Mining Indicator'. To calculate this, the rates of circularity of building materials are determined on the basis of specific parameters: the proportion of secondary or renewable raw materials and the future recycling potential. Different quality levels of circular material pre-use and post-use are differentiated and weighted differently: Materials that can be kept in closed loops at a constant quality level (re-use and recycling) are included in the 'Closed-Loop Potential'. In contrast, materials that can only be managed in open cycles with a loss of quality (further-use and downcycling) are included in the 'Loop Potential'.

20.2 Sub-Contest 6.2: Sufficiency, Flexibility & Environmental Performance

The Sub-Contest 'Sufficiency, Flexibility & Environmental Performance' addresses:

- The general character of the building to achieve more with less: less space per person, fewer appliances per task, multiple uses of space, etc.;
- The quality of the building to react to changes in urban needs and conditions, such as the demographic change, a potential change in use of the building, migration and other effects;
- The environmental performance is based on the choice and use of materials, water and waste management, planting, urban micro-climate, etc.

To assess these goals, the 'Urban Loop Design' checklist is provided via the SDE21/22 WAT addressing the following categories:

- Biodiversity
- Society
- Climate
- Durability
- Building material

RULE 21 _ CONTEST 7: COMFORT

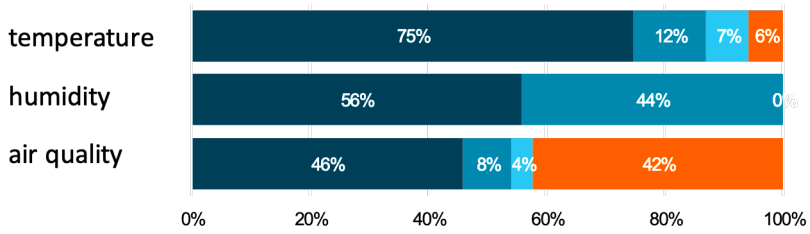
Objective

To assess the capacity for providing interior comfort without active heating or cooling in June under the climatic conditions of the SDE21/22 Solar Campus through the control of temperature, humidity, acoustic, lighting and the quality of the interior air. A specific sub-Contest addresses the capability of each Team to correctly estimate the indoor thermal comfort during the planning.

Assessment

The assessment is based on the collected data by the SDE21/22 Organiser´s monitoring system during the Competition period. Further to that, Teams provide simulation data to be compared with the monitoring results (sub-Contest performance gap). The general approach is based on the comfort classification according to EN 15251. That means that maximum points are earned when the demonstration unit is operated within the best performance class during all measurement periods, indicated by the Event Calendar during the Competition week.

FIGURE 3. TYPICAL PERFORMANCE-CLASSIFICATION BAR GRAPH FOR A MONITORED PERIOD. THE DIFFERENT BLUE COLOURS REPRESENT PERFORMANCE-CLASSES 1 (DARK) TO 3 (LIGHT); THE ORANGE COLOUR REPRESENTS DATA OUTSIDE THE LOWEST CLASS. THE PERCENTAGE NUMBER REPRESENTS THE SHARE OF DATA WITHIN THE MONITORED PERIOD. ALL DATA IN PERFORMANCE-CLASS 1 GIVES THE MAXIMUM SCORE, ALL DATA OUTSIDE PERFORMANCE-CLASS 3 GIVES NO POINTS.



Criteria

Sub-Contest 7.1: Temperature

In the absence of active heating or cooling for the demonstration unit, the free-floating interior temperature will be constantly measured. Two temperature sensors will be located in the two main rooms or zones of the unit. If necessary, a third temperature sensor will be installed.

Available points are earned at the conclusion of each scored period by the amount of data in or out of the comfort classes according to a slightly modified EN 15251 approach. 100% of data in comfort class 1 defines the highest possible score in the defined period. The sliding average outdoor temperature is defined by EN 15251 and calculated by taking the weighted average of the outdoor temperatures of the past few days into account. Measurements will be done by the Organisers' weather station on the Solar Campus. The typical range of the sliding average outdoor temperature for June in Wuppertal is between 12 and 20 °C. The Event Calendar defines the schedule for the scored periods.

FIGURE 4. THREE COMFORT CLASSES ACCORDING TO EN 15251 WITH MODIFICATION IN THE RANGE OF LOW OUTDOOR TEMPERATURES. CLASS 1 IS DEFINED BY THE AREA BETWEEN THE UPPER LOWER LINE AND THE LOWEST UPPER LINE.

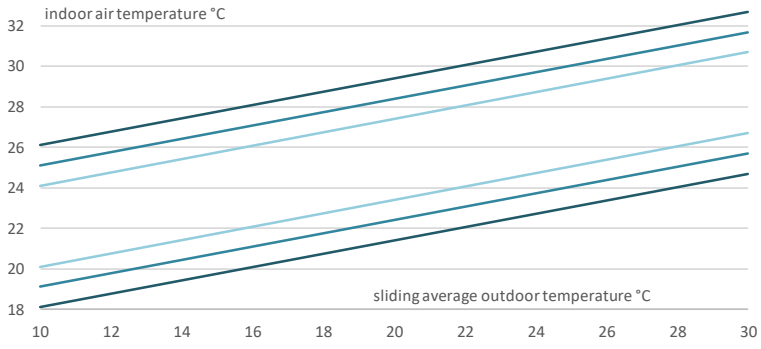


TABLE 8. THERMAL COMFORT SCORING.

		PERCENTAGE OF POINTS
FULL POINTS	Class 1	100%
ATTRIBUTED POINTS	Class 2	50%
	Class 3	25%
NO POINTS	outside	0%

Sub-Contest 7.2: Humidity

The free-floating relative humidity will be constantly measured. A humidity sensor will be located next to a temperature sensor. All available points are earned at the conclusion of each scored period by consistently keeping the interior relative humidity between 35% and 65% during the scored period. See the Event Calendar for the schedule of scored periods. Attributed points are earned when interior relative humidity is maintained between 30% and 35% or 65% and 70%; or between 25% and 30% or 70% and 75%. No points are earned outside this range.

FIGURE 5. HUMIDITY SUB-CONTEST POINTS DISTRIBUTION.

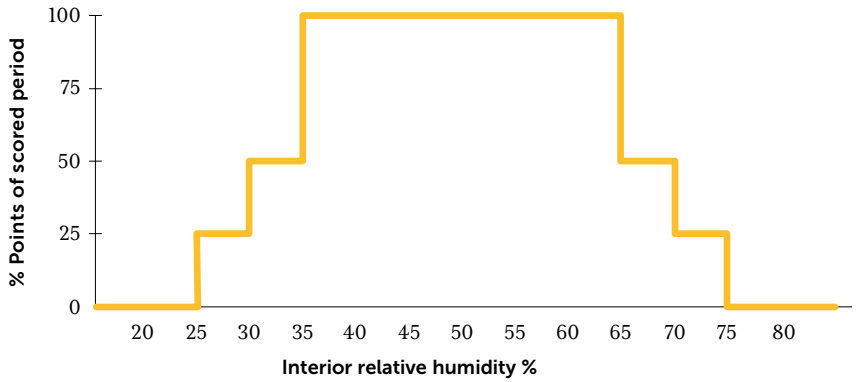


TABLE 9. HUMIDITY SCORING.

	LOWER HUMIDITY LIMIT	UPPER HUMIDITY LIMIT	PERCENTAGE OF POINTS
FULL POINTS	35%	65%	100%
ATTRIBUTED POINTS	30% - <35%	>65% - 70%	50%
	25% - <30%	>70% - 75%	25%
NO POINTS	<25%	>75%	0%

Sub-Contest 7.3: Air Quality – CO_2

The concentration of CO_2 in the air will be constantly measured. In most cases, CO_2 sensors will be located next to temperature sensors. Ambient concentrations can be estimated to about 400 ppm. All available points are earned at the conclusion of each scored period by keeping the content in CO_2 below 950 ppm during the scored period in accordance with EN 16798. See the Event Calendar for the schedule of scored periods. Attributed points are earned if the content in CO_2 is maintained between 950 and 1200 ppm or between 1200 and 1750 ppm. No points are earned equal and above 1750 ppm.

FIGURE 6. AIR QUALITY SUB-CONTEST POINTS DISTRIBUTION.

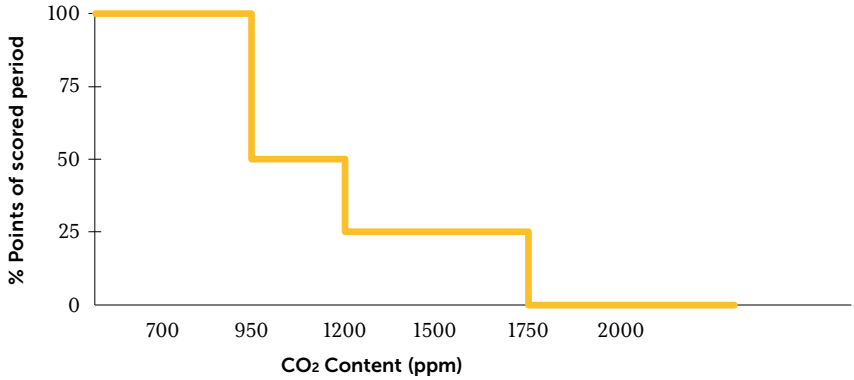


TABLE 10. AIR QUALITY SCORING.

	LOWER CONCENTRATION LIMIT	UPPER CONCENTRATION LIMIT	PERCENTAGE OF POINTS
FULL POINTS		950	100%
ATTRIBUTED POINTS	>950	1200	50%
	>1200	1750	25%
NO POINTS		>1750	0%

Sub-Contest 7.4: Daylighting

The daylight level measurements will take place at the scored period in the Event Calendar. Photometer(s) will be located in the living room. All available points are earned by keeping the Daylight Factor, ratio lighting level/exterior lighting above 4% during measurement periods (cloudy sky). Attributed points are earned if the ratio is between 2% and 4%, no point below 2%. The measurement point height is 0.9 m and the minimum distance to a window is 2m.
Direct light-emitting devices and direct sunrays are not permitted on the sensor.

FIGURE 7. DAYLIGHTING SUB-CONTEST POINTS DISTRIBUTION.

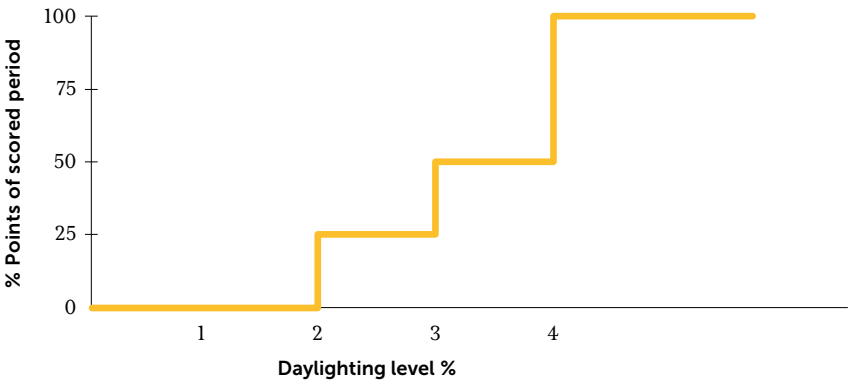


TABLE 11. DAYLIGHT SCORING.

	LOWER DAYLIGHT RATIO LIMIT	UPPER DAYLIGHT LIMIT	PERCENTAGE OF POINTS
FULL POINTS	4%		100%
ATTRIBUTED POINTS	≥3%	<4%	50%
	≥2%	<3%	25%
NO POINTS		<2%	0%

Metering of the lighting level is also done to ensure that during the daytime periods of thermal comfort evaluation, a sufficient daylight level (>500 Lux) is always provided (shading system not fully closed). Artificial light must be switched off during these times.

Sub-Contest 7.5: Sound Insulation

The measurement will be done by the Organisers according to the global method proposed in the DIN EN ISO 16283-3. The measurements are made on the most unfavourable or the least noise-insulated façade. Experts of the Organisers select the façade. The sound insulation Dls,2m,nT (dB) values for each of the 1/3 octave bands will be calculated between 100 Hz and 5 kHz. Dls,2m,nT,w (dB) will be calculated according to ISO 717-1:1996 and will be used as an assessment parameter. All available points are earned at the conclusion of all the housing/demonstration units' sound measurements by having an acoustic value equal or above 42 dB. Attributed points are earned if the acoustic value is between 30 dB and 42 dB. Attributed points values are scaled linearly. No points are earned if the acoustic value is equal or below 30 dB.

FIGURE 8. SOUND INSULATION SUB-CONTEST POINTS DISTRIBUTION.

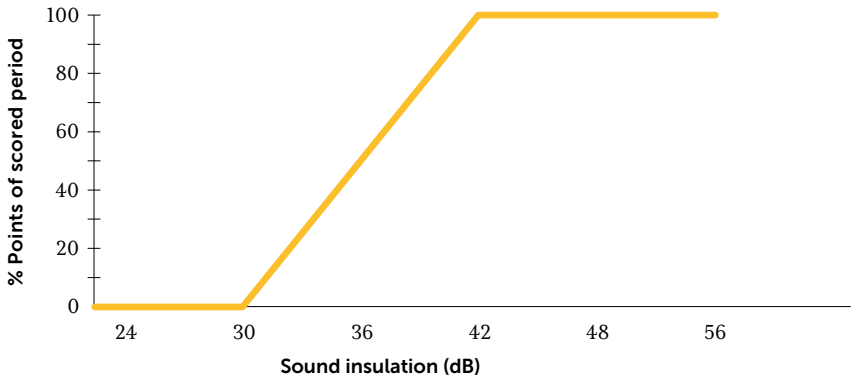


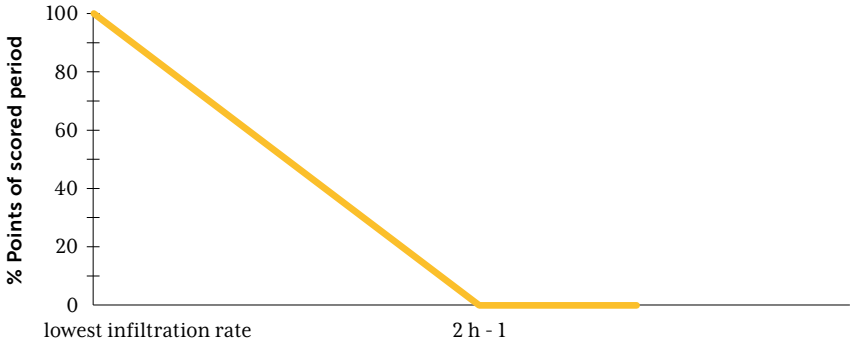
TABLE 12. SOUND INSULATION SCORING.

	LOWER D LIMIT	UPPER D LIMIT	PERCENTAGE OF POINTS
FULL POINTS	> 42 dB		100%
ATTRIBUTED POINTS	30 dB	42 dB	linearly reduced
NO POINTS	< 30 dB		0%

Sub-Contest 7.6: Blower Door Test

In the interest of comfort and quality insurance, a blower-door test will be conducted by the Organisers for each unit to control the airtightness value. These tests respect the EN13829 norm. All available points will be earned by the Team with the best result (=lowest infiltration rate). The rest of the Teams will receive points in relation to their own infiltration rate relative to the best infiltration rate. This scoring ensures that Teams with almost identical results will score almost identically. No points are received at leakage rates above 2 h-1. By advice from the experts involved, no measurements will be performed in buildings with obvious leakage (=no points). The measuring device requires a suitable opening with a width of 0.75 - 1.10 m and a length of 1.35 - 2.2 m, such as a suitable window or door.

FIGURE 9. BLOWER DOOR TEST SUB-CONTEST POINTS DISTRIBUTION.



Sub Contest 7.7: Performance Gap Evaluation

The SDE21/22 Organisers implement a 'co-heating test' to allow a thermal characterisation of all the House Demonstration Units (HDU) on the Solar Campus. The test is based on short periods of heating with constant power to reach a temperature well above ambient temperature (e.g. 40°C). The heating energy is delivered by extra equipment temporarily installed in each HDU by the Organisers and not counted for the Energy Performance Contest. All HDUs and the external climatic conditions will be monitored for about three days in non-occupied, free-floating conditions. A full climate data set of this period is handed to each Team together with the request for simulating the thermal performance of the HDU in the monitored period. Simulations have to be performed with the tool, delivered by the SDE21/22 Organisers. Teams can apply additional tools.

All Teams successfully delivering the simulation results in a standardized format using the standardized tool with the provided climate data of the defined period receive the full points (successful task completion). A comparison between simulated and monitored performance will be made for each HDU by the Organisers. Teams should provide realistic simulations while avoiding differences between planning and construction (ie. air leakage rate).

RULE 22 _ CONTEST 8: HOUSE FUNCTIONING

Objective

To evaluate the unit's functionality and the efficiency of the selected appliances, in order to maximise the performance of the unit, while complying with the demanding standards of present-day society. This Contest tries to reproduce the average energy use in a modern dwelling. The SDE21/22 Organisation wants to encourage Teams to think about innovative solutions meeting all appliances-required performances. That is why evaluation will concern results rather than means.
The operation of the appliances defines the major energy load of the demonstration unit during the Competition weeks and is of major importance for the overall energy figure of the whole building design project. Due to improved insulation, ventilation, and shading, the energy load of advanced buildings becomes more and more determined by the appliance and the DHW.

Assessment

The assessment is conducted through the collected data by the SDE21/22 Organisers' monitoring system during the Competition weeks, the measurements realized 'in situ' on the SDE21/22 Solar Campus, and the successful completion of tasks. The evaluation will be based on the unit's measurements realised during the Competition Week and on the corresponding tasks completion, with the exception of the dinner and user friendliness sub-Contests in which each guest Team shall assign an evaluation to the host Team after each dinner party.

Monitored Performance Scoring

- Refrigeration;
- Freezing.

Tasks Completion Scoring

- Clothes washing;
- Clothes drying;
- Dishwashing;
- Oven;
- Hot water draws;
- Cooking;
- Home electronics and automation.

Guests Scoring

- Dinner;
- User friendliness.

Monitored Performance (Direct Reading)

- Water Balance.

[**Important notes:** To participate in the units' functioning sub-Contest, Teams must use appliances and equipment that comply with the requirements stated in the Criteria section below.]
Appliances'characteristics, specifications and user manuals must be included in the Project Specifications as stated in Rule 48 _ Project Specifications. Information submitted in this section must show that appliances and equipment comply with the Rules requirements.

Criteria

Sub-Contest 8.1: Refrigeration

The refrigerator has to be used for storage of all food and beverages used during the dinner Contest. All available points are earned at the conclusion of each scored period by keeping the time-averaged interior temperature of the refrigerator between 2.0 °C and 6.0 °C during the scored period. A temperature sensor will be located inside the volume and will be continuously measuring. Points are attributed if the time-averaged interior refrigerator temperature is between 0.0 °C and 2.0 °C or between 6.0 °C and 8.0 °C. Reduced point values are scaled linearly, as shown in Figure 10. Refrigerator volume shall be a minimum of 150 litres. Refrigerator must be used to store food and beverages.

FIGURE 10. REFRIGERATOR SUB-CONTEST POINTS DISTRIBUTION.

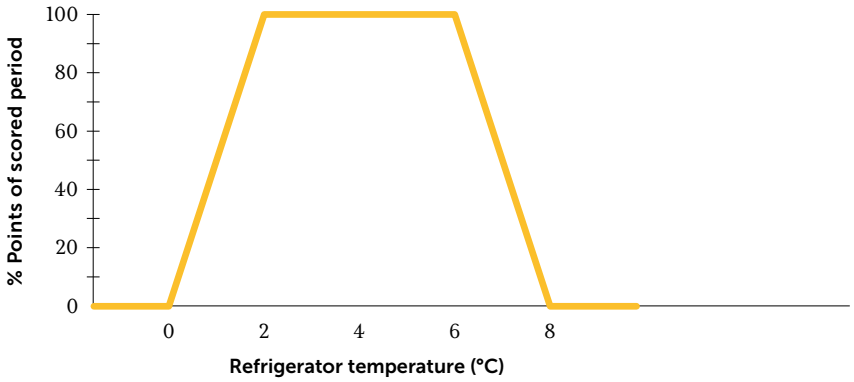


TABLE 13. REFRIGERATION CALCULATION

FULL POINTS:	2.0 °C	≤	TEMPERATURE	≤	6.0 °C
ATTRIBUTED POINTS:	0.0 °C	<	TEMPERATURE	<	2.0 °C
	6.0 °C	<	TEMPERATURE	<	8.0 °C
NO POINTS:			TEMPERATURE	≤	0.0 °C
NO POINTS:			TEMPERATURE	≥	8.0 °C

Sub-Contest 8.2: Freezing

A freezer may be used for storage of all food and beverages used during the dinner Contest. All available points are earned at the conclusion of each scored period by keeping the time-averaged interior temperature of the freezer between -28.0 °C and -18.0 °C during the scored period. A temperature sensor will be located inside the volume and will be continuously measuring. Points are attributed if the time-averaged interior temperature is between -34.0 °C and -28.0 °C or between -18.0 °C and -12.0 °C. Attributed points are scaled linearly, as shown in Figure 11. Freezer volume shall be a minimum of 50 litres.

FIGURE 11. FREEZER SUB-CONTEST POINTS DISTRIBUTION.

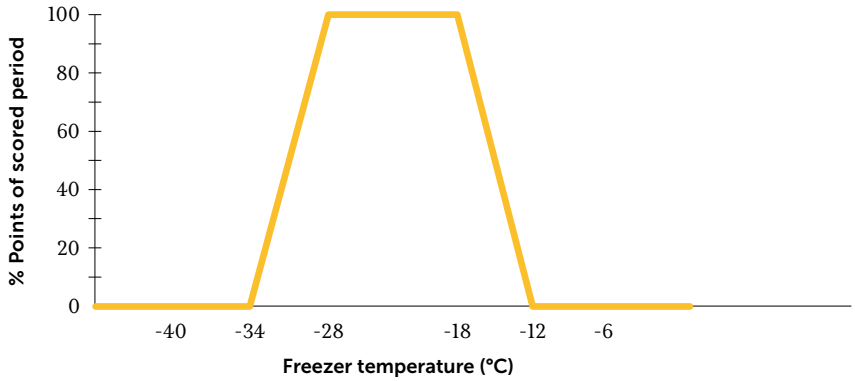


TABLE 14. FREEZER CONTEST CALCULATION.

FULL POINTS:	-28 °C	≤	TEMPERATURE	≤	-18 °C
ATTRIBUTED POINTS:	-34 °C	<	TEMPERATURE	<	-28 °C
	-18 °C	<	TEMPERATURE	<	-12 °C
NO POINTS:			TEMPERATURE	≤	-34 °C
NO POINTS:			TEMPERATURE	≥	-12 °C

Sub-Contest 8.3: Clothes Washing

The Clothes Washing task requires to run one or more complete, uninterrupted, 'Normal' or 'Eco' (or equivalent, but > 1 h program) cycle within a specified period in an automatic clothes washer. A sensor, placed in the clothes washer, will continuously be measuring the temperature inside. All available points are earned if the water reaches a temperature equal or higher than 40.0 °C, at some point during the clothes washing cycle.

Proportionate points are earned if the temperature sensor reaches a maximum temperature between 36 °C and 40 °C. Points are scaled linearly as shown in Figure 12. No points are earned if the temperature sensor does not reach a temperature higher than 36 °C. A load of laundry is defined as six organiser-supplied bath towels (approx. 2.5 kg). The clothes washer shall operate automatically and have at least one wash and rinse cycle. Drying function in a combination washer/dryer shall be disabled until the completion of the wash cycle. Cycle 'interruption' includes the adjustment of supply temperature or flow in a manner not anticipated by the manufacturer or addressed in its operation manual. Cycle completion shall be confirmed by the observance of an audible or visible signal. The SDE21/22 Organisers will consult the operations manual to identify appropriate cycle settings. 'Normal' or 'regular' settings shall be selected, if available. Otherwise, settings most closely resembling typical 'Normal' or 'regular' settings shall be selected. Only water may be used for clothes washing. No other kind of soap or similar products may be used during the Contest.

FIGURE 12. CLOTHES-WASHING SUB-CONTEST POINTS DISTRIBUTION

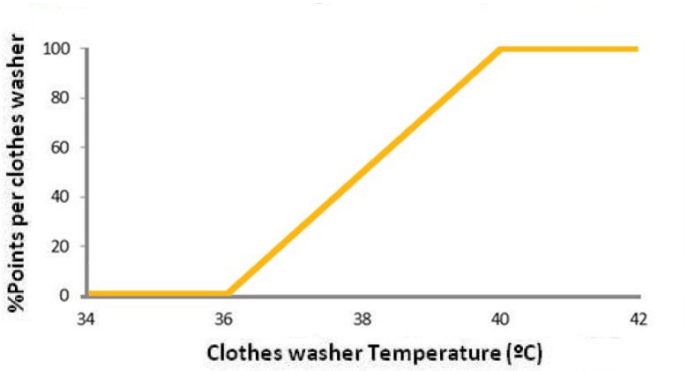


TABLE 15. CLOTHES-WASHING CALCULATION

FULL POINTS:	40° C	≤	TEMPERATURE		
ATTRIBUTED POINTS:	36° C	<	TEMPERATURE	<	40° C
NO POINTS:			TEMPERATURE	≤	36° C

Sub-Contest 8.4: Clothes Drying

All available points are earned by returning a load of laundry (defined as six Organiser-supplied bath towels) to a total weight less than or equal to the towels' total weight before washing. Clothes drying shall be completed within the defined task period of the respective day in the Event Calendar. Points are attributed if the 'dry' towel weight is between 100.0% and 110.0% of the original towel weight. Reduced point values are scaled linearly, as shown in Figure 13. A load of laundry is eligible for clothes-drying points only if the load experienced a complete, uninterrupted cycle in an automatic washing cycle. However, scoring points in the Clothes Washer sub-Contest is not a prerequisite for scoring points in the Clothes Dryer sub-Contest.

FIGURE 13. CLOTHES-DRYER SUB-CONTEST POINTS DISTRIBUTION.

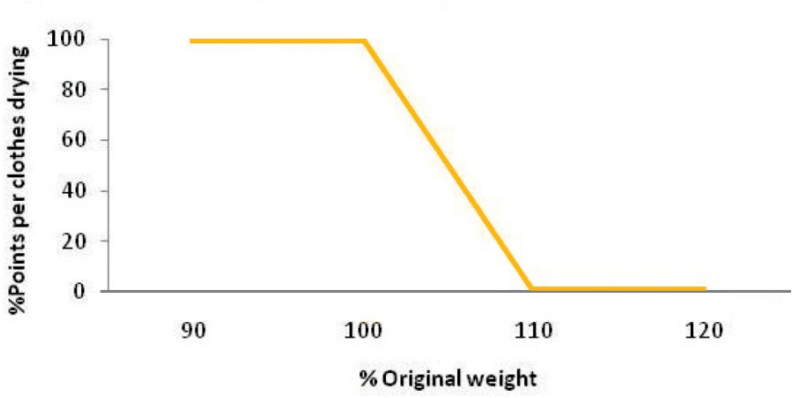


TABLE 16. CLOTHES-DRYER CALCULATION.

FULL POINTS:			WEIGHT	≤	100%
ATTRIBUTED POINTS:	100%	<	WEIGHT	<	110%
NO POINTS:			WEIGHT	≤	110%

Clothes Drying Method

Teams must specify the clothes drying method or methods that they plan to use during the Competition. Clothes drying methods are active drying (e.g. drying machine), passive drying, (e.g., on a clothes line), or combined (any combination of active and passive drying). The use of drying machines (or any other active dryer system) is not mandatory since the Team can decide to use only a natural dryer system. Teams that plan to use drying machines or other commercial clothes drying systems must submit to the SDE21/22 Organisers their technical information as stated in Rule 48 _ Project Specifications. Teams planning to use any custom made or non-commercial active or semi-passive drying system must submit drawings and explicative documentation and drawings of the proposed system. Additionally, an agency or external professional must certify that the proposed solution is safe and does not represent any risk for the users or visitors. All drying systems that Teams plan to use during the Competition must be clearly shown in the project drawings. To use any drying method that require the clothes to be visible (such as on a clothes lines), in addition to include its information in the drawings, Teams must show the drying place to the Architecture Jury.

Sub-Contest 8.5: Dishwashing

The dishwashing task requires to run a complete, uninterrupted, 'Normal' or 'Eco' (or equivalent but > 1 h program) cycle within a specified period. A sensor, placed in the dishwasher, will be continuously measuring the temperature inside. All available points are earned if the water reaches a temperature equal or higher than 49.0 °C, at some point during the dishwashing cycle.

Points are attributed if the temperature sensor reaches between 43.0 °C and 49.0 °C. Attributed points are scaled linearly, as shown in Figure 14. No points are earned if the water does not reach a temperature over 43.0 °C. The dishwasher shall operate automatically, have at least one wash and rinse cycle, and have a minimum capacity of six place settings according to the manufacturer's specifications. If the dishwasher has a heated drying option, this option shall be disabled. Cycle 'interruption' includes the adjustment of supply temperature or flow in a manner not anticipated by the manufacturer or addressed in its operation manual. Cycle completion shall be confirmed by the observance of an audible or visible signal. SDE21/22 Organisers will consult the operation manual to identify appropriate cycle settings. 'normal' or 'regular' or 'Eco' settings shall be selected, if available. Otherwise, settings most closely resembling typical 'normal' or 'regular' or 'Eco' settings shall be selected. Dishwasher may be run empty, partially loaded or fully loaded; the load may be soiled or clean.

FIGURE 14. DISHWASHER SUB-CONTEST POINTS DISTRIBUTION.

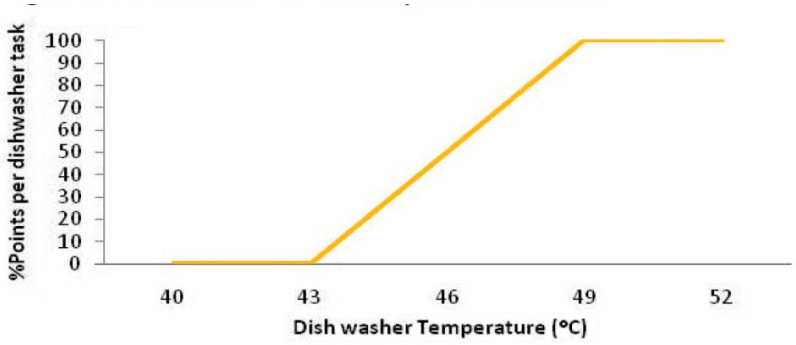


TABLE 17. DISHWASHER CALCULATION.

FULL POINTS:	49 °C	≤	TEMPERATURE		
ATTRIBUTED POINTS:	43 °C	<	TEMPERATURE	<	49 °C
NO POINTS:			TEMPERATURE	≤	43 °C

Sub-Contest 8.6: Oven

The oven task lasts 60 minutes, from its start to its stop. A sensor will be located inside the oven, to monitor the temperature during the entire oven task. The temperature will be sampled every minute. The monitoring system will retain the value of the 45 highest measurements within the entire oven period (60 minutes) and take the lowest value among these 45 values as the oven temperature to be used for score calculation. All available points are earned at the conclusion of each scored period by keeping the oven temperature above or equal to 220°C during specified scored periods. Attributed points are earned if the median interior oven temperature during specified scored periods is between 180°C and 220°C. Attributed points are scaled linearly, as shown in Figure 15. The oven volume published in the manufacturer's specifications shall be a minimum of 55 litres.

FIGURE 15. OVEN SUB-CONTEST POINTS DISTRIBUTION.

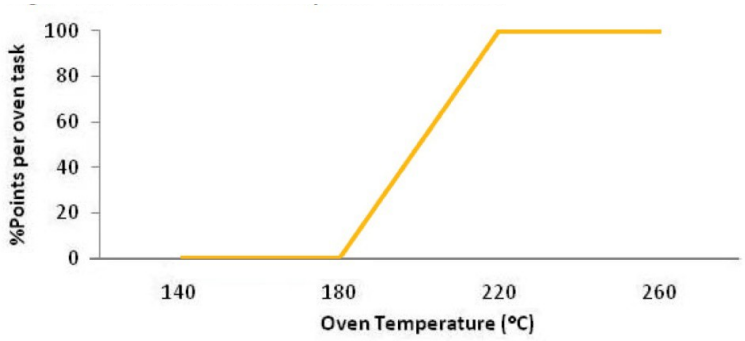


TABLE 18. OVEN CALCULATION.

FULL POINTS:			TEMPERATURE	≥	220° C
ATTRIBUTED POINTS:	180° C	<	TEMPERATURE	<	220° C
NO POINTS:			TEMPERATURE	≤	180° C

Sub-Contest 8.7: Cooking

All available points are earned by using a kitchen appliance to evaporate 2.3 kg of water within a maximum time of two hours. Attributed points are attributed if between 0.5 kg and 2.3 kg of water are vaporized. Reduced point values are scaled linearly, as shown in Figure 16. No points are earned if the evaporated water is equal or less to 0.5 kg. Any kitchen appliance may be used, but it must operate in its 'normal' configuration as it is vaporizing the water. The water shall be evaporated in a single pot and the starting water weight shall be at least 2.75 kg.

FIGURE 16. COOKING SUB-CONTEST POINTS DISTRIBUTION

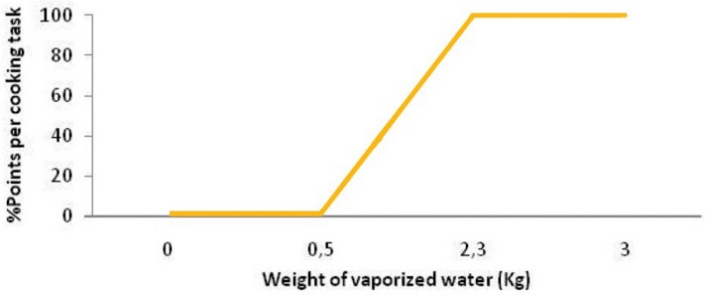


TABLE 19. COOKING CALCULATION

FULL POINTS:			WEIGHT	≥	2.3 kg
ATTRIBUTED POINTS:	0.5 kg	<	WEIGHT	<	2.3 kg
NO POINTS:			WEIGHT	≤	0.5 kg

Sub-Contest 8.8: Home Electronics

All available points are earned for operating a computer and TV (or equivalent audio-visual equipment) during specified periods of time. See the Event Calendar for details regarding the number of points per home electronics task and the time periods designated for home electronics tasks. The TV shall be a minimum of 32 in. (81.3 cm) according to the manufacturer's stated display size. The computer display shall be a minimum of 17 in. (43.2 cm) according to the manufacturer's stated display size. The computer may be a notebook, laptop, or desktop computer. The computer and video displays shall be able to be operated simultaneously and controlled independently of each other.

The video player function may be integrated in the TV. In cases when the video player is a separated equipment, during the whole Home Electronic periods, the TV must be presenting a video. Functions of 'Screensaver', 'Stand by', or another mode that reduces the energy consumption of these devices have to be disabled during this sub-context period. The brightness of TV and computer displays shall be set to at least 75%of maximum. Observers will conduct spot checks to verify that the displays' brightness is at the required level.

Sub-Contest 8.9: Hot Water Draws

Hot water draws will occur during the times specified in the Event Calendar. For each draw, at least 50 litres of hot water shall be delivered in 10 minutes to qualify for points. All available points are earned by delivering an average temperature of at least 43°C. An average temperature below 37°C earns no points. For temperatures between 43°C and 37°C, points are scaled linearly, as shown in Figure 17. These hot water draws are designed to simulate most of the washing and bathing tasks that would take place in a typical day. The schedule of hot water draws will most likely vary from one day to the next, just as it does in a typical home. The maximum number of hot water draws for one day will not exceed three, but they may occur consecutively. Hot water will be drawn from the shower. For that, it is necessary to connect a hose in the shower, Teams are responsible for providing the fitting to accept the SDE21/22 Organiser's hose and replace their showerhead prior to performing this task. For information about the hose connection requirements please refer to the Technical Monitoring Procedures Document.

FIGURE 17. HOT WATER DRAWS SUB-CONTEST POINTS DISTRIBUTION.

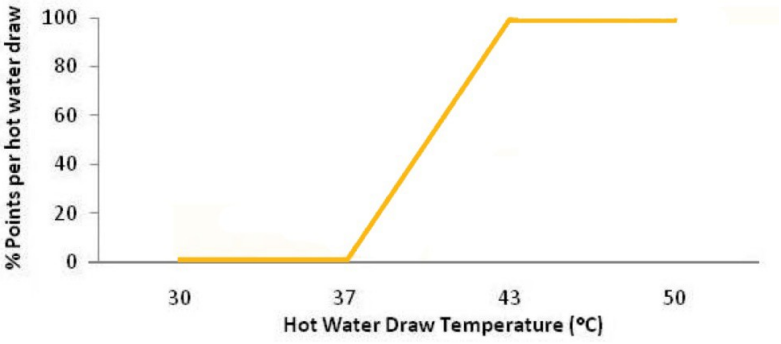


TABLE 20. HOT WATER CALCULATION.

FULL POINTS:			TEMPERATURE	≥	43° C
ATTRIBUTED POINTS:	37° C	<	TEMPERATURE	<	43° C
NO POINTS:			TEMPERATURE	≤	37° C

Sub-Contest 8.10: Water Balance

To complete a whole House Functioning, water management has an important role in the process. Therefore, water consumption of participating units will be measured during Competition.

Scoring

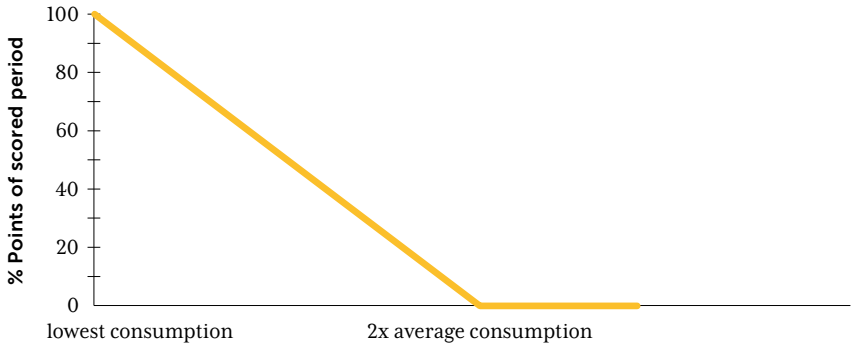
The scoring will the calculated using the meter's initial value (beginning of the Competition phase) and the end value (end of the Competition phase). The Team with the lowest water consumption will achieve the maximum points. Reduced points are earned if the house's water consumption is between the lowest consumption and twice the houses' average consumption. Reduced point values will be scaled linearly. No points are earned if the house's water consumption is equal to or higher than twice the houses' average consumption. SDE21/22 Organisers will perform a daily reading of the meters in order to verify the functioning of the measuring system.

In relation to the water meters, Teams must take the following into account:

- Water meters will be supplied by the SDE21/22 Organisers;
- The water meter's model and size will be announced to the Teams through the SDE21/22 WAT. Its selection will be in accordance with the European Union Directive MID. (The typical length of water meters is about 150 mm, without taking into account connecting parts.)

Water meters will be installed between the water pump and the water distribution circuit of the unit (HDU). The nominal diameter of the inlet and outlet of meters is 15 mm. Teams will choose upstream and downstream pipes compatible with the meter inlet and outlet diameters. If the pipes' diameters are not compatible, Teams must provide the required connection fittings to perform the adaptation. The Team should provide two valves, one upstream and the other one downstream the meter. These valves will allow shutting (closing) the water flow, if there are any problem with the meters. Water meters should be accessible, and their location must permit easy reading of their measurements. Teams must submit a drawing showing where and how they plan to place the meters. They must also include details showing that the meter is accessible and including valves, connections and any other necessary fittings. Meter location must be approved by the SDE21/22 Organisers.

FIGURE 18. WATER BALANCE SUB-CONTEST POINTS DISTRIBUTION.



Sub-Contest 8.11: Dining

Each Team shall host three dinner parties during Contest weeks. Dinner parties will feature a pair of guest Decathletes from three neighbouring units, and each pair of guest Decathletes shall assign a score to the host Team after each dinner party. To maintain consistency of this sub-Contest, guest Teams shall use the scoring chart that the Observers will give to them (one per guest Team) when entering the unit for the dinner party. The guests must give the chart back to the Observer, once completely filled out at the end of the dinner. Each guest Team shall assign a score to the host Team after each dinner party. The quality of the meal, atmosphere, and overall experience needs to be considered in the evaluation. There will be 8 participants: 2 hosts and 6 guests (2 per Team). Each host Team shall prepare dinner for guests and Team members. Non-Decathletes are prohibited from preparing the meal or instructing Decathletes in any way on the Competition site. All meals have to be prepared in the units with fresh ingredients stored in the refrigerator.

Take-out and prepared over-the-counter food items are not permitted. Meals have to contain at least one main hot dish. The meal shall be served and eaten in the conditioned space at the eating area designated in the Construction Documents. Before and after the dinner portion of the party, the host Team is permitted, but not required, to serve hors d'oeuvres and/or beverages, which may be served outdoors.

Teams are required to submit detailed dinner party menus to the SDE21/22 Organisers. The SDE21/22 Organisers will review each menu for compliance. If corrective actions are required to meet all safety requirements, a Team must submit an updated version of the menu. See Rule 41 _ Dinner Party Menu).
Teams hosting dinner parties shall comply with the following safety requirements:

- The use of fire for cooking is prohibited;
- All water used for cooking and drinking shall be drinking water purchased in sealed containers;
- All dishes and cookware shall be washed with hot water and soap and rinsed prior to use;
- Normal domestic wastewater may go into the wastewater tank;
- All beverages and food must be stored properly and according to the instructions on the packaging, e.g., beverages and foods marked 'refrigerate after opening' must be refrigerated appropriately after opening;
- To help prevent allergic reactions among dinner party guests, Teams shall create a list of ingredients for each of the items being served at each meal. Common food allergies include milk/dairy products, eggs, peanuts, tree nuts (walnuts, cashews, pecans, etc.), fish, shellfish, soy, and wheat. See Rule 41 _ Dinner Party Menu
- Outdoor cooking and grilling equipment may be incorporated into the Competition unit, but the use of such equipment is prohibited on the Competition site because of fire safety reasons.

Sub-Contest 8.12: User Friendliness

The three dinner parties give the floor to explain the functionality and operation of the unit to each pair of the invited Decathletes and let them try to operate and evaluate it. Each guest Team works with a predefined questionnaire developed by the SDE21/22 Organisers to evaluate the unit operation from the perspective of the user group, for whom the unit is designed. The questionnaire is handed to the guests prior to the dinner party together with the scoring charts.
At minimum, the following aspects are covered by the questionnaire:

- General intuitiveness of operation;
- General information transfer (system approach, language, ...);
- User interfaces for control of indoor climate and air quality;
- User interfaces for shading and lighting operation;
- User information on energy use;
- Gender aspects;
- Age suitability;
- Innovations.

Teams are required to provide any information handed to the dinner party guests for explanation.
The scoring for the Contest is based on averaging the score of all dinner parties hosted by a Team.

RULE 23 _ CONTEST 9: URBAN MOBILITY

Objective

The goal of this Contest is to create a mobility concept for the building project reflecting the situation and needs in the specific urban district. The concept has to contribute to reducing car traffic while preserving mobility needs.
The mobility concept should consider different utility levels, such as:

- District level: public mobility infrastructure, district garages, ...;
- Building level: parking spaces, charging points, sharing concepts, ...;
- Demonstrator: charging of small electric vehicle such as a cargo bike, ...

Assessment

The Jury scoring will be based on the urban-mobility reports and the presentation on site. A Jury consisting of experts, specialized in the various areas of this Contest, scores the demanded output. The evaluation of the Contest is examined related to the overall concept. The evaluation is added by specific transportation tasks during the Competition weeks using electric-assisted mini vehicles such as cargo bikes.

Criteria

The Urban Mobility Reports are evaluated by completeness for all levels, consistency, creativity and innovation with respect to the reduction of the carbon footprint of urban mobility and accuracy in fitting the residents' needs. Three urban mobility tasks are part of the practical evaluation. Full points in each task are earned with successful completion.

- Beverages have to be provided by a cargo bike or a miniature electric vehicle. A number of crates with mineral water have to be delivered during specified times indicated in the Event Calendar from a defined place to the SDE21/22 Campus. The vehicle must be charged at the demonstration unit only. Further details will be communicated via the SDE21/22 WAT;
- All ingredients and implements for the dinners (as a part of the House Functioning Contest) have to be provided by foot, a miniature electric vehicle, or a cargo bike. The vehicle must be charged at the demonstration unit only. Further details will be communicated via the SDE21/22 WAT;
- The Decathletes have to retrieve food during specified times indicated in the SDE21/22 Event Calendar. The goods have to be provided by foot, a miniature electric vehicle or a cargo bike. If the food is not consumed by the participants themselves, it can be brought to a food sharing fridge. Further details will be communicated via the SDE21/22 WAT.

Notes:

- The vehicle must be driven by a Decathlete;
- The driver must comply with the German driving laws;
- The vehicle must be charged from the House Demonstration Unit (HDU) electrical system.
- The vehicle's batteries must be fully charged at the completion of the Contests period.
- The vehicle must be allowed to drive on cycle paths.

RULE 24 _ CONTEST 10: INNOVATION

Objective

The objective of this Contest is to evaluate the innovative content of the whole building design project and the demonstration unit in five different areas. Innovations can be strategies, methods, designs, processes or technologies demonstrating new approaches to meet the challenges of the future and add to the value or the performance of buildings in the urban environment. Inventions may be in some cases related to innovations.

Assessment

The five Juries from the other five Contests mentioned below will assess the different Deliverables relative to each project with special attention to the innovations mentioned on:

- Innovation in Architecture;
- Innovation in Engineering and Construction;
- Innovation in Sustainability;
- Innovation in Affordability & Viability;
- Innovation in Urban Mobility.

The maximum points are equally divided into the five categories.
The sum of the points gained in each category define the scoring for the Team in the Contest.

Criteria

The Jury scoring is based on the five 'Innovation Reports' addressing the whole building project, as well as the demonstration unit in the five Contests mentioned above, and the correlated, individual Jury assessments. An overall assessment adds to the sectoral assessment.

section 3.0 deliverables

SDE21/22 is the first edition of the Solar Decathlon Europe working within a highly defined urban context, simultaneously combining the work of a design challenge and the challenge to build the House Demonstration Unit (HDU). The Deliverables will reflect both challenges to document the full Team entry. The level of detail is the highest for the HDU (implementation planning). As Teams will design the HDU as a result of the whole project design, the first Deliverables will focus on the development of the design challenge; later Deliverables will emphasise the implementation planning of the demonstration unit.

The SDE21/22 participating Teams will submit seven separate sets of Deliverables. The Deliverables are intended to document the progress of their design development, their compliance with the SDE21/22 Rules and Building Codes, and to indicate the potential performance of their HDU designs.

The Solar Decathlon Europe seeks to promote modern technologies as part of the establishment of resource-efficient buildings and constructions. For this purpose, the SDE also promotes innovation in the design, assembly and management of buildings using digital applications that enable and support the efficient and sustainable use of information about buildings and cities. In the context of digitalization, the working method Building Information Modelling (BIM) is playing an increasingly important role, as it enables the linking of all relevant data on a building in a virtual data model throughout the entire life cycle, from conception, planning and realisation to operation and deconstruction of a building. As part of the SDE21/22-HDU design assessment and Solar Campus management, the SDE21/22 Organisation therefore expects digital building data models (BIM models), which represents as a source of all relevant data according to the principle of Single Source of Truth (SSoT). Therefore, all relevant geometric and non-geometric information of each HDU is managed within the BIM models and provides the basis for all derivation of the deliverables listed below. Furthermore, the delivered BIM models can be used for future digital simulation technologies, for visualization purposes or Virtual Reality (VR) applications.

The SDE21/22 Organisation does not prescribe any software for the creation of the BIM models. It is only necessary to ensure that, in addition to the native file format, BIM models are also supplied as IFC files with regards to the open standard format Industry Foundation Classes (IFC) according to ISO 16739:2013. The requirements for the creation of the BIM model have been compiled in the Modelling Guideline (see Rules Related Document, Modelling Guideline (BIM)) for quality assurance purposes and must be met. To secure the project information for the public and future competitions, a comprehensive so called 'building competition & living lab knowledge platform' was developed with a special focus on the SDE: https://building-competition.org/. All teams need to enter a set of the most relevant material (manuals, pictures) on their project together with fact sheets and technology tags at the final phase of the competition. The entries are created by using a Team specific login to the platform. Advice will be given with the SDE21/22 WAT.

RULE 25 _ SCHEDULE OF DELIVERABLES

TABLE 21. SCHEDULE OF DELIVERABLES.

DELIVERABLE #1	SCHEMATIC DESIGN DOCUMENTATION & DISSEMINATION MATERIALS SCHEMATIC DESIGN DOCUMENTATION OPTIONAL UPDATE	08/04/2020 02/09/2020
Electronic File	Press Kit & Press Release #1	PK#1 & PR#1
Electronic File	Project Manual #1	PM#1
Electronic File	Project Drawings #1	PD#1
URL	Preliminary Website	

DELIVERABLE #2	CONCEPT DOCUMENTATION & DISSEMINATION MATERIALS	03/12/2020
Electronic File	Press Kit & Press Release #2	PK#2 & PR#2
Electronic File	Project Manual #2	PM#2
Electronic File	Project Drawings #2	PD#2
Electronic File	Project Facts	FACT
Electr. File- CD/DVD	Audio-visual #1 - (presentation of project)	AV#1
URL	Website	
DELIVERABLE #3	**DESIGN DEVELOPMENT DOCUMENTATION & DISSEMINATION MATERIALS**	**17/03/2021**
Electronic File	Press Kit & Press Release #3	PK#3 & PR#3
Electronic File	Project Manual #3	PM#3
Electronic File	Project Drawings #3	PD#3
Electronic File	Electric & PV Chart & Checklists	ELEC#1
Electronic File	Workshop Documentation	WD
Electronic File	Project Facts	FACT
Electr. File- CD/DVD	Audio-visual #2 (updated version of Audio-visual #1)	AV#2
Model	Architectural Model #1 – Design Challenge	
DELIVERABLE #4	**CONSTRUCTION DOCUMENTATION & DISSEMINATION MATERIALS**	**07/07/2021**
Electronic File	Press Kit & Press Release #4	PK#4 & PR#4
Electronic File	Project Manual #4	PM#4
Electronic File	Project Drawings #4	PD#4
Electronic File	Project Facts	FACT
Model	Architectural Model #2: Demonstration Unit	
Electronic File	Electric & PV Chart & Checklists (Updated)	ELEC#2
Electronic File	Sim-Room Model	SIM
Electronic File	Design Approval Documents	APP
DELIVERABLE #5	**UPDATED CONSTRUCTION DOCUMENTATION & DISSEMINATION MATERIALS**	**01/12/2021**
Electronic File	Press Kit & Press Release #5	PK#5 & PR#5
Electronic File	Project Manual #5	PM#5
Electronic File	Project Drawings #5	PD#5
Electronic File	Project Facts	FACT
Electronic File	Electric & PV Chart & Checklists (Updated)	ELEC#3
Electronic File	Sim-Room Model	SIM
Hard Copies	Design Approval Documents	
Electronic File	SDE21/22 Solar Campus Visiting Guide information	GUIDE

DELIVERABLE #6	DESIGN ADJUSTMENTS DOCUMENTATION & DISSEMINATION MATERIALS	23/03/2022
Data base entry	Initializing the project in the building competition & Living Lab Knowledge Platform	
Electronic File	Press Kit & Press Release #6	PK#6 & PR#6
Electronic File	Project Manual #6	PM#6
Electronic File	Project Drawings #6	PD#6
Electronic File	Project Facts	FACT
Electronic File	Electric & PV Chart & Checklists (Updated)	ELEC#4
Electronic File	Sim-Room Model	SIM
Electronic File	Jury Reports	JURY
Electr. File- CD/DVD	Audio-visual #3 - (presentation of final project)	AV#3
Hard Copies	Design Approval Documents	
DELIVERABLE #7	**AS BUILT DOCUMENTATION & DISSEMINATION MATERIALS**	**27/07/2022**
Data base entry	Finalizing the project entries in the building competition & Living Lab Knowledge Platform	
Electronic File	Press Kit and Press Release #7	PK#7 & PR#7
Electronic File	Project Manual #7	PM#7
Electronic File	Project Drawings #7	PD#7
Electronic File	Project Facts	FACT
Electronic File	Electric and PV Chart and Checklists	ELEC#5
Electronic File	SDE21/22 Official Dissemination Materials	DM
Electronic File	Sim-Room Model	SIM

RULE 26 _ DELIVERABLE SUBMISSION INSTRUCTIONS

Each Team will follow the defined schedule in sending the Deliverables with the stipulated format, at the specific due dates and following the guidelines of the SDE21/22 Organisation. Although the official languages for communication of the SDE21/22 Competition event are English and the local German language, for scientific dissemination reasons, all the Deliverables are in English. Only the Constructions Specifications, to be included in the Project Manual, may be in another language, in case they are not available in English or German, the SDE21/22 local language.
In the SDE21/22 Competition, there are two different ways to submit the Deliverables: by shipped or electronic means; depending on the materials or documentation required. Deliverables are considered to be on-time if they are accessible on the SDE21/22 WAT or, in the case of physical objects, received by the SDE21/22 Organisers in their offices on the respective due date by 17:00h (5:00 PM local time). Teams sending late Deliverables, or not fulfilling all content requirements, will be subject to penalties. Please refer to Rule 2.7 for further details. All submitted Deliverables are property of the SDE21/22 Organisation.

26.1 Shipped Submission

Requested hard copies of documents, including models, are the only required Deliverable materials to be sent to the postal address of the SDE21/22 Organisers:
TBD: <<Solar Decathlon Europe 2021 (in 2022) postal address>> will be announced on the WAT.
Teams do not submit physical copies of any other Deliverables.

26.2 Electronic Submission

All electronic files shall be uploaded to the SDE21/22 WAT Deliverable area. Teams wishing to reduce file upload times may archive electronic files in ZIP files. Please verify that files in ZIP archives can be extracted using standard extraction software. For further details please refer to the SDE21/22 WAT guidelines in Appendix B.

a) Computer Generated File Requirements

Any and all electronic files generated from a computer (drawings, specifications, renderings, etc.) shall be submitted as a PDF meeting the following criteria:

- Embed all fonts;
- Maintain a minimum resolution of 300 dpi;
- The different sections shall be indicated with bookmarks;
- Whenever possible, utilize the 'Save As' or 'Export' to PDF functions within a CAD, 3-D rendering, or illustration application to produce a PDF;
- Utilizing the native application's PDF functions usually produces a smaller, cleaner PDF with fonts defined and illustrations and drawings retained as vector objects;
- Available options for PDF creation vary between applications. Be sure to always select the option to embed all fonts and keep image compression at a minimum of 300 dpi;
- If there are colour options, choose no conversion if available. If not, select RGB conversion as that will typically yield a smaller file than CMYK;
- If an application does not support a 'direct-to-PDF' function, create a postscript file by printing to a postscript printer with the 'print to file' option selected. Use this postscript (.ps or .prn) file to create a PDF using Acrobat Distiller's high-resolution job settings;
- Creating a PDF from scans, or by outputting the drawings into a raster image format (.jpg, .tiff, .png, .gif, etc.) and then creating a PDF from the images, is NOT ACCEPTABLE;
- All-raster PDFs are large files at 300dpi, are of unacceptable quality at lower resolutions, and are not scalable without degradation;
- Logos must be submitted in vector format (eps) and in four versions: CMYK, RGB, Greyscale for light background and Greyscale for dark background. [**Note:** spot colours or Pantone colours are not allowed!). All logos must be submitted as individual files.]

b) Multimedia File Requirements

- Teams may submit photographs, graphics or videos in each Deliverable, to complete the information submitted or give further details;
- Photographs shall be submitted in the native format of the camera, such as JPEG or RAW, if available. Every file conversion or image resampling from the original results in image degradation, so keep conversions to a minimum;
- Colour photos must be in RGB, 8-bit colour;
- For multimedia files to be properly credited, the following information shall be included in each file's metadata or in a text file accompanying the files:
  - Name, phone number, and e-mail of person submitting the file;
  - Multimedia file editor's name and affiliation.
- For photographs, please indicate date and location.

c) File Naming Instructions

The required file-naming convention for all electronic files follows:
[TEAMABBREVIATION]_[DELIVERABLE ABBREVIATION]_ [SUBMISSION DATE(YYYY-MM- DD)].[EXTENSION]

Example #1: A set of Updated Constructive Development Project Drawings submitted by University X (AAA) to the SDE21/22 Organisers for follow-up review on April 12, 2021, would have the following file name:
AAA_PD#4_2021-04-12.pdf

Example #2: A set of three multimedia files submitted by University X (AAA) to the SDE21/22 Organisers, would have the following file names:

- AAA_MUL_1_2021-05-16.pdf
- AAA_MUL_2_2021-05-16.pdf
- AAA_MUL_3_2021-05-16.pdf

[**Note:** Table 22 will be updated with the Team selection.]

TABLE 22. LIST OF TEAM ABBREVIATIONS.

CODE	TEAM NAME

26.3 Documents Formatting Requirements

a) Project Drawings & Hard Copies Drawings

ISO 'A3' (297 mm X 420 mm) sheet size 'packaged' into a single PDF file
(see Rule 26.2 _ Electronic Submission) Consistent with Rule 30.2 Project Drawings Structure & Contents.

b) Project Manual & Hard Copies Manual

ISO 'A4' (210 mm X 297 mm) sheet size 'packaged' into a single PDF file
(see Rule 0 _ Electronic Submission) Consistent with the Project Manual Structure & Contents (see Rule 30.3).

c) Press Kit & Press Release

ISO 'A4' (210 mm X 297 mm) sheet size 'packaged' into a single PDF file (see Rule 26.2 _ Electronic Submission)

26.4 Revision & Evaluation Criteria

The Deliverables will be reviewed by the SDE21/22 Organisers during all phases of the Competition in order to verify compliance with the Rules. The Organisers seek to assist the Teams in the understanding and compliance of the Rules. During the SDE21/22 Competition weeks, Juries for each Contest will evaluate the documentation delivered by the Teams following their criteria, guidelines and basic parameters established in the SDE21/22 Rules.

RULE 27 _ DELIVERABLE PHASES

The primary objectives of each Deliverable are as follows:

Deliverable #1

- To verify the work that the Teams are generating;
- To verify any aspect or design which does not comply with the Competition Rules.

Deliverable #2

- To obtain additional information and update the documentation sent in Deliverable #1 based on the requirements made by the SDE21/22 Organisation.

Deliverable #3

- To obtain additional information and update the documentation sent in Deliverable #2 based on the requirements made by the SDE21/22 Organisation;
- To ensure that the documentation is in compliance with the SDE21/22 Building Code and the SDE21/22 Rules.

Deliverable #4
- To obtain all necessary information to define the construction of SDE21/22 Solar Campus;
- To foresee all the elements required for the above purpose.

Deliverable #5
- To obtain additional information and update the documentation sent in Deliverable #4 based on the requirements made by the SDE21/22 Organisation;
- To structure documentation for Juries, and to clarify any ambiguities in Teams' documentation.

Deliverable #6
- To begin the integration of materials into the building competition & living lab knowledge platform;
- To update Deliverable #5 with late design changes that may occur;
- To make sure that the final project assembled on the Competition site is consistent with the design and specifications presented in the Construction Documents.

Deliverable #7
- To finalize the entries in the building competition & living lab knowledge platform;
- To have the 'as-built' drawings and specifications of the participating HDUs, with an extensive description of details and specifications;
- To secure the relevant information in the building competition & living lab knowledge platform.

27.1 Schematic Design Documentation

The primary objective of Deliverable #1 is to verify the work that the Teams are generating among the various fields to develop in the project. It is also designed to identify, as soon as possible, any aspect or design which does not fit or match with the sense of the Competition. As of Deliverable #2, the documentation includes a short audio-visual presenting the Teams' strategies. In the Schematic Design Documents, the project must be defined as a functional machine, demonstrating the advances, targets and goals of their original proposal, in compliance with the SDE21/22 Building Code and the SDE21/22 Rules, or at least the intention and corresponding degree of accomplishment. Therefore, it is not mandatory for this Deliverable to provide all the data for each section included in the Project Manual, nor in the Project Drawings, nor in the Communication Plan.
[**Note:** The proposals sent with this Deliverable can be subject of complete revisions by the Teams in following Deliverables.]

27.2 Dissemination Materials

Deliverables of the SDE21/22 Competition are intended to compile materials from participating Teams, in order to organise different events and activities, to contribute to the ongoing SDE objective of disseminating knowledge and project results, with an ultimate goal of raising awareness and energy literacy. Dissemination Materials will be verified for compliance with SDE21/22 Rules. The materials submitted by the participating Teams in each Deliverable will be used by the SDE21/22 Organisation for the different dissemination activities planned. Please refer to the SDE21/22 Graphic Chart & Brand Manual.

27.3 Concept & Design Development Documentation

At this stage of the Competition, projects will include an extensive description of the Project.
The level of detail is different for each project facet:
- the neighbourhood integration (concept level);
- the whole building challenge (moderate with detailing regular building parts) and;
- the demonstration unit (detailed).

The implementation planning for the HDU includes details and specifications, including materials, constructive systems, equipment, footing, a structural & trades report, and details drawing. Teams will have to consider all the remarks made by the SDE21/22 Organisers in the previous Deliverable, and design and plan accordingly. This Deliverable will be used to prepare the sessions for the Workshops in the Host City. Therefore, Teams are encouraged to submit as much specific documentation, beyond the specifically required Workshop documentation, in order to receive much more detailed Workshop feedback.

27.4 Construction Documentation

Deliverable #4 aims to obtain the necessary information to define the Construction of the HDU on the SDE21/22 Solar Campus, and to foresee all the factors and items required for that purpose.

The Construction Documentation includes the following important functions:

- The Construction Documents shall demonstrate compliance with the SDE21/22 Building Code and the SDE21/22 Rules so that inspectors will be able to grant final on-site approval by simply verifying that the constructed project on the Competition site was accurately represented by the Construction Documents;
- The Construction Documents shall clearly describe Team's proposed assembly and disassembly procedures. The SDE21/22 Site Operations Coordinator will review the Teams' procedures to identify and address potential conflicts among the Teams. Each Team is encouraged to consult the SDE21/22 Site Operations Coordinator as the relevant sections of the Construction Documents are being developed;
- The Construction Documents shall include all the information needed to generate an accurate, detailed cost estimate and to efficiently construct the building as the design Team intended it to be built. The Construction Documents must be exhaustive because the design Team shall assume that the contractor has had no prior communication with them, has no prior knowledge of the design, and has little or no experience building high-performance residences.

27.5 Update Construction Documentation

The objective of Deliverable #5 is to obtain additional information and update the documentation sent in Deliverable #4 based on the requirements made by the SDE21/22 Organisation, including changes and design adjustments from the last Deliverable.

[**Note:** Deliverable #5 is the most important Deliverable of the SDE21/22 Competition before the final phase of the SDE21/22 Competition.]

This Deliverable is planned in order to organise documentation for Juries, and to ensure clarity of Teams' documentation. Since the Juries have a very limited opportunity to evaluate the constructed projects on the Competition site, the Construction Documents provide the only means for a Team to give a detailed presentation of its project to the Juries. In the weeks leading up to Contest week, each Juror shall evaluate sections of the Teams' Construction Documents relevant to the Juror's respective area of expertise.

27.6 Design Adjustments Documentation

As stated in Rule 12.4 _ Late Design Changes: 'The final project assembled on the Competition site shall be consistent with the design and specifications presented in the Construction Documents'. The Design Adjustments Documentation Deliverable will be opened to the participating Teams from the day after Deliverable #5 due date. Therefore, if there is any change in the Team's project, after Deliverable #5 _ Updated Construction Documentation, the Team must send it to the SDE21/22 Organisers, as soon as possible. The corresponding missing and/or revised information will be passed on to the building inspections group, who will verify that the constructed unit corresponds to the unit's design, at the Competition Site, and will not penalise the Team for any incongruity. However, there will be neither feedback nor revision if not specifically requested by Teams. Please do not send the complete documentation again, but just the modified section, attaching to the documents a brief description of the changes that have taken place. Deliverable #6 also includes SDE21/22 Solar Campus Documentation, with information required to prepare the SDE21/22 Solar Campus Visiting Guide and the Jury Reports. With Deliverable #6, Teams initialize their project in the building competition & living lab knowledge platform.

27.7 As Built Documentation

The objective of Deliverable #7 is to have the 'as-built' drawings and specifications of the participating HDUs, with an extensive description of the details and specifications of the materials, constructive systems, equipment, structure, plumbing, ventilation, etc. Teams must record any changes of the Project Documentation during the fabrication, construction or assembly process and reflect them in the As-Built Documents. Deliverable #7 is the last Deliverable of the SDE21/22 Competition, and it will be issued after the final phase of the SDE21/22 Competition, so it will define the unit as it was built on the SDE21/22 Solar Campus, as well as the Team's strategy during the Contest Week. The final documents are to be entered into the building competition & living lab knowledge platform together with a representative set of pictures as well as the completed fact sheets and technology tag list.

RULE 28 _ SHIPPED DELIVERABLE MATERIAL

28.1 Hard Copies

- Electric Drawings and Calculations (see Rule 6.1b _ Electrical and Photovoltaic Design Approval);
- Structural Drawings and Calculations (see Rule 6.1a _ Structural Design Approval);
- Certificate of country-of-origin Code compliance (see Rule 6.1c _ Codes Design Compliance).

28.2 Architectural Models

Teams must submit two architectural models of their project to the SDE21/22 Organisation within Deliverables #3 and #4.

- The model in Deliverable #3 is intended to illustrate the design challenge incl. the site with its existing structures and the HDU's as a removable part;
- The model in Deliverable #4 specifically focuses on the HDU.

The level of detail will be determined by the Team, according to the model scale and to their Competition strategy. The model of the Design Challenge in Deliverable #3 will be metric scale 1:100, base dimensions of 80 cm x 80 cm. Teams should choose the part of the urban surrounding area of the site that is important for their concept. The model should be aligned north, that means the north direction should be parallel to the side edge of the base plate of the model. The model of the HDU in Deliverable #4 will be metric scale 1:25, base dimensions of 80 cm x 80 cm. It is possible to include lighting in the model but the SDE21/22 Organisers may not guarantee that it will be switched on during exhibitions. The model must be built and packaged with appropriate materials, in order to withstand handling and transportation. Along with the model, a methacrylate display case, 5 mm thick must be included, following the indications given by the SDE21/22 Organisers.

Models will be shown in fairs and events, representing and explaining the SDE21/22 project. To make transportation and exhibition assembly easier, and contribute to the exhibition homogeneity, models will be sent with the display case inside a plywood box, according to the design proposed by the SDE21/22 Organisers. Teams may replace their model by shipping the new model to the address specified in Rule 26.1 _ Shipped Submission, only after having communicated that decision to the SDE21/22 Organisers via the SDE21/22 WAT and specified if they wish to have the old model back to their university (at the university's expenses) or being discarded by the SDE21/22 Organisers.

RULE 29 _ TEAM WEBSITE

Please refer to the SDE21/22 Graphic Chart & Brand Manual.

29.1 Preliminary Website

A preliminary URL to a website consisting of at least three pages shall be submitted with Deliverable #1. The sites should offer then, at least, basic information about the university or universities that support the Team, as well as the webmaster, communications, and sponsorship manager contacts. SDE21/22 and EEF logos must be included and linked to the respective webpages. Please refer to the SDE21/22 Graphic Chart & Brand Manual.

29.2 Website

The final Team website shall consist of considerably greater content than the preliminary website and must comply with the following requirements. The SDE21/22 Organisation will continuously monitor the Team's websites; SDE21/22 Organisers will request changes and propose improvements where necessary to comply with the Competition's Rules. The final website shall be evaluated by the Communication, Education & Social Awareness (CESA) Jury during the Competition.

a) Encoding

Teams' websites must comply with the W3C encoding guidelines, as well as the international accessibility standards WCAG 2.0 (http://www.w3.org/WAI/guid-tech.html). Websites must pass the W3C test for HTML.4.01 Transitional or XHTML 1.0 Transitional (http://validator.w3.org/). File names will not contain uppercase letters, spaces, or special characters (e.g., &or $). Forms will include text labels that correspond with form controls and mark-up to associate the two. Equivalent alternatives will be provided for all multimedia. Pages requiring an applet or plug-in must provide a link to a page where the applet or plug-in can be downloaded.

b) Compatibility

The website will be compatible with the current web browsers both PC and mobile devices (*responsive* web design). Pages must display correctly (e.g., no horizontal scrolling is necessary to view the full width of the page) in 1024 x 768 resolution (800 x 600 resolution is also acceptable). The website will be accessible by mobile devices such as smart phones and tablets. If that is not possible an alternative dedicated version must be developed, in a way that users are diverted automatically by an automatic device detection system. The website will be compatible with the most popular mobile systems. Other:

- Scripts/applets/dynamic pages (CGI, JavaScript, Java, etc.): Every script works correctly in the standard browser set;
- Content produced by scripting languages is accessible or has an accessible alternative;

c) Style

It must have an attractive design that invites navigation and offer a good user experience. It will provide legible and accessible contents, with dynamic, combinations of images and/or videos/demos that accompany the text. Page information conveyed with colour is also available in black & white, and foreground and background colours provide sufficient contrast. Graphic style is consistent throughout the site. Basic elements of content include the objective of the page and its identification with its creator, which must be clear from the beginning. A brief description (with the possibility of extending it) of the key identification data: who, what, where, when, why, how (description, objectives, etc.). It is recommended that it be regularly updated.

d) Language

The entire website's content must be available in English, and optionally, in any other language. It is recommended to publish a shortened version in the Team's mother language and in German, the Host City's local language.

e) URL

Teams must have their own internet domain, using either a geographical (.es, .fr etc.) or a generic .com or .org one.

f) Contact

At a minimum, an e-mail contact to the Webmaster is provided as a graphic link or text link on the home page of the site. Additionally, the webpage will include a press and a sponsorship contact.

g) Sponsors' Recognition

Teams' websites will contain a specific section where supporting institutions and sponsors will be named or represented by their logos, linking to their websites. Linking to sponsors must be verified with supporting institutions and sponsors to ensure full understanding of all legal and financial responsibilities. We encourage Teams to ask those institutions and business entities to place the combined version of SDE21/22 + Team logo, with the 'Team sponsor' or equivalent heading, in their homepages, linking to the website of the Team which they are supporting.

h) SDE21/22 & EEF Branding Recognition

The SDE21/22 and EEF logos must appear in every section of the Teams' website. Please refer to the SDE21/22 Graphic Chart & Brand Manual for this. Both logos have to be linked to the SDE21/22 Organisations' websites (http://sde21.eu, http://energyendeavour.org). Teams' website must include a section for the publication of all the Press Releases that the SDE21/22 Organisers sends to the Teams. In this same section, Teams may include any complementary information they find appropriate (for example, news and blogs).

i) Advertising

Advertisements are forbidden in Team's websites. Sponsors' logos may be freely placed but commercial messages are not allowed.

j) Current Legislation Compliance

Contents as images, files or codes employed in programming, have to be copies authorized to Teams or owned by them. If forms or any kind of user information storage is enabled, it must comply with Team's (or its server's) country law.

RULE 30 _ ELECTRONIC DELIVERABLE DOCUMENTS

30.1 Press Release & Press Kit

The SDE21/22 Organisation will use the information provided by the Teams in the Press Release and Press Kit for dissemination of the SDE21/22 Competition. Therefore, this will be the part of every Deliverable.

a) Press Release (PR)

The Press Release is meant to provide the most synthetic interpretation of key information related to the Team project. It should explain the most fundamental 'bites' of information, sufficient to attract the interest of a journalist for follow-up reporting, broadcasting or publication. The Press Release must be under 2 pages and must follow the following structure and contain the following contents:

- Team logo, lead university logo & corresponding branding principles as specified in the SDE21/22 Graphic Chart & Brand Manual.
- Headline & sub-headline: sum it up in approx. 15 words.
- City, Dateline (ie. Barcelona, 02_12_19).
- Key texts: a few paragraphs, 600 words max, including:
  - > catch intro: a powerful, engaging first sentence(s);
  - > quote(s): the human factor as enticement, at least one quote from the faculty advisor and one quote from a Team member (max. 35 words each);
  - > description (body text): use a compelling tone to describe, including a short description: "Our motivation to participate in SDE21/22..." (max. 45 words);
  - > the who, what, where, when, why & how of your project;
  - > about your Team: key info that reveals the essence or values that your project represents;
  - > contact: name, phone, email, social media links & (eventually) a link to your downloadable Press Kit;
  - > keys: words that can lead in search functions;
  - > links: lead your reader toward your website, social media channels or other sources of additional info as well as to the SDE21/22 website;
  - > images: key images/visuals, 3 max. with caption.

b) Press Kit (PK)

Teams are requested to consider the Press Release as the first component that will figure in a broader Press Kit. A Press Kit is often also referred to as a 'media kit', a well-structured compilation or package of information to be distributed to those interested in your project, notably the press or media. While it is important to provide specific information, it is equally important and highly advisable to curate and produce well-written, streamlined information for all sections in the Press Kit. In the context of the SDE21/22 Deliverables, the Press Kit is obligatory in every Deliverable and must include the following information:

- **Press Release**
  Each set of Deliverables should include the most recent Press Release (see Rule _ 30.1a Press Release). Please include all previous Press Releases chronologically in each set of Deliverables.
- **List of Team Members**
  Team Officers, students, teachers and other collaborators indicating their studies/specialty. Moreover, students shall specify the university course they are attending, and teachers and other collaborators shall mention their degree, research field and teaching areas, emphasising aspects which the Team consider most relevant. Please keep this information updated within each Deliverable and make sure to include all the Team Officers (please refer to Rule 3.2 _ Team Officers & Contact Information).
- **Project Description**
  Teams must include an essay from 500 to 1500 words, describing the progress made in the project, as well as updated information on the dissemination activities realized since the previous Deliverable. The target audiences for these documents include international mass media journalists, so it is important to use a clear structure, and include complete, updated and easy to understand information. Among others, Teams should provide information on the following key sections:

> Team's Organisation and Objectives;
> Project Development and Current State;
> House Description and Relevant Items (technologies, materials, etc.);
> Dissemination Activities and Current Impact;
> Collaborating Institutions and Sponsoring Companies.

Short description of each of them, identifying their field of work and defining the collaboration established with the Team. Please keep this information updated within each Deliverable.

- **Project Images**
  Within each Deliverable, Teams must provide new, high-quality images (300 dpi .jpg) all free of rights, for their publication in printed or online media and/or television. The following copyright information for photos and drawings needs to be used by each Team: © **Team name / SDE21/22**. If the author wishes to be specifically credited, you can say: **author name / Team name / SDE21/22**. The copyright should also be embedded in the EXIF information of the image. These images must reveal the progress of the project. Each image or drawing must be accompanied by a short description. Images can include sketches/drawings, renderings, working models, interesting devices in the project, pictures of parts of the unit, of the daily work of the Team and of the dissemination activities. An updated group photo of all the Team members must be included with each Deliverable. The Team logo must also be included (please add a vectorised version e.g. eps/pdf of the Team logo). All images must be included in the Press Kit as well as be submitted as independent multimedia files (complying with Rule 0 Electronic Submission requirements). Teams must keep the requested information updated from one Deliverable to the next. Additionally, Teams may include any other material they wish the SDE21/22 Organisation to use for the SDE21/22 Competition dissemination, which complements the aforementioned information. The Teams' Press Releases will be published through the SDE21/22 website.

The Press Release and corresponding elements that appear in the Press Kit can contribute to the content that will be developed for the Sponsorship Manual. The Press Release and corresponding Press Kit will be made public for SDE21/22 dissemination activities.

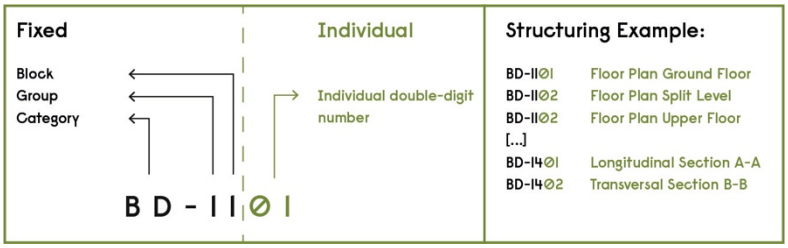
30.2 Project Drawings Structure & Contents

As stated in Rule 26.3 _ Documents Formatting Requirements, the Project Drawings must be consistent with the following guideline. In order to have the drawings of the Deliverables organised and named, the basic principles outlined below should be followed. It is not necessary to include all the Drawings mentioned. In case there are particular drawings (plans, sections, elevations, details etc.) that do not fit in this Structure & Contents guideline, these must be located where appropriate (you may ask the SDE21/22 Organisers through the SDE21/22 WAT, if necessary). If you have drawings corresponding to two different sections, put it in the most general one and use reference notes to indicate their final location.

a) Drawings Code

To name the drawings a code will be used, which is binding for all Teams:

FIGURE 19. CODING OF THE DRAWINGS.



b) Drawings General Requirements

The drawing Structure & Contents guideline must be followed. Teams must include dimensions and graphic scales in all scale drawings, North indication and plan date in all plans. Project Drawings and Project Manual need to be clearly understood as independent documents. Readers should not have to juggle the two documents in order to access and understand the information. In the Project Drawing each individual section has to start with a single cover page.
The table of contents should include bookmarks which link to every single page (drawings and cover pages).

A visible differentiation of the existing versus new building parts must be made in the drawings. We encourage you to show the difference between both through high quality visual design. The following colour code needs to be used: Existing building (dark grey), new building part (black), demolition elements (grey, dashed).
[**Note:** It is not mandatory for each Deliverable to provide all the data for each section included in the Project Drawings. However, the drawings related to the emphasized items for a specific Deliverable should be included. Only the Sheet List has to show all existing drawings, even they are not up to date.]

c) Structure & Contents Guideline

- **Urban Situation**

  Choose one of the three urban situations:
  - i renovation & extension
  - ii closing gaps
  - iii renovation & addition of storey

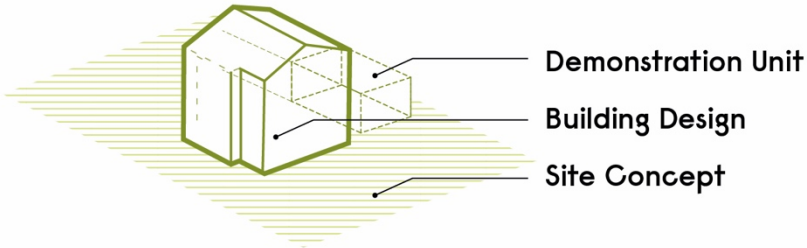
  Detailed information on the urban situations for Wuppertal, District Mirke are provided here:
  https://sde21.eu/competition/documents.

  If you choose a similar urban situation in your city of origin, you must illustrate the general conditions in accordance with the publication in the link above (will be filled with further content) and consider the following aspects:
  - Project city and district (general information, neighbour/ residents);
  - Local climate analysis;
  - Urban project location (Location and analysis/ profile of the existing urban area, existing urban mobility, the concrete boundary for the site concept must be marked);
  - Existing building drawings [scale mind. 1:200] and analysis of the building you are working with (renovation & extension, renovation & addition of storey) or if necessary, of the neighbouring buildings (e.g. closing gaps);
  - System details (all necessary component structures regarding the energy concept);
  - Isometry of the 3D-Model of the urban situation (basic volume model of the competition site and the surrounding buildings);
  - Photographic documentation of the neighbourhood.

If you choose your own urban situation, it will be presented as a brochure (ISO 'A4' (210 mm X 297 mm) sheet size 'packaged' into a single PDF file) as part of Deliverable #1.

- **The tasks relate to three different planning levels**
  - Site Concept;
  - Building Design;
  - Demonstration Unit.

FIGURE 20. PLANNING LEVELS.



Site Concept (SC)

- SC-00 Urban Design Explanation (Graphics and notes to briefly explain proposal main aspects, including aspects of the social context);
- SC-10 Urban Mobility Concept (Illustrate your design with drawings and/or site plans);
- SC-20 Competition Area (Illustrate with drawings and brief notes the relation between your urban design, the existing building/ your building design and the demonstration unit);
- SC-30 Isometry of the 3D-Model of the Site Concept (Basic volume model of the competition unit with the demonstration unit and the surrounding buildings to prove the shade and the solar potential);
- SC-40 Exterior Renderings (Renderings or perspective drawings of the urban situation).

Your Site Concept will be presented as a layout of the competition plan (ISO 'A1' upright / 594 mm X 841 mm / sheet size, 'packaged' into a single PDF file). The code above should be used as a drawing number, not as single plans.

Building Design (BD)

- BD-00 Conceptual Drawings (e.g. Building Design and Urban Mining Concept);
- BD-10 Site Plan [Scale 1:500];
- BD-11 Floor Plan [Scale 1:100];
- BD-12 Roof Plan [Scale 1:100];
- BD-13 Building Elevations [Scale 1:100];
- BD-14 Building Sections [Scale 1:100];
- BD-20 Construction Details (Special solutions, e.g. integration of photovoltaics) [Scale 1:5/1:10/1:20];
- BD-21 Construction Details (Regular building parts);
- BD-30 Energy Concept (Including PV-Integration);
- BD-31 System Details (All necessary component structures regarding the energy concept);
- BD-40 Isometry of the 3D-Model (Basic volume model of the competition unit with the demonstration unit, including interior walls, ceilings etc.);
- BD-50 Group of residents;
- BD-60 Exterior Renderings (Renderings or perspective drawings of the Building Design).

Your Building Design will be presented as a layout of the competition plan (ISO 'A1' upright / 594 mm X 841 mm / sheet size 'packaged' into a single PDF file). The code above should be used as a drawing number, not as single plans.

Demonstration Unit

The following categories of the Demonstration Unit will be presented as single plans ISO 'A3' (297 mm X 420 mm) sheet size 'packaged' into a single PDF file. Usually, the scales should be adhered; only in special cases may they deviate. Teams must use the plan template which will be available on the SDE21/22 WAT.

- **General (GE)**
  - GE-00 Cover sheet;
  - GE-10 Sheet List (the index including all existing drawings with their current valid date);
  - GE-11 Summary of changes;
  - GE-20 General Symbols (defined symbols and list notes used throughout the entire drawing set);
  - GE-21 General Abbreviations (list of abbreviations used throughout the entire drawing set).

- **Architecture (AR)**
  - AR-00 Conceptual Drawings;
  - AR-10 SDE21/22 Solar Campus Plan (Site plan including the lot location inside the 'SDE21/22 Solar Campus') [Scale 1:1000];
  - AR-20 Site Plan [Scale 1:100];
  - AR-21 Floor Plan [Scale 1:50];
  - AR-22 Roof Plan [Scale 1:50];
  - AR-23 Building Elevations [Scale 1:50];
  - AR-24 Building Sections [Scale 1:50];
  - AR-30 Construction Details (Showing all details, which are important for your concept and energy concept and which show the consideration of the building code) [Scale 1:2/1:5/1:10/1:20];
  - AR-31 Constructive section of the façade (from the roof to the base point) with respective horizontal section and elevation (cut-out), focusing on circularity and the representation of the elementation (e.g. wall/floor elements or modules) [Scale 1:20];
  - AR-40 Solar Envelope (Site Plan and Site Elevations, Showing the Solar Envelope geometry) [Scale mind. 1:100];
  - AR-41 Measurable Area [Scale 1:100] (Floor plan(s). Highlight the measurable area with colour and indicate its size);
  - AR-42 Empty;
  - AR-43 Architectural Footprint [Scale 1:100] (Site Plan, highlighting the footprint area with colour and indicating its size);
  - AR-44 Site Elevation [Scale 1:100];
  - AR-45 Reconfigurable features [Scale 1:100] (Plan showing the exterior moveable components, the Solar Envelope and the Architectural Footprint);
  - AR-50 Exterior Rendering.
- **Interiors (IN)**
  - IN-00 Conceptual Drawings;
  - IN-10 Floor (materiality, properties, compliance to building code: e.g. slip-resistant, accessibility) [Scale 1:50];
  - IN-11 Reflected ceiling [Scale 1:50];
  - IN-12 Elevations [Scale 1:50];
  - IN-20 Kitchen Plan (Furniture and Appliances) [Scale 1:20];
  - IN-21 Kitchen Elevations (Furniture, Appliances) [Scale 1:20];
  - IN-22 Kitchen Details [Scale 1:5/1:10/1:20];
  - IN-30 Bathroom plan (Fixtures and Accessories) [Scale 1:20];
  - IN-31 Bathroom Elevations (Fixtures and Accessories) [Scale 1:20];
  - IN-32 Bathroom Details [Scale 1:5/1:10/1:20];
  - IN-40 Furnishings;
  - IN-50 Interior Renderings.
- **Structural (ST)**
  - ST-00 Conceptual Drawings;
  - ST-10Foundation Plan [Scale mind. 1:50];
  - ST-11 Structural Floor Plan [Scale 1:50];
  - ST-12 Structural Roof Plan [Scale 1:50];
  - ST-13 Structural Sections [Scale 1:50];
  - ST-20 Structural Details [Scale 1:5/1:10/1:20].
- **Plumbing (PL)**

  Please refer to Note 1
  - PL-00 Conceptual Drawings;
  - PL-10 Plumbing Plan. Supply and removal (cold and hot water);
  - PL-20 Greywater;
  - PL-30 Drain / Waste / Vent;
  - PL-40 Schematic diagram;
  - PL-50 Supply and removal Isometric (cold and hot water);

  - PL-51 Greywater Isometric;
  - PL-52 Drain/Waste/Vent Isometric.
- **Solar Water Heating (SW)**
  - SW-00 Conceptual Drawings;
  - SW-10 Plan;
  - SW-20 Isometric.
- **Mechanical (ME)**
  - ME-00 Conceptual Drawings;
  - ME-10 HVAC distribution Plan;
  - ME-11 HVAC equipment;
  - ME-20 Heating;
  - ME-23 Ventilation;
  - ME-30 Mechanical room elevation;
  - ME-40 HVAC System Schematic drawings;
  - ME-41 Heating mode Schematic drawings;
  - ME-50 Controls;
  - ME-60 Isometric Distribution.
- **Electrical (EL)**

  Please refer to Note 2
  - EL-00 Conceptual Drawings;
  - EL-10 Grid Interconnection;
  - EL-20 DC wiring diagram;
  - EL-30 Power plan;
  - EL-40 Lighting plan;
  - EL-50 One-line Diagram;
  - EL-60 AC Circuit layout.
- **Photovoltaic System (PV)**

  Please refer to Note 3
  - PV-00 Conceptual Drawings;
  - PV-10 Photovoltaic system: general;
  - PV-20 Photovoltaic system: DC circuits;
  - PV-30 Photovoltaic system: AC circuits;
  - PV-40 Photovoltaic system: grounding system.
- **Telecommunications and Building Management System (BMS)**
  - BMS-00 Conceptual Drawings;
  - BMS-10 Wiring plan;
  - BMS-20 Schematic diagram;
  - BMS-30 Equipment.
- **Instrumentation Drawings (ID)**
  - Please refer to the Technical Monitoring Procedures Document.
  - ID-00 Conceptual Drawings;
  - ID-10 General Monitoring (Showing all appliances, distribution & monitoring panel, sensors, tripods in Floor Plan [Scale 1:50]);
  - ID-20 Monitoring panel room;
  - ID-30 Electricity meters' topology (single-line diagramm of Grid connection, PV, batteries, loads);
  - ID-40 Electricity meters' connection;
  - ID-50 House appliances.
- **Site Operations (SO)**

  Please refer to Rule 44 _ Site Operations Plan
  - SO-00 Trucks Shipment;
  - SO-10 SDE21/22 Solar Campus (trucks entry and exit; route to the lot);

> SO-20 Lot plan (locations of crane, containers, trucks, tools, waste disposal on the lot);
> SO-30 Phases.

- **Fire Protection (FP)**
  Several plans and details regarding fire protection of the demonstration unit are necessary for the approval of the site construction. Specific requirements will be published in Rule 50 'Building Code Application'.
  > FP-00 Fire Protection Plan;
  > FP-10 Fire Protection Concept.
- **Health and Safety (HS)**
  Several plans and details regarding health and safety during the construction time of the demonstration unit are necessary. Specific requirements will be published in Rule 51 'Health and Safety'.
  > HS-00 General Coordination Plan (table of visualisation of activities, processes and hazards);
  > HS-10 Assembly Sketches (show work phases on the lot (location, action, hazard);
  > HS-20 Evacuation Plan.
- **Public Tour (PT)**
  > Please refer to Note 4
  > PT-00 Site accessibility;
  > PT-10 House Tour floor plan;
  > PT-20 House Tour General Information.

Notes:

1. Include a note indicating that the unit toilet(s) will not be installed on SDE21/22 Solar Campus, see SDE21/22 Building Code, Water Use.
2. The ELECTRICAL (EL) drawings must include electrical layouts, detailed electrical components information and complete electrical diagrams of the conventional electrical installation showing all elements and protections (including those of the interface between the Photovoltaic system and the electricity distribution network). The one-line diagram of the electrical installation must include battery charger, inverter charger and photovoltaic installations as well as the locations of the SDE21/22 electric meters. For more information about the SDE21/22 meters' requirements please refer to the Monitoring Procedures document.
3. The PHOTOVOLTAIC SYSTEM (PV) drawings must include electrical diagrams describing all components (equipment), wiring and protections. The general diagram of the photovoltaic system (PV-001) shall include the interface with the electrical installation of the unit (HDU) and the electrical distribution network. Drawings reference numbers indicated show the minimum drawings required for approval. Additional drawings can be included, provided that they are placed on the corresponding sub-section, for example: for details of DC circuits, new drawings with reference numbers PV-012, PV-013, up to PV-019 can be added; the same applies to details of the PV system as a whole (new drawings: PV-002 to PV-009), AC circuits (PV-022 to PV-029) and Grounding system (PV-031 to PV-039).
4. PUBLIC TOUR (PT) The tour must be illustrated and explained in detail; drawings must show the points at which the Decathletes will make their explanations and specify the information that it will explain at each point. The location of the waiting line and the number of people by tour must be indicated. Drawings must include furniture, objects and all possible obstacles in the proposed route. They also must include accessibility-related information, e.g. widths of ramps, steps, doors and narrow areas in the tour route, and wheelchair turning circles. If there are any movable elements which are going to be shown to the visitors, include a sketch of the moving mechanisms and measures adopted to assure the safety of the visitors. Add explanatory notes as needed. Two-storey houses should display both floor plans on one page.

30.3 Project Manual Structure & Contents

As stated in Rule 26.3b, the Project Manual must be consistent with the SDE21/22 Project Manual formatting and guidelines provided below. In order to have the Project Manual of the Deliverables organized and named, it is important to adhere to the basic principles illustrated in the Project Manual Structure & Contents. In case there are particular sections which do not fit in this Structure & Contents guideline, those must be located where appropriate (you may ask the SDE21/22 Organisers through the SDE21/22 WAT). If there is information that corresponds to two different sections, please put it in the most general one and make the appropriate reference to its corresponding location.

General requirement
In order for the SDE21/22 Organisers and the Juries to quickly understand the project, please put the relevant information into the project manual and place the support documents (calculations, software outputs, data sheets, etc.) into appendices, using reference notes to indicate their location.

The SDE21/22 Project Manual Contents & Structure is as follows:

TABLE 23. PROJECT MANUAL STRUCTURE.

COVER SHEET	
SUMMARY OF CHANGES	RULE 31 _
TABLE OF CONTENTS	RULE 32 _
RULES CHECKLIST	RULE 33 _
CONTESTS SUPPORT DOCUMENTS	RULE 34 _
ARCHITECTURE DESIGN REPORT	RULE 35 _
ENGINEERING & CONSTRUCTION REPORT	RULE 36 _
AFFORDABILITY AND VIABILITY REPORT	RULE 37 _
COMMUNICATION, EDUCATION & SOCIAL AWARENESS REPORT	RULE 38 _
SUSTAINABILITY REPORTS	RULE 39 _
URBAN MOBILITY REPORT	RULE 40 _
DINNER PARTY MENU	RULE 41 _
CONTEST WEEK TASKS' PLANNING	RULE 42 _
COST ESTIMATE AND PROJECT FINANCIAL SUMMARY COST	RULE 43 _
SITE OPERATIONS PLAN	RULE 44 _
HEALTH & SAFETY REPORT AND DOCUMENTATION	RULE 45 _
DETAILED WATER BUDGET	RULE 46 _
ELECTRICAL & PV DESIGN SYSTEMS INFORMATION	RULE 47 _
PROJECT SPECIFICATIONS	RULE 48 _
STRUCTURAL CALCULATIONS	RULE 49 _
APPENDIX	

Notes
- Teams must follow the SDE21/22 Project Manual Structure & Contents which will be made available on the SDE21/22 WAT.
- In order to rationalize the Team'strategies, technical decisions must be justified by parametric studies and calculations. Figures and diagrams should highlight most relevant findings or results.
- Concerning only Contest Support Documents, the Jury will attach greater important to quality of information rather than to quantity.
- Jurors will be focusing specifically on their corresponding sections, since it is recommended that Teams systematically introduce a brief, synthetic project recapitulative at the introduction to each section including your project statement &its local context.
- Electrical &PV Chart Checklists must be submitted as four separate documents, (see Rule 47 _ Electrical and PV Chart and Checklists).

30.4 Workshop Documentation

SDE21/22 & EEF co-branding principles as applied to Teams' documentation/dissemination material will be communicated after Team selection, in an additional chapter of the SDE21/22 Graphic Chart & Brand Manual.

a) Team Brochure

Public SDE21/22 Workshop Dissemination Brochure: Teams must submit the following information, which will be used for the SDE21/22 Workshop Dissemination Brochure:

- **Text:** Include the name of the unit, of the Team, and of the university. Also, a brief description of the full project (design challenge & HDU), of approximately 200 words, explaining its main goals and innovative elements. This text will be published in English and in German, the Host City's local language; both versions of this text will be provided by the Teams;
- **Images:** three photographs for the public dissemination of the project;
- **HDU rendering:** 1 high-quality rendering (minimum 300dpi .jpg) or vector (.eps or .pdf);
- **HDU Plan, vertical and cross sections**: 1 clean vector file of the vertical section, plan and cross section, scaled 1/500 - 1/1000 (.eps or .pdf);
- **Other relevant image:** 1 high-quality picture of the project (.jpg minimum 300dpi, or vector .eps or .pdf).

b) Project Description Poster

- Teams must submit a poster describing their project (design challenge & HDU). This poster will be shown with the model in exhibitions, or independently at events, to disseminate the SDE21/22 Competition. The requirements for the poster design will be specified through the SDE21/22 WAT.
- The project description poster may be updated whenever the Team wishes to, after having communicated that decision to the SDE21/22 Organisers via the SDE21/22 WAT.

c) Team Description Poster

- Teams must submit a poster describing their Team's organisation. This poster will be shown with the model in exhibitions, or independently at events, to disseminate the SDE21/22 Competition. The requirements for the poster design will be specified through the SDE21/22 WAT.
- The Teams' description poster may be updated whenever the Team wishes to, after having communicated that decision to SDE21/22 Organisers via the SDE21/22 WAT.

30.5 SDE21/22 Solar Campus Documentation

Information to prepare SDE21/22 Solar Campus Visiting Guide

Teams must submit information and material regarding their project, in order to prepare the Visiting Guide, which will be given to all professional visitors attending SDE21/22 Solar Campus. The 'project' addresses both the design challenge & demonstration unit (HDU). Therefore, for the sake of efficiency in producing the SDE21/22 Solar Campus Visiting Guide, it is extremely important to follow the provided indications, as the descriptions and images must be exactly as specified. The requirements for this item, as well as a layout example of this SDE21/22 Solar Campus Visiting Guide, will be available through the SDE21/22 WAT.

Professional visitors must be able to understand the basic layout and characteristics of the Team's project with a brief reading of this guide; it is mandatory to provide the most precise, accurate information possible. Teams must submit the required documentation in English and in German, the Host City's local language for the 'SDE21/22 Solar Campus Visiting Guide'. To this end, Teams are requested to provide the best possible translations from their own language into English and German.

[**Note:** Regarding the preparation of information for the SDE21/22 Solar Campus Visiting Guide, please refer to the SDE21/22 WAT for specific due dates.]

30.6 SDE21/22 Official Dissemination Materials

The SDE21/22 Official Dissemination Materials will be used for a specific SDE21/22 official book, among other publications in magazines, brochures, webs, etc. Details are to be determined. As per all communications actions, please refer to the SDE21/22 Graphic Chart & Brand Manual for style guidelines.

30.7 Electronic Files

- Electric Drawings and Calculations (see Rule 6.1b _ Electrical and Photovoltaic Design Approval);
- Structural Drawings and Calculations (see Rule 6.1a _ Structural Design Approval);
- Certificate of country-of-origin Code compliance (see Rule 6.1c _ Codes Design Compliance).

30.8 Project Description Poster

Teams must submit a poster describing their project. This poster will be shown with the model in exhibitions, or independently in events, to disseminate the SDE21/22 Competition. The requirements for the model, display case and poster design and packaging will be specified through the SDE21/22 WAT. The project description poster may be updated whenever the Team wishes to, after having communicated that decision to SDE21/22 Organisers via the SDE21/22 WAT.

30.9 Audio-visual

a) Audio-visual #1.

For Deliverable #2, Teams must produce an audio-visual presentation to reveal the goals of the Teams, describe their projects, the technologies to be used and the corresponding sustainable concepts applied. These audio-visuals will be used for the SDE21/22 Competition dissemination.

b) Audio-visual #2.

For Deliverable #3, Teams must produce an updated version of their Audio-visual#1. The audio-visuals #1 and #2 may be replaced at any time after having communicated that decision to SDE21/22 Organisers via the SDE21/22 WAT. The SDE21/22 Organisers will verify compliance with the SDE21/22 Rules and replace revised audio-visual material as soon as possible.

c) Audio-visual #3

For Deliverable #6, Teams must produce an audio-visual presentation to show their final achievements, explain their units (HDU), the technologies used, and the sustainable concepts applied. These audio-visuals will be used for dissemination during and after SDE21/22 Competition.

Technical Requirements

- Maximum length: 5 minutes
- Language: English. Other spoken languages might be used in punctual interventions, but they must be subtitled or dubbed in English.
- A written version of all spoken parts must be provided as an appendix to the SDE21/22 Organisers in English.
- Additionally, Teams may send a German or any other language translation.
- Video Format:
  - Full HD 1080p or 1080i (1920×1080 px);
  - Encoding: Mp4 compression H.264;
  - Frames per second: 25 or 50 fps;
  - Minimum Bitrate: 4000 (more is better).
- Audio Encoding:
  - MP3 (MPEG-1 Audio Layer 3) or other with Frequency: 44.1 KHz;
  - Number of channels: 2 channels stereo;
  - Minimum Bitrate: CBR or VBR 128kb/s.

Recognition of all Team sponsors and supporting institutions must be limited to a maximum of 1 minute or 20% of the total time (whichever is less).

RULE 31 _ SUMMARY OF CHANGES

Changes and additions to the Project Drawings and Project Manual listed in the Summary of changes will be reviewed. Anything not listed is assumed to be unchanged from the previous version of the Project Drawings and Project Manual and will not be reviewed. As always, an important question to ask before submitting is, 'Will the information be easy for the reviewers and Jurors to find?'

RULE 32 _ TABLE OF CONTENTS

Most users of the document will be reviewing it electronically and will navigate using the PDF bookmarks and hyperlinks. For the benefit of the reviewers and Jurors, Teams must use the basic bookmarking structure and section titles supplied by the SDE21/22 Organisation. Remember that some users will print the document, so make sure that the printed version is also easy to navigate, i.e., clearly numbered sections and/or pages are essential. Also remember to design the margins appropriately. For example, the SDE21/22 Rules PDF document is intended for electronic and printed viewing; PDF bookmarks and hyperlinks are provided, as well as margins and end-of-section blank pages designed for double-sided, spiral-bound, portrait printing. A similar approach is recommended for the Project Manual. A 'test print' is advised, to ensure a successful print for an A4 binder.

RULE 33 _ RULES CHECKLIST

The SDE21/22 Rules Checklist is intended to make revisions easier. Participating Teams must fill in each of the aspects required, specifying the drawing or section included.

TABLE 24. SDE21/22 RULES CHECKLIST.

RULE DESCRIPTION	CONTENT REQUIREMENT(S)	DRAWING(S) / REPORT(S)
3.2 Team Officers & Contact Information	Team officer's contact information completely fulfilled in Table 2 (SDE21/22 WAT).	
4.3 Lot Conditions & attribution	Drawing(s) showing the storage and unloading areas and corresponding load's calculations.	
4.3 Lot Conditions	Calculations showing that the structural design remains compliant even if there is a level difference, and drawing(s) showing shimming methods and materials to be used if needed.	
4.4 Footings	Drawing(s) showing the locations and depths of all ground penetrations on the Competition site.	
4.4 Footings	Drawing(s) showing the location, contact area and soil-bearing pressure of every component resting directly on the ground.	
4.7 Construction Equipment	Drawing(s) showing the assembly and disassembly sequences and the movement of heavy machinery on the Competition site and specifications for heavy machinery.	
5.1 Solar Envelope Dimensions	Drawing(s) showing the location of all unit and site components relative to the solar envelope.	

6.1 Structural Design Approval	Structural drawings and calculations signed and stamped by a qualified licensed professional.	
6.1 Electrical & Photovoltaic Design Approval	Electrical and Photovoltaic drawings and calculations signed and stamped by a qualified licensed professional.	
6.1 Codes Design Compliance	List of the country-of-origin codes complied, properly signed by the faculty advisor.	
6.2 Architectural Footprint	Drawing(s) showing all information needed by the Rules Officials to digitally measure the architectural footprint.	
6.2 Architectural Footprint	Drawing(s) showing all the reconfigurable features that may increase the footprint if operated during Contest week.	
6.3 Measurable Area	Drawing(s) showing the Measurable Area.	
6.4 Entrance & Exit Routes	Drawing(s) showing the accessible public tour route, specifying the entrance and exit from the unit to the main street of SDE21/22 Solar Campus.	
7.3 PV Technology Limitations	Specifications and contractor price quote for photovoltaic components.	
7.4 Batteries	Drawing(s) showing the location(s) and quantity of stand-alone, PV-powered devices and corresponding specifications.	
7.6 Thermal Energy Storage	Drawing(s) showing the location of thermal energy storage components and corresponding specifications.	
8.1 Containers locations	Drawing(s) showing the location of all the water tanks.	
8.2 Water Delivery	Drawing(s) showing the fill location(s), quantity of water requested at each fill location, tank dimensions, diameter of opening(s) and clearance above the tank(s).	
8.3 Water Removal	Drawing(s) showing the quantity of water to be removed from each fill location, tank dimensions, diameter of opening(s) and clearance above the tank(s).	
8.5 Greywater reuse	Specifications for greywater reuse systems.	
8.6 Rainwater Collection	Drawing(s) showing the layout and operation of rainwater collection systems.	
8.8 Thermal Mass	Drawing(s) showing the locations of water-based thermal mass systems and corresponding specifications	
8.9 Greywater Heat Recovery	Specifications for greywater heat recovery systems.	
9.1 Placement	Drawing(s) showing the location of all vegetation and, if applicable, the movement of vegetation designed as part of an integrated mobile system.	
9.2 Watering Restrictions	Drawings showing the layout and operation of greywater irrigation systems.	
10.2 SDE21/22 Sensors' Location & wire routing	Drawing(s) showing the location of bi-directional meters, metering box, sensors, cables and feed-through to pass the instrumentation wires from the interior to the exterior of the unit.	

11.2 Use of the SDE21/22 Logo	Artwork, and content of all communications materials, including signage (please refer to the SDE21/22 Graphic Chart & Brand Manual).	
11.3 Teams' sponsors & Supporting Institutions	Drawing(s) showing the dimensions, materials, artwork, and content of all communications materials, including signage (please refer to the SDE21/22 Graphic Chart & Brand Manual).	
11.4 Team Uniforms	Drawing(s) showing the artwork, content, and design of the Team uniform (please refer to the SDE21/22 Graphic Chart & Brand Manual).	
12.4 Public Tour	Drawing(s) showing the public tour route, indicating the dimensions of any difficult point, complying with the accessibility requirements.	
23.0 Contest 5: Drying Method	Drawing(s) showing the clothes drying method and the place where the clothes will be dried.	
23.0 Contest 5: House Functioning	Appliances and corresponding technical specifications (Appliances and Home Electronic Equipment specifications and user manuals).	
36.5 Photovoltaic systems design	Specifications of PV generators, inverters, wiring, cables, protections, earthing systems, interface with the electricity distribution network turned on.	
36.5 Photovoltaic systems design	Inverters' certificates.	
36.5 Photovoltaic systems design	Maintenance plan for PV generators, supporting structure, inverters, wiring, cables, protections, circuit breakers in case of fire and earthing system. Fire protection systems for PV DC wiring.	
36.5 Photovoltaic systems design	The corresponding table 'design summary' must be completed.	
51.3 Fire Safety	Specifications for Fire Reaction of Constructive elements, extinguishers, and fire resistance of the unit's structure.	
51.3 Fire Safety	Drawings showing compliance with the evacuation of occupants' requirements and fire extinguishers location.	
51.4 Safety against falls	Specifications of compliance with the slipperiness degree classes of floors included in House Tour.	
51.4 Safety against falls	Drawing(s) showing compliance with conditions for uneven flooring, floors with different level, Restricted Areas stairs, Public Areas Staircases, Restricted Areas Ramps and Public Areas Ramps.	
51.4 Safety for impact risk & avoiding trapping	Drawing(s) showing compliance with conditions for avoiding impact risk and trapping.	
51.4 Safety against the risk of inadequate lighting	Specifications for level of illumination of House Tour areas light fittings.	
51.5 Accessibility for People with Disabilities and Special Needs	Interior and exterior plans showing the entire accessible tour route.	
51.6 Structural Safety	Specifications for the use of dead loads, live loads, safety factors and load combinations in the structural calculations.	
51.7 Electrical and PV Systems	Complete the 'Electrical System Design PV Chart and Checklist'.	
51.7 Electrical and PV Systems	Specifications of the wiring, channels, panels and protections of the electrical installation.	
51.7 Electrical and PV Systems	One-line electrical diagram and drawings showing the grounding, execution, and paths.	

RULE 34 _ CONTESTS SUPPORT DOCUMENTS

The Contests Support Documents will be used to justify the Teams' strategies towards the 10 Contests of the Competition, as well as describing the projects objectives in the different aspects considered in each of the Contests. The following documents per Contest have to be prepared and must be consistent in their contents:

TABLE 25. LIST OF CONTEST SUPPORT DOCUMENTS

	DESIGN REPORT	BRIEF REPORT	INNOVATION REPORT
ARCHITECTURE	x	x	x
ENGINEERING & CONSTRUCTION	x	x	x
SUSTAINABILITY	x	x	x
AFFORDABILITY & VIABILITY	x	x	x
URBAN MOBILITY	x	x	x
COMMUNICATION, EDUCATION & SOCIAL AWARENESS	x	x	-

The design reports are the full documents describing each Contest entry in detail incl. the relevant additional documents, fact sheets, etc. The Organisers will review these reports in advance of the Jury presentations.

Teams must submit a brief report or summary for six out of the seven Juried Contests (Table 25). These briefings intend to make Juror's revision easier by providing a short summary per participating Team. Before the event begins, these reports will be given to the Juries associated with each of the Contest activities. The Jurors use the reports and the documents submitted by the Teams to preview what they will be evaluating at the event. Each Jury will assign points to its Contest. Brief Reports give the Teams the opportunity to emphasise the most important aspects of their proposal regarding the corresponding Contests. Moreover, the following requirements must be met:

- The length, including all text, figures, tables or equations, may be no more than 4 pages (A4 sheets or 8.5 in. x 11 in) per juried Contest;
- The body text and captions must be in 11 pt. minimum;
- These documents will be published on the SDE21/22 website after the official award ceremony in order to provide first-hand information to share within the scientific community.

Teams must submit a one-page Innovation Report for each of the juried Contests except the Contest 'Communication, Education & Social Awareness'. These Innovation Reports will qualify the Team for the Innovation Contest. The Innovation Contest summarises all innovations to a separate scoring. The following sections address these reports by topic. The guidelines for the innovation reports are identical to the brief reports, with the exception, that only a single page per contest report is allowed. The set of five individual innovation reports will make up the full innovation report.

RULE 35 _ ARCHITECTURE DESIGN REPORTS

35.1 General Architectural Concept

In this report, Teams must include the explanation of their design strategies on all three levels of the project with increasing level of detail:

- the neighbourhood;
- the whole building;
- the house demonstration unit (HDU).

These three levels are to be organised as main chapters of the report. The self-defined socio-economic background of the project must be reflected. According to Table 6 the sub-Contests addressed and scored are:

- the site integration;
- the building design;
- the interior design, and
- the solar system integration.

Make sure to document sufficient information to allow the Jury's fair judgment on your project in these Sub-Contests. The neighbourhood level refers mainly to the district and site integration. The HDU will be the focus for the evaluation of interior design, lighting design and the solar system integration. The lighting design shall describe both the use of natural and artificial lighting. Calculations such as the daylight factor distribution or visualizations of the lighting atmosphere shall be included. The lighting quality evaluation should describe both night and day scenarios.

It is necessary to explain the design process, from the primitive idea up to the final project design including alternatives considered. The reports must be consistent with the intersection of the Engineering & Construction Report (insulation level, energy supply, solar system integration…), the Sustainability Report (sufficiency concepts, materials, recycling…) and the Urban Mobility Report (parking…).

35.2 Structural Design

Teams shall explain the structural design of the project, from the initial premises to its consequent project development, describing the materials used, key objectives and the main reasons for the final adopted solution. Relevant calculations are to be included in the Structural Calculations section of the Project Manual.

35.3 Solar System Integration

The solar system integration is a key component of the building design and the HDU. Details must illustrate the beauty and functionality of the general approach, and the construction in detail. Teams shall explain the building integrated solar systems concept and selection criteria, and how the solar systems fulfil energetic and aesthetic functions according to the following items:

- **Aesthetic Integration:** How the solar systems become an integrated part of the architecture;
- **Constructive Solution:** Quality and consistency of the constructive details, and the modules are adapted to the structure, to the modularity and to other conventional materials of the HDU; in this section the key objectives of the energy concept need to be described, no calculations are needed here (these are part of the E&C report).
- **Additional properties:** Conformity of the systems performing architectural functions, like weather protection, thermal insulation, noise protection, modulation of daylight etc., always considering the functioning requirements of the systems;
- **Maintenance:** Specific conditions for operating, maintaining and repairing the systems;
- **Economy of the installation:** including its economic justification considering the savings for replacing conventional materials, electrical energy production and possible extra energy saving costs by the influence of the systems integration in the unit general performance (architectural function).

35.4 Summary of Reconfigurable Features

This summary will be used before, during, and after Jury tours to verify that the HDU complies with the maximum architectural footprint, Rule 6.2. Be sure to include references to relevant drawings and/or specifications. If you are not sure whether something is considered a 'reconfigurable feature', include it in this summary, just in case.
The Competition Manager will review the summary and notify the Team if any of the listed items are not considered 'reconfigurable features.'

RULE 36 _ ENGINEERING & CONSTRUCTION REPORTS

36.1 General Engineering & Construction Concept

Teams must include in these reports the detailed explanation of their design strategies on two levels of the project:

- The whole building;
- The demonstration unit (HDU).

The engineering and construction reports shall include a description of the following aspects:

- A fact sheet listing the project key dimensions for the whole building and the demonstration unit. The form will be provided through the SDE21/22 WAT;
- Measures taken to reduce the building energy demand such as insulation, airtightness, solar shading, heat recovery, energy efficient household devices etc;
- Measures undertaken to decarbonise the energy supply such as the use of ambient heat, solar energy utilisation etc;
- Systems design: plumbing, ventilation ducts, electrical and photovoltaic installations;
- An operation energy simulation covering the demand and the generation;
- A life cycle foot-print calculation for a 50-year cycle.

The drawings and technical descriptions have to be clear, precise and complete. Innovative strategies, processes or technologies should be highlighted within the Innovation Report.

36.2 Comprehensive Energy Analysis

All Teams will analyse the energy demand for the Design Challenge and the HDU through suitable tools. Dynamic building simulations with at least hourly time steps are mandatory for the HDU. All calculations have to be performed

1. for the location of the Design Challenge;
2. for the location of Wuppertal.

Calculations must use a publicly available weather data set. For the Wuppertal site, the dataset for Düsseldorf (closest meteorological station to Wuppertal) is to be used and is available here:
https://energyplus.net/weather-location/europe_wmo_region_6/DEU//DEU_Dusseldorf.104000_IWEC
Data sets for other locations have to be confirmed by the SDE21/22 Organisers.

The energy analysis must include the following topics:

- Description of the methodology and tools applied for the load as well as the generation analysis;
- Analysis and documentation of the weather data and the shading impact of the surrounding of the building site;
- Documentation and analysis of the energy supply system. This covers the whole building level only;
- Domestic hot water supply has to be taken into account with special consideration of the relatively high importance for the heat demand in apartment buildings and the need for legionella protection;
- List of all electric loads (house-hold appliances, lights, etc.) used in the households, including the main technical characteristics given by the manufacturer, and the estimated consumption for their use during the Contest week. This list covers the demonstration unit only;
- Verification of a carbon neutral operation by using simulation results on an annual basis. This covers the whole building level only;
- Documentation and discussion of the control strategy to minimize energy use, maintain indoor comfort and user satisfaction (temperature, air quality, daylight…);
- Special attention should be paid to model user behaviour (occupation, blind operation, window opening, DHW demand profiles…) and controls correctly with respect to the different building functions and defined user groups;
- Justification of the solar system sizing including; technical descriptions (types of generators/collectors, types of storage, control strategy, …) and detailed simulation of the system performance of all solar systems considered for the whole building and the demonstration unit. Further detailed information (e.g. characteristics) are to be included in the Project Manual;
- Simulation results in the form of tables and figures incl. parameter studies to justify the final system design. The post processing of the simulation outputs has to address the indoor climate (thermal, comfort, air quality, daylighting), the overall Energy Performance and its distribution (heating, DHW, ventilation, pumps & controls, appliances & lighting, additional sectors) the solar system performance and the grid interaction. A post-processing simulation data sheet will be made available through the SDE21/22 WAT to harmonise the visualisation of the outputs. Further individual figures and tables are welcome.

A free, simplified single zone simulation tool will be provided by the Organisers via the SDE21/22 WAT for the dynamic simulation of the HDU with special attention to the performance gap experiment within the Comfort Contest.
The completed template 'Project Facts' is mandatory to summarize the energy relevant information starting with Deliverable #2. The template is provided by the SDE21/22 WAT. The application of this tool is mandatory, but Teams are free to use any suitable tool for the whole building simulation.

36.3 Life Cycle Carbon Footprint

The calculation and documentation will summarise the Energy Performance analysis for a utilization period of 50 years for construction, operation, maintenance and demolition/recycling of the whole HDU. The energy data will be converted to the equivalent carbon emission scale using harmonised conversion factors. The carbon emission calculation for the main construction elements is taken from the Sustainability Contest (UMI tool). No recalculation is needed for this part.
While the evaluation of the embodied energy should focus on the major building construction elements, it has to include estimations for the ventilation and energy supply system (duct work, wiring, PV modules, solar collectors, batteries, ...).
Harmonized tables with estimated input data for this purpose are submitted via WAT. The main calculation results are to be documented within the template 'Project Facts'. The analysis is mandatory for the HDU only.

RULE 37 _ AFFORDABILITY & VIABILITY REPORTS

This report addresses the concept of the project for Affordability and Economic Viability as well as Social Viability. These aspects only can be quantified and evaluated in a specific context, which has to be described and documented in detail. Nevertheless, the scalability and the projects' answers to particular urban issues are crucial.
Therefore, the report shall follow the suggested structure:

37.1 Analysis

The analysis of the situation defines the context and is the fundament for the entire concept. The analysis contains the information necessary to understand and put in context the strategy, the target audiences and the operative actions. Therefore, it shall include all relevant data about the local housing market, the structure and central aspects of the built environment, the housing situation, the socio-economic background of the inhabitants addressed. Teams shall also include a SWOT analysis (Strengths, Weaknesses, Opportunities and Threats) of the chosen city, district and unit / overall building. It shall be stated clearly why the situation is relevant for urban sustainability transformation and which relevant urban issues can be found.

37.2 Definitions

a) Full Definition of the Social Scenario & Urban Issues

According to the analysis on the one hand, Teams describe an adequate social scenario of targeted residents added to the description of the physical building made elsewhere. This would imply a combination of citizens suitable for the district. It is not necessary to choose the constellation of people living in the selected building / complex of buildings, nor does it have to be representative. It has to be indicated, why the specific social scenario is chosen. The scenario has to include the neighbourhood to address aspects of sharing and cooperation. On the other hand, it has to be defined to which specific urban issues the concept (or parts of the concept) delivers solutions (e.g. energy poverty, social isolation, individual living space consumption). It has to be indicated, why the specific urban issues are chosen.

b) Definition of the Strategic Objectives

The strategic planning answers the question 'What do we want to achieve?'. The objectives of the concept have to be defined according to the chosen social scenario and the chosen urban issues.

37.3 Concepts

Based on the previous analysis and definitions, the concepts strategy shall be developed and described to answer the question 'What to do to reach our objectives?'. Here the Teams describe the basic idea or strategy of their project relative to their objectives. This is at first defined on the level of the project in general and focuses on the design challenge.
If possible, due to their specific nature, these elements shall be represented in the demonstration unit.

Please structure the description of concepts according to the guiding questions in the Contest as follows:
(It is allowed to add parts or change the structure, as long as the Jury is easily able to find the information needed)

a) Concept for Affordability & Economic Viability

- **Focus on residents**
  - > **Effects on operational costs:** Effects on rent levels, electricity, heating, water, etc. for the tenants/residents, including the fitting to the selected social scenarios, and description to what extent the proposal finds innovative ways to minimise these costs;
  - > **Affordability for the residents:** Describe the proposals' affordability for the residents, considering the selected social scenarios and the defined housing market.
- **Focus on property owner / investor**
  - > Estimated real-live **construction costs** under chosen circumstances.
  - > **Financing plan for the implementation:** under the chosen circumstances, can include funding, rental level after proposal implementation, etc., shall include calculated rental return, please describe the suitable parameters relative to selected social scenarios and the defined housing market.
  - > **Effects on unit value:** Describe how the energy-related and other innovative features enhance the market value of the unit.
  - > **Operating and business models:** Describe operating and business models to bring your concept to live in the chosen situation (if applicable).

b) Concept for Social Viability

- **Focus on Urban Context**
  - > **Solving of urban issues:** Describe How the concept(s) solve your defined urban issues.
  - > **Neighbourhood support:** Describe what the concept provides for the neighbourhood?
- **Focus on Residents / target group**
  - > **Quality of living improvement:** Describe which innovations improve the quality of life for the residents, while still being affordable.
  - > **Room program and interior design:** Describe how the room programs and interior design fit into the specific needs and desires of the defined residents and also solve urban issues.
  - > **Scalability:** Describe how the proposal and inherent social innovations, serve as a blueprint for a roll-out within the neighbourhood and beyond in cities of the chosen kind.

RULE 38 _ COMMUNICATION, EDUCATION & SOCIAL AWARENESS REPORTS

38.1 Communication Sub-Report

Each Team will present an integrated communication strategy and show its development and success in chapters that include a full communication cycle (Analysis, Strategic Planning, Operative Planning, Implementation, Assessment/ Controlling). Through the ongoing Deliverables, the concept develops while proceeding through this cycle. The Communication Project must be submitted in Deliverable #3 and onwards, explaining the Team's intentions, plans and on-going activities toward the disseminated of the project throughout its development.
However, in Deliverable #6, Teams must only describe what was previously realised and document the results.
The Communication Project must include the following sections:

38.2 Analysis

The analysis of the situation answers the question 'Where do we stand?' and is the fundamental for the communication management process. The Analysis contains the information necessary to understand and put in context the strategy, the target audiences and the operative actions. Teams shall include a SWOT analysis (Strengths, Weaknesses, Opportunities and Threats).

38.3 Strategic Planning

a) Definition of the Strategic Communications Objectives

The strategic planning answers the question 'What do we want to achieve?'. In this strategic planning, the long-time term communication objectives are defined according to the initial analysis. For instance, (AIDA) 'Attention' to your project/ SDE21/22, raising 'Interest' in the project topics, creating the 'Desire' to visit, sponsor, etc., then transform this desire into Action. These objectives shall include the promotion of the SDE21/22 in general and the acquisition of visitors from the Team's country of origin in particular. From that point, the strategy shall be developed and described to answer the question 'How and what do we do to reach our objectives?'. This describes the Teams' goals and corresponding actions to implement the Communication Plan.

b) Identification of the Target Groups

Beyond the end user or consumer who will inhabit, operate or purchase the dwelling, and the corresponding technologies and innovations deployed, Teams will identify the groups of citizens to whom the Team's communication is addressed. Teams must consider the SDE21/22 target groups: school children, academia, professionals, general public, industry and cities. Regarding the means of communication, to make the distribution of information easier, it will be helpful to create lists, identifying to whom the Team must address the project.
[**Note:** it is clear that one of the target groups will be the communications media. While this target audience is not the sole target group, each Team must include a short list of media channels they are aiming to reach with their press releases.]

c) Message/s Establishment

When dealing with different target groups, it is necessary to articulate the main message in different ways, treating the main message specifically for each target group.

d) Social Media/Online Strategy

Each Team will present a social media/online communication strategy, which shows the Team's approach to building, maintaining and developing social media networks, in order to reach specific communication objectives.

e) Offline Strategy

Each team has to present an offline strategy, which shows the Teams' approach to use offline instruments to reach specific communication objectives. This shall include a press and event strategy.

38.4 Operative Planning

The operative planning includes the setting of operative objectives and the confirmation of concrete messages and corresponding actions. Describing the activities to be carried out during project development is fundamental.
Teams are encouraged to include a timetable (where, at a simple glance, you can schematically have a complete panorama of the work to be carried out), and a budget (including the cost of each action and each communication channel used). For example: cost of brochures, insertions in the press, communications agency fees or similar, merchandising costs, etc.

Previous to the Competition

- Online and offline addressed to three different scopes within the identified target groups: university, city and country. International activities and actions are encouraged;
- Teams' participation in events organized by themselves, or by others;
- Information on the project produced in any format, by the Teams or by third parties, from an article in a newspaper to a collaboration with an art creator.

During the Competition

- Speed Peer Review presentation;
- Public tours;
- Leaflets/objects to be given to the public;
- Audio-visual #3, to be shown at SDE21/22 Solar Campus.

a) Tracking Table of the Communication Actions

Teams must include a table defining the following actions: Project appearances in national media (from the Team's country of origin) and/or international media if identified. This table should list the materials generated for the Team's dissemination, either done on Teams' or third parties' stands, other than materials generated by external media channels. Organised events or those with a confirmed future celebration date must be included. Teams must also include the latest version (including ALL previous information, beyond the information added after the latest Deliverable) of the tracking tables relative to communication actions in each Deliverable.

38.5 Implementation, Assessment / Controlling

Teams must provide a description and documentation of their implemented activities and corresponding successes. The success of the actions must be tracked according to suitable and measurable variables (ie. visitors (online/ offline), followers, sponsorships). In the next step, the deviations to the expected outcome of the actions must be shown, indicating how these deviations lead to changes in the chosen communication strategy and/or operative actions, leading to the ultimate achievement of communicative objectives.

38.6 Education Sub-Report

This report focuses on the strategic and operative effect and implementation of the Solar Decathlon Europe and the SDE21/22 with its specific urban transformative topics in the education of students at their respective participating institutions. This report has to be done by or under the full responsibility of the faculty advisers.

Guiding questions are:

- How is the participation in the Solar Decathlon (Europe) or comparable competitions strategically integrated into the curricula and the broader strategy of the university?
- How are the Teams' SDE21/22 concept and corresponding urban transformation topics integrated into research and teaching?

The proposed approach indicates the structure of the communication report applied to the specific topic:

- Analysis including a SWOT Analysis;
- Strategic planning on different levels (Bachelors / Masters / PHD / Research/ Strengthening of connections and cooperation with other schools / field / fields of expertise / companies / authorities;
- Operative planning of measures on different levels (projects, publications, courses, field trips, scientific dissemination of results;
- Implementation, Assessment / Controlling.

38.7 Social Awareness Sub-Report

This report focuses on the strategy and actions for raising social awareness of urban sustainability topics toward target audiences, (notably students of all ages and general public) in the context of the SDE21/22 Competition.

Guiding questions are:

- How can the Team use the SDE21/22 as a tool for teaching sustainable living and urban building practices to students, both in the Team's country of origin and through actions and on-site classes, courses or workshops?
- How can the Team use the SDE21/22 as a tool to teach the general public about sustainable urban living and building practices in the Team's country of origin, through specific actions in Wuppertal, and through the general guided tours on-site?

The proposed approach indicates the structure of the communication report applied to the specific topic:

- Analysis including a SWOT Analysis
- Strategic Planning on different levels (e.g. country of origin, Wuppertal, on-site)
- Operative Planning of measures on the different levels (for instance: courses, actions, tours)
- Implementation, Assessment / Controlling.

38.8 Mandatory Attachments

a) Team Visual Identity Manual

Teams must submit to the SDE21/22 Organisation in Deliverable #3 and onwards, a PDF version of the manual and an annexe .eps, including the vector graphic versions of all the different components. The manual must be consistent with the SDE21/22 Graphic Chart & Brand Manual, which will be available on the SDE21/22 WAT.

The Team's Visual Identity Manual will include the branding and design of, at least:

- Name of the unit (dwelling) and the Team;
- Team logo in its three possible versions (isolated, combined with the SDE21/22's logo, and combined with the Team's supporting institutions and sponsors, in vector graphic format, and coloured and grey scale variations). Please refer to the SDE21/22 Graphic Chart & Brand Manual;
- Rules of use and possible compositions, including a slogan, tagline or baseline, if intended;
- All the Team's supporting institutions and sponsors' logos;
- The chosen typography with all variants used in the communication materials;
- The design of the Team uniform.

[**Note:** In each Deliverable, the Visual Identity Manual must be updated, containing all the information submitted in previous Deliverables, as well as updated developments. Before the final phase of the Competition, Teams must also include the design of their uniforms, to verify compliance with the SDE21/22 Rules.]

b) Sponsorship Manual

The sponsorship manual shall include:

- A list of supporting / sponsoring / collaborating institutions and companies indicating their names, industry sectors and/or fields of work, including the type of collaboration;
- Contact details of Team members in charge of the communication with the company or entity: full name, telephone and e-mail address. This contact information will be used by the SDE21/22 Organisation to review the companies' R&D implication and impact in the Competition, enriching the integrated activity in an international professional network. This information must be included from Deliverable #3 onwards;
- Presentations used to raise sponsorships.

c) Public Tour Description

From Deliverable #3 onward, Teams must describe the route proposed for the Public Tours at SDE21/22 Solar Village, indicating: access and exit of the lot (located in the main roadside); access and exit of the unit; waiting lines and waiting line management; the demonstration unit tour itself (a single route for all visitors). Teams must submit drawings showing the route and contouring: intersection paths' circle diameter, width of doors, corridors, crossings and narrow paths, demonstrating compliance with the accessibility requirements stated in Rule 50 _ Building Codes Application.
A complete tour description is required, indicating the stops established throughout the tour while explaining the unit's features. Different explanations will be required for various target groups; please include a brief description of each. Moreover, Teams must explain the choreography of the route (one Decathlete guiding, or several Decathletes positioned at specific points), the time-length of each tour, the languages used and the number of people per group. Teams intending to realise live demonstrations of the project's mobile elements must include sketches showing the adopted measures to guarantee public safety. If Teams plan any measure for the sensorial or motor disabled, this must also be described. Teams must plan entertainment and/or animation for the public while waiting in line (indicate any type of activity planned and its organisation). In order to verify compliance with the Rules, Teams will submit, before the final phase of the Competition, the design of the brochure (or) handout (or any other) object to be given to visitors. Please refer to Rule 12.5 _ Public Tour for further details. In the same way, any additional information sources must be described, indicating its format (such as posters or electronic means), location and content.
[**Note:** All this information may be explained either with drawing/s and/or on a written document.]

d) Implementation List

This shall contain a list of activities with a short description, date, time (duration), place, the number of participants, audiences or other appropriate variables that indicate outreach. Further documentation of the activities and their impact can include description of concepts through various materials, texts, photos and videos. Please deliver this for all sub-reports separately.

RULE 39 _ SUSTAINABILITY REPORTS

The objective of the Sustainability Report is that the Teams reflect in a document, in a systematic and organised way, all those elements related to the sustainability of the proposals, in such a way that they can be visualized as a whole and make a holistic vision possible as to how this variable has been integrated into the project.

39.1 Circularity Sub-Report

A description of the materials and the joining pieces of the building elements must be provided, highlighting the following sections:

- **Materials:** Precise description of the constructive and building envelope materials selected, including possible toxic substances identified, quantifying the existing recycling-content and marking the future possibilities of recycling, down-cycling, reuse or further use and other ways of following utilisation, such as landfilling, dumping, incineration et cetera. To carry that into execution icons describing the End-of-Life-Way of each material (provided by the SDE21/22 Organisers) have to be used in the drawing AR-31.
- **Construction:** Description of the main construction elements in design, composition and joining technique, in order to gain a high recycling rate. The joining technique of each building element has to been clearly defined. To carry that into execution icons describing the connecting pieces (provided by the SDE21/22 Organisers) have to be used in the drawing AR-31.
- **Maintenance:** Description of the necessary renovation measures in the life cycle of the building and the replacement frequency in which the most important building elements (floors, façade, waterproofing, etc.) must be renewed.
- **Circularity concept:** Teams evaluate their designs regarding the recycling potential of the constructions chosen.
- **Carbon footprint of the construction:** Calculation of the carbon footprint considering the materials used in the project.

A tool for estimating the circularity based on a so-called 'Urban Mining Index – UMI' will be provided by the SDE21/22 Organisers via the SDE21/22 WAT. The UMI is a system for calculating circularity rates for building constructions. In the assessment, the use of recycled or renewable raw materials in the construction phase plays just as much a role as the possibility of subsequent use at the end of the life cycle. For this, the participants record the essential components (floors, exterior walls, windows, interior walls, ceilings and roofs) with the planned materials and masses in the application. While considering the material loop potential, the assembly of the components, and the efficiency of the selective dismantling, buildings and their constructions are evaluated at the level of the component layers with regard to the quality and quantity of the circulation potential.

With the tool, the user can simultaneously record building material data for the calculation of the carbon footprint of the building construction for the Engineering and Construction Contest.

39.2 Sufficiency, Flexibility & Environmental Performance Sub-Report

The 'Sufficiency, Flexibility & Environmental Performance' Sub-Report should address the following categories:

- **Biodiversity:** Measures to strengthen and preserve flora and fauna in accordance with the overall building concept.
- **Society:** Measures to promote a sustainable community must be specified. This includes a sufficient use of living space and concepts that increase space efficiency, as well as issues such as accessibility for people with disabilities, integration and, among others, the solution of acoustic conflict potential.
- **Climate:** Concepts should be developed to mitigate climate change and, at the urban level, micro-climatic heat islands. This includes, among others, the preparation for extreme weather and the efficient use of water resources.
- **Durability:** The most effective way to save resources is to use buildings as long as possible and to avoid demolition and new construction. Concepts that contribute to an increase in the period of use or ensure a high degree of flexibility of the building are evaluated in this context.
- **Building material:** The choice of materials for the building should be sustainable. In contrast to the 'Circularity' Sub-Report, the focus here is on issues such as the distance of the materials from the building site, the mass of the construction and the absence of pollutants and building biology, and the avoidance of component layers.

A more precise definition of the five categories, with about ten sub-categories each, can be found in the 'Urban Loop Design' (ULD) checklist provided in the SDE21/22 WAT. This checklist also is used by the SDE21/22 Organisers for pre-evaluation. A variation in content from the sub-categories of the five categories 'Biodiversity', 'Society', 'Climate', 'Durability' and 'Building material' given in the ULD checklist is possible in order to explain the individual visions.

RULE 40 _ URBAN MOBILITY REPORTS

40.1 General Urban Mobility Report

The Urban Mobility reports will address all three levels of the Team's entry with specific emphasis:

- District level: interaction with public mobility infrastructure, district garage, ...;
- Building level: parking spaces, charging points, sharing concepts, ...:
- House Demonstration Unit: charging of small electric vehicle such as a cargo bike, ...

The report describes the strategies chosen in detail and may refer to reference projects to illustrate experiences. The district level has to include the description of existing (public) transport and mobility situations in the city and the selected district. It must show how the traffic infrastructure of the district is related to the building and the demonstration unit with regard to mobility. The building level must address the parking topic concerning individual mobility and link to plans and/or the Architectural Design Report. In the case of electric mobility options, the energy topic must address and be linked to the Engineering and Construction Report. Teams have to describe in which way the mobility concept will be made visible with the demonstration unit on the Solar Campus. The mobility concept is to be visualized and mapped (e.g. in an QGIS map, shape file).

In addition, the following questions are to be answered in the concept:

- What type of district is there and what are the key characteristics?
- What is the geographical location of the district in the city?
- What is the topography of the city and the quarter?
- How are the areas in the district divided (e.g. according to a land use plan)?
- Where are important destinations in the district?
- How many and what kind of businesses / companies / points of interest are there in the district?
- Can the district be divided into sub-quarters in a meaningful way?
- What is the social structure of the inhabitants of the district and the SDE21/22 building project?
- What are the main means of transport in the city and the district?
- What is the special traffic feature of the city and the quarter?
- How is the district's road network developed in terms of main and secondary roads?
- Which kinds of cooperative measures and / or incentives are proposed by local associations or district organisations?
- How many public transportation stops are there in the district (and where), and what is the frequency in the traffic's peak hours to / from the main or nearest railway station?
- What is the degree of motorization in the city and the district?
- Plan case: Which measures/action concepts can be used to create more environmentally friendly mobility? Show this for the three levels: district, building, HDU?
- What changes do these measures bring in comparison to the current situation?

The documentation will be evaluated based on completeness on all levels, consistency, creativity and innovation with respect to the reduction of the carbon footprint of urban mobility, and the appropriate responses to the needs of the residents. Mobility-specific innovations are to be addressed in the Urban Mobility Innovation report.

RULE 41 _ DINNER PARTY MENU

Teams will have to submit the dinner menu, indicating:

- Name of the courses and drinks;
- List of ingredients and quantities per course;
- Food preparation;
- An image of every course;
- Cost evaluation of the menu;
- Energy consumption for cooking evaluation;
- Nutrition data compared to guest needs;
- Local content of ingredients (according to local context).

RULE 42 _ CONTEST WEEK TASKS' PLANNING

In the general timetable of actions Teams will include the planning given by the SDE21/22 Organisers for the realization of the tasks' sub-Contests during the Contest Week. This timetable will help the Team and the SDE21/22 Organisers to provide the resources needed and plan it in advance.

RULE 43 _ COST ESTIMATE & PROJECT FINANCIAL SUMMARY

Teams will have to submit the Cost Estimate and the Business and Fund-Raising Plan, including updated information and details, from one Deliverable to the next. This section should provide a clear understanding of the costs associated with the project and the need for fund raising, how that fund raising is planned, and whether there are available or obtainable equipment, instrumentation, and facilities.

43.1 Business & Fund-Raising Plan

Teams are required to submit plans that describe their overall project, including a projected budget and fund-raising plan. The plan should include a description of each Team's interactions with other departments involved in fund-raising (e.g., the school's development office), identify key sponsors, and describe the means by which these sponsors may be reached.

43.2 Cost Estimate & Project Summary Budget

Teams must provide complete, current, and accurate cost or pricing. A project summary budget is required according to the price cost proposal form (available in the SDE21/22 WAT). The following guidelines help Teams fill in the cost estimate table.

43.3 Direct Materials

Direct materials are normally purchased parts, purchased items or services (e.g., welding, minor fabrication etc.), raw materials, standard commercial items, interdivisional transfers at other than cost, etc. All direct materials should be identified separately on an attached sheet with the quantity, unit price, and total amount provided. Further, price/cost proposal should indicate whether the unit price for each direct material item was determined and documented using written vendor quotes, catalogue prices, prior invoices, engineering or shop estimates, or some other method with an explanation provided. Provide supporting documentation (cost or pricing data) such as the written vendor quotes, copies of the catalogue page indicating the price, or prior invoices for all direct material items.

43.4 Material Overhead

If the accounting system includes material overhead, propose such indirect costs in this area.
Indicate the rate(s) used and provide an appropriate explanation.

43.5 Direct Labour

Direct labour should indicate the hours, hourly rate, and total for each individual or category of labour proposed.

43.6 Labour Overhead & Fringe Benefits

If the accounting system includes labour overhead, propose such indirect costs in this area. Indicate the rate(s) used and provide an appropriate explanation. If fringe benefits are not included in direct labour and are not a portion of the labour overhead, identify fringe benefits in this area and provide the same type of information concerning fringe benefits as required for labour overhead.

43.7 Lower-tier Subcontractors

Identify each proposed lower-tier subcontractor and obtain a cost proposal containing the same information and in the same format from each proposed lower-tier subcontractor. Consultants: Identify each proposed consultant and the estimated budget of their services.

43.8 Other Direct Costs

Include any direct costs not covered by one of the other cost elements in this area. A detailed list of each cost item including description, and estimated budget is required. An example of this type of costs could be general and administrative expenses, indirect expenses, security activities and services, cost of models, communications costs etc.

43.9 Travels & Costs for Final Phase in Host City

The travels costs will be, for some universities, an important chapter of their budget. The number of Team members and the unit cost estimated of travels, transports, expenses allowance, lodging accommodations and miscellaneous expenses must be defined.

43.10 Insurance Policies

According to the MOU (Memorandum of Understanding) that will be signed between the SCHOOL or UNIVERSITY and the SDE21/22 ORGANISERS (SDE21/22 HOST CITY), 'their respective officers, directors, employees, agents, contractors, subcontractors, and representatives (the 'Released Parties') from any and all claims, losses, expenses, and demands, including those resulting from injury or death to any person or damage to any property, arising from the SCHOOL or UNIVERSITY's work on or participation in the Event or any activities incidental thereto'. Liability Insurance costs, transport insurance, accidents and medical insurances, must be included in the estimated budget of the project.

Additionally, Teams will have to clearly specify the **Total Construction Cost of the House**, indicating the items exclusively corresponding to the construction process and materials. Teams may do so underlining the items in the above-mentioned cost estimate or elaborating a Construction Cost Budget apart.

[**Note:** All costs are calculated including Value Added Taxes (VAT). Local expenses are calculated with local VAT rate. Expenses in the host country are calculated with national VAT rate.]

RULE 44 _ SITE OPERATIONS PLAN

44.1 Objective

The Site Operations Plan (SOP) is an executive document for planning, specific for each Team, in which they must consider all activities, resources, needs and deadlines. The Plan has to guarantee the assembly and disassembly of the unit (HDU) with logic, order and total safety. Every Team must hand in its Plan to the SDE21/22 Organisers, who will draw up the general Site Operations Plan of SDE21/22 Solar Campus that will harmonise the needs of all Teams and avoid interference.

The SDE21/22 Organisers will revise all of the Site Operations Plans of the Teams to verify their efficiency and identify possible conflicts between them. The SDE21/22 Organisers will develop a general Site Operations Plan of SDE21/22 Solar Campus; based on the information sent by the Teams in their Site Operations Plans. These plans must be as specific as possible.

44.2 Content & Structure

The Site Operations Plan will be required from Deliverable #3 onwards and will comply with all the requirements specified in Rule 4 _ SDE21/22 Solar Campus. Information will be updated and specified along with the project development, including further details in each Deliverable. The plan consists of the Site Operations report (to be included in the Project Manual) and the Site Operations drawings (to be included in the Project Drawings).

The Site Operations report must include at least the following sections:

TABLE 26. SITE OPERATIONS PLAN CONTENTS STRUCTURE

1.0 General data	This part must describe general data, aims, and deciding factors.
2.0 Site Operations Coordinators	Names and contacts of each Site Operations Coordinator (One per construction working Team).
3.0 Logistic outside of SDE21/22' Solar Campus	
3.1 Trucks route	Map and brief description of the trucks' route.
3.2 Trucks specifications and shipments	This part must include (for each truck) the type of vehicle, order of entry, dimensions, load per axle of each vehicle, turn ratios, specifications of the load to be transported (including dimensions and weights of all elements) and machinery use for unloading.
4.0 Logistic in SDE21/22 Solar Campus	
4.1 Infrastructures	Description of all infrastructures that will be installed on the lot during the assembly and disassembly phases.
4.2 Construction working Teams	Construction site working Team's composition, including one Site Operation Coordinator on each Team.
4.3 Phases description	Description of all phases of assembly and disassembly process. For each phase, it must include at least working Teams' members, necessary timing and necessary machinery.
4.4 Waste management	Description of the Team's waste management strategy.
5.0 Assembly / Disassembly schedules	Schedules summarizing all assembly and disassembly processes. Must appear: all assembly and disassembly phases, trucks presence, cranes presence and working Teams on site.
6.0 Equipment requirement Chart	Teams must fill in this file, available in the SDE21/22 WAT.
7.0 Assembly & Disassembly Chart	Teams must fill in this file, available in the SDE21/22 WAT
8.0 Site Operations Chart	Teams must fill in this file, available in the SDE21/22 WAT

The Site Operations drawings must include at least the following sections:

TABLE 27. SITE OPERATIONS SECTIONS

SO-001 Trucks shipment	Trucks drawing including shipment view.
SO-101 SDE21/22 Solar Campus	Must include a brief description of SDE21/22 Solar Campus using the drawings that will be given to the Teams by the SDE21/22 Organisers, technical and spatial constraints of the Campus and the way to solve them will be identified. Must include (at least) the truck route into SDE21/22 Solar Campus and waste disposal areas that will be used by the Team.
SO-102 Lot plan	Must include (at least) lot accesses, loading/unloading area with the truck footprint, the crane footprint and the stock area(s).
SO-201 Phases	3D graphics illustrating the assembly and the disassembly phases. Must show the construction evolution and for each phase, crane, trucks and stocks positions.

[**Note:** These documents will be evaluated by the Architecture Jury for the Architecture Contest.]

RULE 45 _ HEALTH & SAFETY REPORT AND DOCUMENTS

The Health & Safety Report, as well as the Health & Safety Specific Terms and Conditions Document, are part of the HS Plan of the project. Please refer to Rule 51 _ Health and Safety for further details.

RULE 46 _ DETAILED WATER BUDGET

The water budget information may either be divided between the Project Drawings and this section of the Project Manual or provided entirely in the Project Drawings. If the information is divided, make sure this section of the Project Manual is clearly referenced on the relevant drawing sheet(s).

RULE 47 _ ELECTRICAL & PV DESIGN SYSTEMS INFORMATION

The Electric and PV design system information have three parts: the One-line Diagram, the Electrical and PV Checklists, and the Project Facts templates. These documents permit the verification of regulation compliance and prepare the monitoring system for the Electrical Energy Balance Contest. The Electric and PV design system documents have direct relation with the information in the Project Manual. However, they are not part of the Project Manual. As stated in the Rule 7.3 _ PV Technology Limitations, the one-line diagram must be included in the Electrical drawings. The Project Facts template is available on the SDE21WAT. The Electrical and PV Chart and Checklists must be submitted as an independent document.

47.1 Electrical and PV Chart and Checklists

Teams must complete and submit the 'Electrical and PV Chart and Checklists'. This is a document that includes the 'Electrical and Photovoltaic Chart', 'Electrical System Design Checklist', 'Photovoltaic Checklist' and 'Electrical Storage System Checklist'. 'Electrical and PV Chart and Checklists' will be included in an Appendix. Teams must use the MS Word template which will be available on the SDE21/22 WAT. Completed 'Electrical and PV Chart and Checklists' documents must be sent as an independent document along with other Deliverable documents (Project Drawings, Project Manual, etc.) from Deliverable #3 onwards. These documents must be submitted as four independent MS Word files. In addition to completing the chart and checklists, Teams must include in the Project Manual all necessary information to evaluate the conformity of their proposals (certificates of compliance, calculus, etc.). Teams must locate the required information indicated on the checklists. Teams that do not send the required documents and information will not be permitted to include the following elements: DC Loads, hard-wired battery bank and battery inverter, and special grid voltage and/or frequency, fire protection on DC side.

RULE 48 _ PROJECT SPECIFICATIONS

A new structure for the documentation of the project specification is provided by the SDE starting from Deliverable 4. The new documentation has a systematic approach in order to feed the BIM Model, as well as referring to the Project Facts. Although that for D#4 it is not mandatory to fill the GUIDs according to the BIM Model, but it is recommended, because by D#5 it is mandatory to have it filled. An Excel sheet Template along with the categorisation guideline as well as the document naming method will be provided. The Excel sheet is a controlling sheet for all the submitted pdfs, it provides a quick sight of the content of the folders without having to go through each. This foreseen documentation method provides a better information documentation management to facilitate the traceability for future research purposes. Following is a quick overview of the new structure:

- **Architectural Elements**
  - 01 _ Construction materials;
  - 02 _ Cladding material;
  - 03 _ Construction boards;
  - 04 _ Thermal Insulation;
  - 05 _ Waterproofing;
  - 06 _ Facade materials;
  - 07 _ Openings;
  - 08 _ Ceiling and Flooring;
  - 09 _ Furnishing;
  - 10 _ Others.
- **Technical Building Services**
  - 01 _ Elevator;
  - 02 _ Plumbing;
  - 03 _ Electrical;
  - 04 _ HVAC;
  - 05 _ Fire Protection;
  - 06 _ Solar systems and PV;
  - 07 _ Appliance;
  - 08 _ Vehicle;
  - 09 _ Other.

48.1 Appliances & Home Electronic Equipment (specifications & user manuals)

This section must be submitted from Deliverable #4 and onwards, and must include:

- **The 'Appliances and Home Electronic Equipment Tables' (filled out by the Team):** In these tables, Teams will include all the appliances and equipment that they plan to use for Contest 8 House Functioning, indicating compliance with the requirements stated in Rule 22. These tables will be part of a future version of the 'Project Facts' that will be available on the SDE21/22 WAT;
- **Appliance specifications and user manuals:** With the technical specifications, Teams will justify the Rules compliances related with capacity, volume, as well as other important information such as energy consumption and energy class (label). The user manual help to know the appliances general characteristic and cycles options;
- **Home electronic equipment basic specifications and user manuals:** With the technical specifications, Teams will justify the Rules compliances related display sizes, as well as other important information as their energy consumption and energy class (label). The user manual helps to know the appliances general characteristic and display brightness setting (Rule 22 _ Sub-contest 8.8).

Notes:

- Only include the sections of the appliances' user manuals related with the appliances' general characteristics, cycles and energy consumption.
- From the TV and computer display user manuals, only include the sections related with their general characteristics, energy consumption and display brightness settings.
- If there are not English versions of the manuals or specifications, Teams must include copy of the documents in the original language and an English translation of the parts that justify the Rules compliance.
- Teams intending to use energy saving programs during the final phase of the SDE21/22 Competition must communicate this to the SDE21/22 Organisers.
- The SDE21/22 Organisers will define the appliances' cycles be used during the Competition.

RULE 49 _ STRUCTURAL CALCULATIONS

Structural calculations for the demonstration unit include the unit itself and all site components (terraces, railings, ramps, stairs, etc.). These calculations must comply with the requirements stated in the SDE21/22 Building Code.
For structural aspects not covered by the SDE21/22 Building Code the structural designer will use requirements stated in their local Building Code.

As required in Rule 6.1a _ Structural Design Approval, a qualified licensed professional must certify that the structural provisions of the Solar Decathlon Europe Building Code have been met by the design, and that the structure of the units, terraces and all site component is safe to be used and visited by the general public, if it has been built as designed.
Each Team must submit structural drawings and calculations that have been signed and stamped by this qualified licensed professional, and the Team is responsible for constructing and assembling their units following these signed structural documents.
If there are any change in the unit or site component that require an adjustment or modification of the signed structural design or details, a qualified licensed professional must certify that the new or revised structural solution met the SDE21/22 Building Code structural requirements and it is safe to be used and visited by the general public.

In the case that structural requirements of the local Building Code are more restrictive than the SDE21/22 Building Code, it is recommended that the Team follow their local Build Code (the most restrictive one). In that way, the unit will can be assembled in SDE21/22 Solar Campus and also in the Team's country.

49.1 Structural Calculations Justification

The structural calculations justification must have the following sections:

Justification

The justification of the adopted structural solutions, including a description of the unit (HDU) bearing system and the list of codes used for the design and construction.

- A description of the materials and its resistant properties;
- Actions carried out: Particularly, the different wind hypothesis of pressure/suction over the envelope will be detailed through the use of sketches;
- Loads combinations made and safety factors used: Loads considerations during the unit transportation, assembly and disassembly;
- Calculations model's) description, identifying the software (program object and application field), indicating the adopted simplifications, the methodology of the analysis done, specific models of singular areas where traditional material resistant theories can't be applied, edging or supporting conditions, type of connections, etc;
- Tensional and distortional verification results, explaining the representation of the software or obtained calculations results, indicating the phases or hypothesis in which dreadful efforts are produced, and covering all the different phases (transport, assembly and use);
- Deflection calculations and tabulated results. Applicable expansion, contraction, and crack-control measures;
- Superficial footing design, indicating soil bearing pressure of each footing (For further details, please refer to Rule 4.4);
- Structural fire resistance justification, according to the national codes of the Team's country of origin.

For materials not being considered in the Rules, Teams must submit a document signed by a competent technician. This document justifies the resistant properties of the materials and the design, from a structural safety point of view, considering the actions indicated in their national codes.

section 4.0: building code

Although there is some degree of overlap between the two, it is important to note some crucial distinctions between the Solar Decathlon Europe 2021 (in 2022) Rules and the Solar Decathlon Europe 2021 (in 2022) Building Code. Rules exist primarily to promote a fair and interesting competition. The SDE21/22 Building Code exists primarily to protect public health and ensure safety. Failure to comply with the Rules may result in official warnings, penalties point, or disqualification from the Competition. Failure to comply with the SDE21/22 Building Code may prohibit the participation of the unit in any aspect of the overall Competition. Therefore, compliance with the SDE21/22 Building Code is a prerequisite for participation in the Competition. The SDE21/22 Building Code is the planning basis for the House Demonstration Units (HDU) and is binding in all parts. For the Design Challenge, the SDE21/22 Building Code can be considered, but compliance with the regulations is not necessary.

RULE 50 _ BUILDING CODES APPLICATION

50.1 General Criteria

Due to the international character of the Competition, it has been decided that the participating universities will use the Building Code and Regulation of their country for their Design Challenge and the House Demonstration Unit (HDU). All the participating countries have similar regulations developed with recognized reliability and safety. Further regulations will only exist for the execution of the HDU to comply with the German laws, especially because of the health and safety of public visitors. The Teams themselves are responsible for compliance with all regulations. Technical revision of the proposals will include a risk analysis of the different proposals, evaluated neutrally, making those suggestions and recommendations deemed necessary to guarantee the safety of the people in accordance with German regulations. Each Team shall submit a certificate assuring the compliance of the Team country of origin codes signed by the faculty advisor. By signing this document, the faculty advisor certifies that the house complies with all the codes of the country of origin, and so the house is safe for the public to enter if it has been built as designed.

A distinction is made between 'Public Areas' which are part of the guided tours and 'Restricted Areas' which are only to be entered by Decathletes and official persons (jury members, SDE21/22 Organisers etc.).

It is allowed and desirable to plan the HDU completely for people with special needs (including all regulations with regard to bathroom, light switches, etc.), but it is not compellingly necessary. The public tour must allow unrestricted access for these persons without external assistance (see Accessibility in chapter 50.3). For that, the following regulation, as an abstract (not complete) of the national laws, have to be followed.

50.2 Applicable Codes

The Solar Decathlon Europe 2021 (in 2022) Building Code includes an extracted selection of the most significant safety aspects that the German construction regulations enforce. The following regulations have been adopted as a reference for the drawing up of the Solar Decathlon Europe 2021 (in 2022) Building Code. The most important aspects of the ordinances and standards specified in the Building Code are illustrated for the respective subject areas.

a) General Construction Regulation in Germany

- **Bauordnung für das Land Nordrhein-Westfalen** (Building Code for the state of North-Rhine-Westphalia)
  - > Date of issue: 21. Jul. 2018, Die Landesregierung Nordrhein-Westfalen (The State Government of North Rhine-Westphalia)

  Correction of errors: 02. Oct. 2019

  Notes: As the House Demonstration Units (HDU) are open for public visits and are situated in an industrial / commercial area they are classified as Building Class 1. The buildings are erected as Special Buildings / 'Sonderbau' as stated in §50 BauO NRW. // This fact concerns requirements regarding Fire Safety, dimensions of staircases etc. which will be described in Rule 50.3 of the Building Code.

b) Building Products/ Types of Construction

- **Bauordnung für das Land Nordrhein-Westfalen** (Building Code for the state of North-Rhine-Westphalia) §3 and §17 -25
  > Date of issue: 21. Jul. 2018, Die Landesregierung Nordrhein-Westfalen (The State Government of North Rhine-Westphalia)

  Correction of errors: 02. Oct. 2019

  Notes: All building products used in Germany in the building industry usually require test certificates from the German building authorities. These test certificates are available for most building products sold in the EU. // For the materials and products used or included in the SDE21/22 HDU, the Teams must at least have building authority approvals from their respective country of origin. // If Teams wish to use non-approved or newly developed products in their HDU, they should notify the SDE21/22 Organisers as early as possible. The SDE21/22 Organisers will try to get a permission from the building inspectorates in cooperation with the Teams.

c) Accessibility for People with Special Needs

- **DIN 18040-1:** Barrierefreies Bauen – Planungsgrundlagen – Teil 1: Öffentlich zugängliche Gebäude (Construction of accessible buildings –Design principles – Part 1: Publicly accessible buildings)
  > Date of issue: Oct. 2010, Deutsches Institut für Normung e.V. (German Institute for Standardization e.V.)

  Note: An English version similar to the German rule is EN 17210 (EN=European Standard). The title of EN 17210 is 'Accessibility and usability of the built environment – Functional requirements.'

d) Fire Safety

- **DIN EN 13501-2:** Klassifizierung von Bauprodukten und Bauarten zu ihrem Brandverhalten – Teil 2: Klassifizierung mit den Ergebnissen aus den Feuerwiderstandsprüfungen, mit Ausnahme von Lüftungsanlagen (Fire classification of construction products and building elements – Part 2: Classification using data from fire resistance tests, excluding ventilation services)
  > Date of issue: Dec. 2016, Deutsches Institut für Normung e.V. (German Institute for Standardization e.V.)

  Notes: Although they could be regarded as temporary buildings the HDUs at the SDE21/22 Solar Campus must follow the Rules related to permanent buildings. // Components must be verified by tests in accordance with EN 1363 et seqq.
- **Bauordnung für das Land Nordrhein-Westfalen** (Building Code for the state of North-Rhine-Westphalia) § 33
  > Date of issue: 21. Jul. 2018, Die Landesregierung Nordrhein-Westfalen (The State Government of North Rhine-Westphalia)

  Correction of errors: 02.10.2019
- **DIN ISO 23601:** Sicherheitskennzeichnung – Flucht- und Rettungspläne (Safety identification – Escape and evacuation plan signs)
  > Date of issue: Dec. 2010, Deutsches Institut für Normung e.V. (German Institute for Standardization e.V.)
- **DIN EN 13501-1:** Klassifizierung von Bauprodukten und Bauarten zu ihrem Brandverhalten – Teil 1: Klassifizierung mit den Ergebnissen aus den Prüfungen zum Brandverhalten von Bauprodukten (Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests)
  > Date of issue: May 2019

e) Structural Safety

- **Eurocodes 0-9 / EN 1990-1999** (harmonised legal framework for the structural design of buildings in the European Union)
  Note: Structural systems shall be designed in accordance with the appropriate prescriptive provisions in the home country of the Teams. In addition, the SDE21/22 Building Code defines the standards concerning design loads etc. that are developed on the basis of the European Standards.

f) Electrical regulation

- **DIN 18015-1:** Elektrische Anlagen in Wohngebäuden – Teil 1: Planungsgrundlagen
  (Electrical installations in residential buildings – Part 1: Planning principles)
  > Date of issue: Sep. 2018, Deutsches Institut für Normung e.V. (German Institute for Standardization e.V.)
- **DIN VDE 0100-410:** Einrichten von Niederspannungsanlagen – Teil 4-41:
  Schutzmaßnahmen – Schutz gegen elektrischen Schlag (Low-voltage electrical installations – Part 4-41:
  Protection for safety – protection against electric shock)
  > Date of issue: Oct. 2018, Deutsches Institut für Normung e.V. (German Institute for Standardization e.V.)
- **DIN VDE 0100-701:** Errichten von Niederspannungsleitungen – Teil 7-701 – Anforderungen für Betriebsstätten,
  Räume und Anlagen besonderer Art – 96rt emit Badewanne oder Dusche (Low-voltage electrical installations –
  Part 7-701: Requirements for special installations or locations – Locations containing a bath or shower)
  > Date of issue: Aug. 2016, Deutsches Institut für Normung e.V. (German Institute for Standardization e.V.)

g) Technical Building Services

- **DIN 1988-200:** Technische Regeln für Trinkwasser-Installationen – Teil 200: Installation Typ A
  (geschlossenes System) – Planung, Bauteile, Apparate, Werkstoffe; Technische Regel des DVGW
  (Codes of practice for drinking water installations – Part 200: Installation Type A (closed system) -
  Planning, components, apparatus, materials; DVGW code of practice)
  > Date of issue: May. 2012, Deutsches Institut für Normung e.V. (German Institute for Standardization e.V.)
- **DIN EN 12975-1:** Thermische Solaranlagen und ihre Bauteile – Kollektoren – Teil 1: Allgemeine Anforderungen
  (Thermal solar systems and components – Solar collectors – Part 1: General requirements)
  > Date of issue: Jan. 2011, Deutsches Institut für Normung e.V. (German Institute for Standardization e.V.)
- **DIN EN 12897:** Wasserversorgung – Bestimmung für mittelbar beheizte, unbelüftete (geschlossene)
  Speicher-Wassererwärmer (Water supply – Specification for indirectly heated unvented (closed) storage water heaters)
  > Date of issue: Dec. 2016, Deutsches Institut für Normung e.V. (German Institute for Standardization e.V.)

h) Building Physics

- **Verordnung über energiesparenden Wärmeschutz und energiesparende Anlagentechnik bei Gebäuden**
  (Ordinance on energy-saving thermal insulation and energy-saving system technology for buildings)
  > Date of issue: 24. Jul. 2007, Bundesregierung (federal government)
  Correction of errors: 24. Oct. 2015

50.3 Building Planning and Construction

a) Building Requirements

Staircases

Staircase Geometry and Materials

- The useable width of the staircase should be ≥ 100 cm.
- Stair treads shall be a minimum of 26 cm deep with risers a maximum of 19 cm
  and a minimum of 14 cm high for any portion of the stairs with access to the public (DIN 18065).
- Stairs can be included in the public tour. For people with special needs, there must be an equal
  and appropriate access to any point of the house shown to the public (e.g. ramps or elevators).
- Stairs or ladders with steeper geometries can be shown as examples. They cannot be used by anyone
  and must be secured with a chain.

Handrails

- Handrails shall be provided on both sides of stairs used by the public during the display.
- Stairs not used by the public should provide a handrail on one side of the staircase.
- Their height should be between 85 cm and 90 cm, measured vertically from top of the handrail to the front of the steps.
- At the beginning and end of the flights of stairs, handrails must be continued horizontally at least 30 cm.
- An interruption of the inner handrail at stairwells and intermediate platforms is not permitted.

Protection against undermining of stairs

- The underside of staircases with less than 2.20 m of headroom must be protected against the risk of injury, especially for visually impaired people (DIN 18040-1).
- Teams must plan structural measures such as upstands, furniture or tactile elements in the floor covering to protect people from undercutting stairs. Strong visual contrast can also minimize the risk of injury.

Ramps

A 'ramp' is any sloping surface used as part of the circulation path that has a slope in excess of 3%.

Ramps Surface

- The useable width of the ramp should be ≥ 120 cm.
- The slope of a ramp cannot exceed 6 % (maximum inclination angle 3.43°) Cross slope is not allowed.
- Maximum length for a ramp without a platform is 600 cm.
- Wheel deflectors are required on both sides of the runway. Their height should exceed 10 cm. (DIN 18040-1)

Platforms and Landing Zone

- The length of a platform is minimum 150 cm, the useable width should be 120 cm.
- A 150 x 150 cm platform is needed at any point where a ramp changes direction.
- At the top and bottom of any ramp, a landing zone with dimensions 150 x 150 cm is required.

Handrails

- Handrails shall be provided on both sides of ramp, interruption at platforms is not permitted.
- Height between 85 cm and 90 cm, measured vertically from the top of the handrail towards the ramps surface.
- The handrail begins and ends with the ramp run, it must not protrude into the landing zone.
- Distance for handrails from the wall or guardrail should be minimum 50 mm.

Guardrails / Fall Protection

- The height of guardrails must be ≥ 90 cm.
- The distance between railing parts in one direction should not exceed 12 cm.
- Overclimbing by small children should be prevented by e.g. vertical bars or a glass panel/closed surface up to a height of 70 cm. A handrail pulled inwards by at least 15 cm is another option (DIN 18065).
- Guardrails must be provided for areas that are directly adjacent to areas that are more than 1 m lower.

Ceiling Height

- Ceiling height shall provide a minimum of 2.40 m of headroom between the surface of the floor and ceiling.
- A height of at least 2.20 m is sufficient for rooms in the attic and basement. Rooms under a sloping roof must have this height above at least half of the floor area.
- Parts of the house or parts of one area of the House Demonstration Unit (HDU) are allowed to have a ceiling height of 2.20 m. Teams must identify these spaces in their drawings and have them confirmed by the SDE21/22 Organisers.

Slipperiness of the floors

- Slip and slip resistance is of crucial importance for safe walking on floor coverings. Interior floor coverings are assigned to the evaluation groups R9 (lowest requirements) to R13 (very high requirements) for slip resistance.
- It is necessary to protect dry/interior areas from exterior areas with effective measures e.g. carpets.
- Floor coverings must be slip-resistant, fixed and suitable for use by wheelchairs, rollators and other assistants.
- The 'German Statutory Accident Insurance' (DGUV/Deutsche Gesetzliche Unfallversicherung) specifies the conditions of floor coverings in work areas and public buildings.
- Slip Resistance is determined according to the test methods described in standard CEN/TS 16165.
- To avoid the risk of slipping, floors shall comply with the floor classes provided in Table 28.

TABLE 28. REQUIRED FLOOR CLASSES DEPENDING ON THEIR LOCATION.

LOCATION AND FLOOR CHARACTERISTICS	CLASS
Dry interior areas, including stairs and ramps	
Surface's slope less than 5%	R9
Surface's slope equal to or greater than 5%.	R10
Humid interior areas, such as building entrances from the outside (direct access to restricted areas excluded), roofed terraces, bathrooms, toilets, kitchens, etc.	
Surface slope less than 5%	R10
Surface slope equal to or greater than 5%.	R11
Exterior areas, including stairs and ramps	
Surface slope less than 5%	R11
Surface slope equal to or greater than 5%.	R12

Glazing

Depending on their inclination towards the vertical, glazing is divided into horizontal glazing (Inclination < 10°) and vertical glazing (Inclination ≥ 10°)(DIN 18008).

Vertical Glazing

- Monolithic single glazing made of coarsely breaking glass types (e.g., float glass, drawn flat glass, ornamental glass) and laminated glass, the upper edge of which is more than 4 m above traffic surfaces, may only be used if they are stored on all sides.
- Monolithic single glass or outer monolithic panes of Insulating Glass (IG) made of tempered or toughened glass may only be installed if their upper edge is less than 4 m above traffic areas due to the probability of failure due to nickel sulphide inclusions (spontaneous fractures).
- Vertical Glazing with parapet height ≤ 80 cm (18008-4):
  - > Single glazing must consist of laminated safety glass (LSG).
  - > For the side facing the impact (attack side) of multiple panes insulating glass, only laminated safety glass (LSG), tempered glass or laminated glass made of tempered glass can be used.
  - > In general, at least one pane of multi-pane insulating glass must be made of laminated safety glass.
- Barrier Glazing subjected to horizontal loads and securing people on traffic areas against falling to the side must be made of at least one pane of laminated safety glass.
- Glass doors must be made of safety glass.

Horizontal Glazing

- For skylights, at least the lower pane must be made as safety glass.
- If laminated safety glass consists of more than two glass panes, the two lower glass panes must consist of safety glass.
- Glass solar collectors or PV-modules used overhead without a solid surface underneath (such as a roof) will be regulated as skylights.
- Walk-on Glazing must consist of at least three planes of laminated safety glass.

Moveable Features

- Teams planning to move or transform major components of their houses beyond the assembly and disassembly phases are required to obtain special approval from a SDE21/22 HS Official.
- Possible design features meeting this description include large, unusual, and potentially dangerous features, such as moveable rooms and walls, changeable façades, collapsible spaces, and folding beds.
- This requirement does not apply to smaller, more typical house features that may be reconfigured, such as awnings, operable windows and window coverings, and doors.

Material Safety

Thermal Storage/PCM

- All thermal storage devices ("mass"), such as phase change materials, must be made of stable, non-toxic materials. For all heat-transfer fluids, Material Safety Data Sheets (MSDS) must be submitted for approval.
- Phase-change materials included within building components must be identified on the plans. Specifications for the material composition must be provided with any available fire-performance testing data. Be advised that phase-change embedment in gypsum board or interior wall or ceiling finishes may affect the ability of these materials to pass required fire tests.
- All liquid-based thermal storage systems must be marked with the hazard warning symbols appropriate to the technology.

Paint Disposal

- Teams are not permitted to dispose of paint on the competition site.
- Teams may either take unused paint home or contact a local facility that disposes of or recycles paint.

Material Safety Data Sheet (MSDS)

- MSDS are required for all potentially hazardous materials to be used at the event, such as cleaning solvents, glycol, rubber cement, rubbing alcohol, etc.

Prohibited Groups of Pollutants

- Asbestos, Dichlorodiphenyltrichloroethane (DDT), Lindane, mineral wool produced before 2000, Pentachlorophenol (PCP), Polychlorinated Biphenyl (PCB) and blowing agent based on Chlorofluorocarbons (CFCs) are prohibited in Germany because they are carcinogenic, organ-damaging and/or toxic to reproduction.

Flat roofs

Roof Waterproofing

- Flat roofs must have a connection height in relation to rising building (DIN 18531-1).
- The connections on rising components are as follows:
  - for used roofs ≥ 0.15 m over the waterproofing layer
  - for unused roofs
    - with a roof pitch of up to 5° (8.8 %) ≥ 0.15 m as well as
    - with a roof pitch of more than 5° (8.8 %) ≥ 0.10 m over the waterproofing layer.
- In the case of waterproofing with a protective layer, gravel, surfacing or vegetation, the dimension given above applies from the top edge of these layers.
- The height of the waterproofing elevation at the edge of the roof/attic is ≥ 0.10 m above the surface of the covering or gravel fill for used and unused roofs.

Barrier-free door connections

- For barrier-free door connections and connections with reduced connection height, suitable measures must be taken to avoid splash water contamination and backwater in the connection area, e.g. drainage channels with grating covers (DIN 18531-3).

Roof Drains

- For flat roofs with parapets, at least two gutter outlets (or one gutter outlet plus one emergency overflow) shall be provided for each part of the roof area.

Emergency Drains/ Overflows

- Emergency drains or overflows should be provided for flat roofs with balustrades and non-suspended gutters to reduce the risk of rainwater entering the building or overloading the structure.
- Emergency overflows must always be provided for roofs with internal gutter drainage and for flat roofs in lightweight construction. Emergency drainage is to be routed freely to the property.
- The Roof Drains and Emergency Overflows must be able to drain the roof surface for at least five minutes in the event of a century-old rainfall (DIN 1986-100):
  - values for a rain duration of 5 minutes in Wuppertal:
    - dimensioning: r(5,5) = 352 l/s*ha
    - emergency dewatering: r(5,100) = 684 l/s*ha

Fall protection

- If it is necessary to enter the roof for maintenance purposes (e.g. to maintain the PV system), there must be a fall protection option for these persons.

b) Accessibility

General Requirements

Accessible Design

- An accessible route usable for people with special needs must be provided within the unit to all spaces opened to the public (DIN 18040-1).

Drawing Requirements

- Accessibility-related information, e.g., widths of ramps, steps, doors and narrow areas in the tour route, and wheelchair turning circles must be drawn in interior and exterior plans.
- Drawing(s) must be made showing the public tour route, indicating the dimensions of any difficult point, complying with the accessibility requirements.

Technical Requirements

Access to the Building

- At least one access to the interior must be free from barriers and obstructions that impede access for wheelchair users.

Accessible Route

- Traffic areas and corridors must be sufficiently wide for use with a wheelchair or walking aids, even in the case of encounters. Sufficient is a usable width
  - > Of at least 1.50 m
  - > Of at least 1.20 m for the maximum length of 6 m, if there is no change in direction. A turning area before and after is required
  - > Of at least 0.90 m, if the narrow is no longer than 0.50 m
- In the Public Tour Route, where 180º changes of direction are foreseen, the minimum unobstructed area available shall inscribe a square of 1.50 m x 1.50 m.

Habitable Roof Deck and Interior Second Floor/Loft Levels

- A roof deck, loft, or upper level accessed via stairs, or other means of inaccessible access, cannot be part of the public route
- Nevertheless, it is possible to present these areas to the juries
- Any provided means of access to internal second floor levels and habitable roof decks shall be fully gated or cordoned off to inhibit entry during public exhibit periods.
- If Teams want to make these areas accessible to the public, it must be possible to access them with a wheelchair, for example by means of an elevator.

Changes in Elevation

- All changes in elevation (including even minor changes in areas such as door thresholds) must be considered along an accessible route.
- Level differences must be solved by means of ramps. Steps are not permitted.

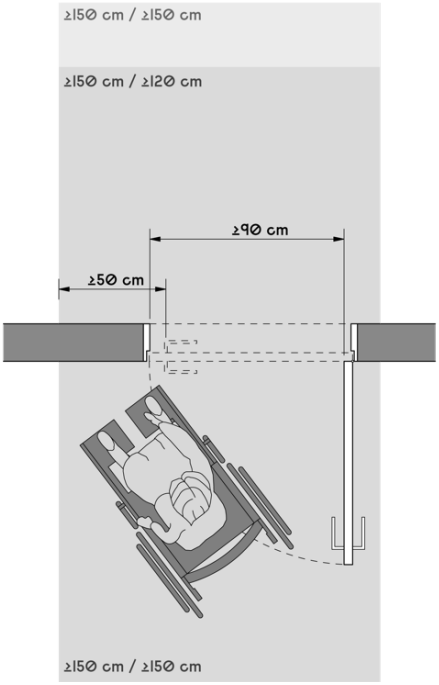
Elevators

- If the Team wants to show a possible second floor of the building unit to the public, an elevator, a lifting platform or a stairlift is required.
- The minimum clear size of the elevator cabin/platform is 1.10 m x 1.40 m.
- The minimum width of the door must be 90 cm.
- There must be a handrail on at least one site of the cabin/platform.

Doors

- The height of the threshold of the door will be at least 2.05 m in clearance.
- In the Public Tour Route, the minimum clear width of the doors will be 90 cm, providing there is an unobstructed space for the movement of the doors of 1.50 x 1.50 m rectangular free space, both before and after them.
- The movement areas in front of doors start at least 50 cm to the side of the lever handle (see Figure 21). This space is necessary to permit opening of the door by a wheelchair user or a walking frame user. This requirement does not apply where automatic doors are provided.
- Lower door hinges and thresholds are not permitted. If they are technically indispensable, they must not be higher than 2 cm.
- Doors without a 1.50 m square for movement on both sides of the door may be accepted as part of the accessible route if 90 cm minimum clearance is provided through the door opening with the door secured in the fully open position. Doors without required clearances intended to remain open must be clearly identified on the plans and approved by the SDE21/22 Organisers.

FIGURE 21. MOVEMENT AREAS IN FRONT OF SWING DOORS.



Safety Requirements

Impact due to fragile elements and not very perceptible elements

- Glazed (glass) walls and fully glazed doors shall be clearly marked with visual indicators. Large, glazed areas close to circulation spaces could be mistaken for openings.
- Visual indicators of at least 8 cm height shall be placed at a height of 40 cm – 70 cm and 120 cm – 160 cm above floor level.

Impact due to fixed elements

- For safety reasons, even for tall people, the usable height above traffic areas must ≥ 220 cm, except for doors, passageways and clear stairway heights.
- Equipment elements in house tour areas shall be visually contrasting and suitable for long-stick palpation by visually impaired people, e.g. by:
  - reaching down to the ground;
  - ending max. 15 cm above the ground, being supplemented by a plinth at least 3 cm high, in accordance with the outline of the equipment element or being equipped with a tactile strip which ends max. 15 cm above the ground.

50.4 Fire Safety

General Requirements

Prescriptive Requirements / Fire Protection Plan

- Teams should provide a fire protection/escape route plan for the HDU. This single plan is intended to provide an overview of the escape routes and show the location of the fire extinguishers (ISO 23601).
- The plan needs to contain:
  - Building ground plan (scale and detail depending on unit size);
  - Escape and rescue routes;
  - Location of rescue exits;
  - Location of emergency and rescue equipment (e.g. fire detector, first aid kit etc.);
  - Location of fire-fighting equipment (e.g. fire extinguishers, etc.);
  - Location of the emergency meeting points;
  - Rules of conduct in case of emergency/fire;
  - Legend explaining the used security signs, graphic symbols and colour codes.
- During the entire event, at least one Team member must be responsible for compliance with the safety rules.
- Before the public visit of the building is allowed, the Fire Protection Plan must successfully pass the SDE21/22 Organisers' examination.

Preventive Measures for the Case of Emergency

- For security reasons, a maximum of 20 visitors may be in the HDU at a time.
  Each Team is responsible for the count of the visitors to provide a safe usage and public tours;
- Each HDU needs in minimum one fire extinguisher in a central position on each floor;
- The SDE21/22 Organisers recommend a foam fire extinguisher with extinguisher rating:
  21A, 144B according to DIN EN 3-7;
- Teams need to install smoke alarms in the living-room and in the bedrooms.
  Smoke alarms can be battery-driven and must be interconnected to each other.

Technical requirements

Fire Resistance Classes

- Building materials are divided into fire resistance classes according to their fire resistance duration.
  Those classifications are regulated by the European Standard EN 13501-2.
- The classes consist of:
  - numbers that indicate the fire resistance duration in minutes;
  - letters that indicate the respective performance criterion.
- The abbreviations in accordance with EN 1365-1 are used as follows:
  - Load capacity I; Room closuI(E); Thermal insulation (I).
- The European classification becomes clear with the following examples:
  - R 30 load-bearing; 30 min fire retardant;
  - RE 60 load-bearing + room closure; 60 min highly fire retardant;
  - REI 90 load-bearing + room closure + thermal insulation; 90 min fire resistant.

TABLE 29. EN 13501-2 ASSIGNMENT TO THE BUILDING SUPERVISORY REQUIREMENTS.

BUILDING AUTHORITY REQUIREMENTS	LOADBEARING PARTS WITHOUT ROOM CLOSURE	LOADBEARING PARTS WITH ROOM CLOSURE	NON-LOADBEARING INTERIOR WALLS	NON-LOADBEARING EXTERIOR WALLS	DOUBLE FLOORS	INDEPENDENT SUSPENDED CEILINGS
fire retardant (30 minutes)	R 30	REI 30	EI 30	E 30 (i→o) and EI 30-ef (i←o)	REI 30	EI 30 (a↔b)
highly fire retardant (60 minutes)	R 60	REI 60	EI 60	E 60 (i→o) and EI 60-ef (i←o)		EI 60 (a↔b)
fire-resistant (90 minutes)	R 90	REI 90	EI 90	E 90 (i→o) and EI 90-ef (i←o)		EI 90 (a↔b)
fire-resistance (120 minutes)	R 120	REI 120	-	-		-
fire resistant wall	-	REI 90-M	EI 90-M	-		-

Requirements for the HDU

- The Teams must design their House Demonstration Unit (HDU) in case of fire safety in accordance with the European Standards.
- In Table 30 the requirements for the most important building parts are defined.
- During the design process, Teams need to involve a safety engineer to evaluate the fire protection relevant components and develop a fire protection concept for the HDU (refer to template in the WAT). This must be submitted to the SDE21/22 Organisers as part of the deliverables.

TABLE 30. MINIMUM REQUIREMENTS FOR THE BUILDING STRUCTURE OF THE HDU.

COMPONENT	PART	REQUIREMENTS
Primary Structure	loadbearing walls, columns and bracing	R 30
Roof	loadbearing structure of the roof	no requirements
Staircases	Loadbearing structure on escape routes	no requirements
Wall & Floor Coverings	interior and ceiling slabs	no requirements
	raised floors in escape route	no requirements
All applied Building materials	all parts	E-d2; EL-d2; Efl according to DIN EN 13501-1:2010-01 or Eca according to DIN EN 50575:2017-02
Rooms for lithium-ion-storage with a storage capacity over 2,5 kWh	perimeter walls	EI 30 according to DIN EN 13501-2:2016-12
	door	SaC5 according to DIN EN 16034:2014-12 incl. DIN EN 16034 Ber 1:2018-02
	openable window	preferably available for ventilation in case of fire

Escape Routes

- There must be at least two independent escape routes to the open air on each floor. However, both escape routes may lead within the floor over the same necessary corridor.
- For rooms that are not at ground level, the first escape route shall be via a staircase. The second escape route may be another staircase or a place within the unit of use which can be reached with firefighting / rescue appliances.
- Windows used as escape routes must be at least 0.90 m x 1.20 m in usable size and no higher than 1.20 m above the upper edge of the floor. If these windows are in roof slopes or roof structures, their lower edge or adjacent step must not be more than 1.00 m away from the eaves edge measured horizontally.
- A second escape route is not required, for rooms situated at ground level which have a direct exit to the outside which can be reached from any point in the room at a maximum distance of 15 meters.
- The minimum useable width of the escape routes shall be 1.00 meters (including stairs) to provide a safe and fast evacuation of the HDU.
- In doorways there may be a reduction of up to 15 cm, i.e. the usable width here must be greater than 0.90 m.
- Doors along the escape route can be opened directly by anyone without tools.

50.5 Structural Safety

General Requirements

Approved Calculations and Drawings

- All structural calculations must be made using the Eurocodes (EC 0-9/EN 1990-1999).
- The structural drawings and calculations included in the Construction Documents shall be signed and stamped by a qualified, licensed design professional. Obtaining the stamp is the responsibility of the Teams, not the SDE21/22 Organisers.
- The SDE21/22 Organisers will submit stamped structural drawings and calculations to a German licensed structural engineer or any other official authority for final approval.
- It is strongly recommended that Teams involve a structural engineer throughout the design process, because structural design changes that could affect other aspects of the house could be required.

Structural Design Challenges for Solar Decathlon Europe 2021

- Please note the document 'Solar Campus Specifications' with further information regarding foundation and ground specifications.
- In addition to meeting the Eurocodes, special attention must be given to the structural design challenges unique to the Solar Decathlon Europe 2021.
- These challenges include, but are not limited to the following:
  - Increased live loads because of public access to houses cf. Eurocodes (EC 0-9/EN 1990-1999): ≥ 2 kN/m²;
  - Tie-downs are not suitable due to different ground conditions on the Solar Campus;
  - Use of low-impact footings to protect the competition site surface;
  - Unique wind-loading conditions because of roof-mounted solar systems;
  - cf. Eurocodes (EC 0-9/EN 1990-1999): Wuppertal Zone 1;
  - Increased dead loads because of unusual mechanical and electrical components and equipment.

Drawing Requirements

- For structural framing, a one-line structural plan view drawing is required at a minimum.
- Successive plan sheets shall be provided and shall include footings, floor framing, wall locations, and roof framing.
- All structural components shall be listed including sizes, species and grade, and repetitive spacing (on-centre distances).
- Drawings should include details on connections between joists and beams, floor systems and foundations, walls and floors, rafters and beams, etc. Specify proprietary hangers or other mechanical connections.

- Provide a foundation plan for a temporary setup on the competition site. Plans shall include location and size of all pad footings and required tie-down anchors (e.g., type, number, and installation configuration) to prevent wind uplift or overturning. Please note the document 'Solar Campus Specifications' with further information regarding foundation and ground specifications.
- Structural plans shall include design details for any exterior appurtenances/constructions such as decks, stairs, ramps, awnings, canopies, and roof projections.

Technical Requirements/ Building Structure

Material Regulations

- Alternate materials are permitted as follows:
  - > Engineered lumber/ I-joist (e.g., TJIs, LPIs, and BCIs) pursuant to specific manufacturer's design data;
  - > Structurally insulated panel systems pursuant to specific manufacturer's design data. Also, be advised that foam plastics must be thermally insulated from the interior of the dwelling;
  - > Engineered trusses (floor or roof) must be designed in accordance with Eurocode 5: Timber Construction (EN 1995) as appropriate. Individual truss reports shall be provided for review.
- Other alternate materials may be permitted if approved pursuant to European Standards. It is the responsibility of the applicant to provide adequate proof to document the alternate as meeting the intent of the prescriptive code requirements. The SDE21/22 Organizers reserve the right to deny any alternate for failure to clearly demonstrate code equivalence. For unlisted materials/ products see Rule 50.2.
- Structural Steel: Provide structural details for load-carrying structural steel assemblies. Include welded or bolted connections within the assembly and were attached to other structures.

Foundation/ Footing Levelling

- All houses, decks and other structures shall be provided with foundations sufficient to safely transmit gravity, lateral, and uplift loads. For purposes of design, please note the document 'Solar Campus Specifications'.
- Please provide consideration for sloping or variable site conditions. The surface of each assigned site on the competition site may vary up to 50 cm depending upon location.
- Foundations should be designed to accommodate site variations without relying on imported fill materials for anything other than levelling the surface for complete pad contact.
- Any imported fill materials must be approved to transmit all required loads. The surface of the Solar Campus must be protected from contamination by fill materials via geotextile fabric or other approved barriers.
- All fill materials shall be retained by approved methods to prevent displacement by water or wind erosion.

Uplift Design

- Please note the document 'Solar Campus Specifications' with further information regarding foundation and ground specifications.
- Uplift design may employ dead-load analysis. Anchorage are not suitable due to different ground conditions on the Solar Campus.
- Structures shall be configured to take advantage of dead loads to resist uplift, overturning, and sliding. All designs shall be supported by calculations demonstrating the efficacy of the system.
- Foundation designs and calculations shall be APPROVED by the SDE21/22 Organisers prior to placement of the structure on the Solar Campus.

LIVING LAB: Additional requirements in Rule–50.9 - Attachment for Living Lab

a) Design Loads

General Requirements

- The following minimum loads must be used in the structural design:

TABLE 31. DESIGN LOADS LIST.

TYPE		LOADS	COMMENTS
Wind		0.50 kN/m²	Wind zone 1 (for Wuppertal) If tie-downs are not used, you must show that there is no overturning or uplifting with a safety factor of 2.
Snow	Roof pitch 0° - 30° Roof pitch ≤ 35° Roof pitch ≤ 40° Roof pitch ≤ 45° Roof pitch ≤ 50° Roof pitch ≤ 55° Roof pitch > 55° Rows of roofs	0.52 kN/m² 0.455 kN/m² 0.325 kN/m² 0.26 kN/m² 0.195 kN/m² 0.065 kN/m² 0.00 kN/m² 1.04 kN/m²	Snow zone 1 (for Wuppertal) The height of the site area is less than 200 m above sea level. The specified snow loads (s) are calculated from the snow load (s_k) resulting from the snow zone and the height of the terrain (0.65 kN/m²) and the specific coefficient of the roof pitch (μ) according to the formula: $s = s_k$ (0.65 kN/m²) • μ
Railings		1.5 kN/m²	Concentrated load applied in any direction at any point at the top of the rail.
Interior floor, decks, ramps		2.5 kN/m²	Live load
Roof		**1.0 kN/m²**	Live load

- Additional structural design requirements at the post-event house location (to be determined by the licensed professional of record).
- Structural plans shall indicate the design loads and the location, size and weight of special loads such as liquid storage tanks and mass or trombe walls.

Dead loads

- The dead load consists of the weights of structural elements, enclosures, dividing elements, partitions, all carpentry types, coatings, fillings, fixed equipment and all permanent loads.
- In general, the dead load characteristic value of the constructive elements will be determined as its mean value, between its nominal dimensions and its specific mean loads.
- Dead load of (moveable) partitions can be considered as uniformly distributed loads and can be added to imposed loads.

Specific Point Loads

- Provide wind-analysis calculations for point-load connections demonstrating the components' abilities to withstand heavy wind conditions.
- Provide point-load connection details for all solar thermal and photovoltaic panel connections to demonstrate that the connections will resist uplift.

Imposed loads

- The imposed load includes all the forces (weights) that vary within the building's normal operation cycle.
- The following table includes the loads to apply:

TABLE 32. IMPOSED LOADS LIST.

USE SUB-CATEGORY	UNIFORM LOAD QK [KN/M²]	LOCALISED LOAD QK [KN]
Floors	2.0	2.0
Stairs	3.0	3.0

Accessible roofs	3.0	3.0

- According to Eurocode 1/EN 1991-1 (1) handrail, parapets or catchments of terraces, oriels, balconies or stairs must resist a uniformly distributed horizontal force, applied at 90 cm or, in case being located below this height, over the element's superior edge. The value of this force will be 1.0 kN/m for restricted areas and 1.5 kN/m for public areas.
- Wind factors and wind loads for houses and multi-storey buildings must be compliant with EN 1991-1 (4).
- Snow factors and snow loads for houses and multi-storey buildings must be compliant with EN 1991-1 (3).

Safety factors

- The following safety factors must be considered:
  - > Ultimate Limit State Design;
  - > Partial Safety Factors for Strength of Materials.

TABLE 33. SAFETY FACTORS OF MATERIALS.

MATERIAL		FACTOR
Concrete	γC=	1.50
Corrugated steel	γS=	1.15
Structural steel	γm0=	1.05 (plasticity)
	γm1=	1.05 (instability)
	γm2=	1.25 (last resistance, material and joints)
	γm3=	1.1 (sliding resistance of ELS pre-stressed screw joints)
	γm3=	1.25 (sliding resistance of ELU pre-stressed screw joints)
	γm3=	1.4 (sliding resistance of pre-stressed screw joints and almond shaped holes or with over measure)
Wood	γmF=	1.3

TABLE 34. SAFETY FACTORS OF DESIGN LOADS.

ACTION	ADVERSE	BENEFICIAL
Dead Load	γG= 1.35	γG= 1.00 for STR and 0.90 for EQU
Imposed Load, Wind Loads and Snow Loads	γQ= 1.50	

Load Combinations

- The following load combinations, corresponding to normal control, will be considered:
- Loads denomination:
  - > Gk: Dead load and self-weight;
  - > Qk: Imposed loads (Q1 Determinant variable action) Permanent or transitory situation:
    - 1.35 G + 1.50 Q1 + ∑ 1.50 ψ0,i Qk,i
- This hypothesis will be considered for the following situations depending on the determinant imposed load.
  - > Imposed use; Wind in direction 1; Wind in direction 2; Snow.
- In addition, the following combination factors will be considered for the calculation combinations determination:

TABLE 35. CALCULATION COMBINATIONS

ACTION	COMBINATION FACTOR $\gamma 0$
Walkable roofs-imposed load of use	0.70
Roofs only accessible for maintenance-imposed loads of use	0.00
Stories imposed loads of use	0.70
Wind	0.60
Snow	0.50

50.6 Electrical Safety

a) Electrical Installations

General Requirements

Electricity System

- The electrical system is understood as collection of all equipment and circuits associated to a particular purpose: electrical energy production, transformation, distribution or use.
- Technical products that are used in the House Demonstration Unit (HDU) must provide a safety level equivalent to European standard.
- The electrical installations of the HDU must be planned properly by an installation designer and needs to be approved by a professional electrical engineer.

Regulation Compliance

- In order to verify the regulation compliance, Teams must complete and submit the “Electrical System Design Checklist”, and the “Electrical Storage System Checklist”.
- Checklists are part of the ‘Electric and PV Chart and Checklists’ document. A template will be placed on the SDE21/22 WAT.
- Additionally, Teams must furnish in the Project Manual all necessary information to evaluate the conformity of their proposals (certificate of compliance, calculations, etc.).
- Teams must locate the required information in the places indicated on the checklist.

Drawing Requirements

- Electrical plan(s) must include layouts of proposed receptacles, switches, light fixtures, smoke alarms, ceiling fans, etc.
- Provide a key for electrical symbols used in the electrical plans.
- Drawings need to be signed and stamped by a professional electrical engineer.

Electrical Grid

Low Voltage Distribution Network

- Nominal voltage and frequency in the German Low Voltage distribution networks are: Voltage: 400 V / 230 V (phase-neutral). Frequency: 50 Hz.
  - > Voltage band: 207 – 253 V (normal operating range);
  - > Frequency band: 49.5 – 50.5 Hz (normal operating range).
- Overvoltage: equal or over 230 + 10% = 253 V; Undervoltage: equal or under 230 – 10% = 207 V
- Over frequency: equal or over 50 + 0.5 = 50.5 Hz; Underfrequency: equal or under 50 – 0,5 = 49.5 Hz

TN-C-S System

- The cable connection of the HDU must be made according to the TN-C-S system, which is used in the German Low-Voltage Grid.
- The TN system (French: terre 109pprox) is a certain type of implementation of a low-voltage grid in the electrical energy supply. The most important feature is the type of earth connection of this power supply system to the power source.
- Colour Code according to the international standard IEC 60446:
  - Neutral conductor: blue
  - Protective conductor: green-yellow
  - AC phase conductor: brown, black or grey

Utility Compatibility

- The HDU needs to connect to the German Grid. If the Teams home country provides a different voltage, they have to announce this to the SDE21/22 Organisers.
- Teams are responsible for the installation of an appropriate transformer, in case their HDU is built for a different voltage. The chosen fabrication needs to be listed in the equipment listings.
- Devices in the house do not necessarily be compatible with the German Grid for the competition phase.

LIVING LAB: Additional requirements in Rule 50.9 – Attachment for Living Lab

Safety Requirements

Short circuit protection

- An automatic Residual Current Device (RCD) for personnel protection against indirect contact is needed.
- RCD prevents injuries caused by short circuits.
- A protection against contact of 30 milliamperes must be ensured.
- The RCD is mandatory in the fuse box of the HDU.

Overvoltage Protection

- Not required.

LIVING LAB: Additional requirements in Rule 50.9 – Attachment for Living Lab

Lightning Protection

- A lighting Protection is not required.

LIVING LAB: Additional requirements in Rule 50.9 – Attachment for Living Lab

Earthing

- An earthing-system is needed according to IEC 60364-5-54:2011.
- Minimum requirements are as follows:
  - Teams must provide equipotential bonding for each washing basin and bathtub and for all household appliances;
  - All conductors must be connected on a main equipotential bonding rail;
  - Connection to rod/ strip earth electrodes on the Teams lot which will be prepared by the SDE21/22 Organisers.

LIVING LAB: Additional requirements in Rule 50.9 – Attachment for Living Lab

Receptacles

- All receptacles must have a building inspectorate approval. For that a CE marking is required.
- Any receptacles used must be protected with ground a residual current device (RCD). Enclosures provided must be suitable for damp locations (minimum IP44 protection level).
- Receptacles must be three-poled and have to be equipped with a child safety lock.
- If a power connection is provided in the kitchen, it must be fused separately.
- For the Heating test, one-phase current socket (equipped for 3.6KW) must be available in the house.

High Current Power Connection

- If there is a high current power connection (fixed connection) for the oven in the kitchen, it must be fused separately.
- Any other device with an output greater than 3.5 kW must also have a fixed connection.

Exterior and Interior Lighting

- In house tour areas, light fittings must provide a minimum illumination level of 20 lux for exterior path and traffic areas, and a minimum of 100 lux in average for interior areas. A minimum of 1 lux for all areas is required.
- Colour temperature of luminaires should be warm white (2700K-3000K) with a colour rendition Ra >80. Coloured lighting is prohibited in outdoor areas.
- The exterior and interior lighting design should minimize light pollution ("dark sky").
- Houses which have no or only inadequate external lighting on their lot, will be closed during evening hours.

Technical Requirements

Electricity Meter

- Teams must provide an installation space for standardized electricity meters in the HDU. Four metering devices with separate wiring are expected to be installed in the HDU (sub-distribution, battery, PV and consumer meters). Dimensions and exact specifications will be provided on the SDE21/22 WAT.
- Installation height: distance of meter niches from the surface of the finished floor (DIN 18013)
  - > Upper edge max. 210 cm;
  - > Lower edge min. 40 cm.
- The cables are inserted vertically into the electricity meter from above or below.

Equipment Listings

- All electrical equipment must be certified for the European market by complying with European standards and must bear a CE mark.
- All DC to AC utility-interactive inverters must be fully listed to European Standard.

House Connection

- Teams must provide an empty conduit with an outside diameter of 25 mm for the house connection of the HDU.

b) Photovoltaic System (PV)

General Requirements

Photovoltaic System Design

- Particular attention should be paid to photovoltaic system design, storage batteries, generators, grounding, conductors for general wiring, flexible cords and cables, and over-current protection devices, respectively.

Regulation Compliance

- In order to verify the regulation compliance, Teams must complete and submit the 'Photovoltaic Checklist'.
- The checklist is part of the 'Electric and PV Chart and Checklists' document.
- Additionally, Teams must furnish in the Project Manual all necessary information to evaluate the conformity of their proposals (certificate of compliance, calculations, etc.).
- Teams must locate the required information in the places indicated on the checklist.

Drawing Requirements

- Provide details on the proposed PV system along with a key for symbols used in the drawings. Such details shall include information on the photovoltaic panels, distribution (e.g., wiring, inverters, switch gear, and over-current protection), and storage equipment.

Safety Requirements

Emergency Switch

- The photovoltaic system shall include the following protection devices at the utility interface:
- A general emergency switch for DC current must be set up close to photovoltaic system, and remote controlled from electric box of the house, near to the house general circuit breaking system.
- The general emergency switch must provide the isolation level required by the German Regulation.
- This switch will be accessible to the electricity distribution company in order to be able to perform a safe manual disconnection of the photovoltaic system.

Earthing

- Earthing of the photovoltaic system equipment shall be done without disturbing the earthing of the utility distribution system, ensuring that no defects are transferred to the distribution network.
  See Rule 50.5 for Ground Penetration limits.
- The photovoltaic system shall guarantee galvanic separation between the Low Voltage distribution network and the photovoltaic system, by means of an isolation transformer (included in or external to the inverters) or by any other means fulfilling the same function, based on state-of-the-art technological development.
- In this sense, inverters with high-frequency transformers or transformer less inverters are permitted, provided that the inverter(s) manufacturer(s) provides a certificate guaranteeing that the maximum DC current to be fed into the grid is smaller or equal than 0.5% of the nominal output current of the device(s).
- Teams must include in the project documents certificates of the inverters manufacturers that demonstrate compliance with the galvanic separation requirement as well as with other requirements of the German Regulations mentioned in Rule 50.2 (for example, protections against over/under voltage and frequency).

Equipment Listings

- Unlisted PV modules may be used in a system with a DC bus voltage of no greater than 60 volts (open circuit) at 0 °C if, and only if, such equipment has been evaluated and approved by the Solar Decathlon Europe 2021 (in 2022) Building Official and Solar Decathlon Europe 2021 (in 2022) electrical inspectors. PV cell and module mounting means are subject to increased scrutiny in custom made, unlisted, building-integrated PV applications.
- The use of unlisted PV modules and the installation of listed PV modules in an unapproved manner in a system with a DC bus voltage of greater than 60 volts (open circuit) at 0 °C are prohibited. Listings shall be to European Standards and shall be granted by an approved, accredited testing laboratory (e.g. German TÜV).
- The attachment of PV modules to any material where the PV module is not listed for such an application is prohibited, regardless of the bus voltage.

Technical Requirements

Grid Interconnection

- The Photovoltaic system will be connected to the electricity distribution network following a single-phase configuration (connection to the phase and neutral) or a three-phase configuration for huge systems.
- The interface between the Photovoltaic system and the electricity distribution network shall comply with the international standard IEC 61727 – Photovoltaic (PV) systems – Characteristics of the utility interface.
- IEC 61727 regulates the grid interconnection of low-power electricity generation installations Photovoltaic systems up to 100 kW to Low Voltage electricity distribution networks.

Inverters

- PV DC cables remain at exterior of the house as most as possible, and then enter directly in mechanical room. In the best case, inverters are positioned at exterior, on house roof. In other cases, PV DC cables remain only in mechanical room, in a protected path. This path must resist during 30 minutes to the fire.
- A circuit breaking system is installed to switch off simultaneously all inverters. This inverters emergency circuit breaking system will be visible, near to house general circuit breaking system, and these two general switches must be identified by quoting: «Warning: presence of tension sources: 1-Distribution grid 2-Photovoltaic panels», in black letter with yellow background. Furthermore, a pictogram representing photovoltaic risk must be indicated at exterior of the house, on mechanical room door.

Over/under Voltage and Frequency

- The photovoltaic system shall disconnect from the utility system (grid) whenever voltage or frequency are outside the specified ranges. To this aim, an automatic switch will be used to guarantee protection against over/under voltage and frequency. This switch can be integrated in the inverter, in which case it shall comply with the German Low Voltage Electric-Technical Regulation.

c) Telecommunications / Building Management System (BMS)

General Requirements

General Data Protection Regulation

- Since 2016 the General Data Protection Regulation (GDPR) is in charge. In Germany it is called the 'Datenschutzgrundverordnung' (DSGVO).
- The GDPR is a European Union Regulation harmonising the rules governing the processing of personal data and needs to be considered by the Teams.

Event Registration for Solar Campus

- During the SDE21/22 a central event registration of the visitors will be established. Therefore, Teams do not have to inform the visitors during public guided tours about photo and video recordings in the house and on the lot.

Photography / Filming

- If Teams take pictures or videos of interested pedestrians or residents for public relations/social media around the solar campus or elsewhere, they must obtain permission before starting their video/photography shoot.

Safety Requirements

WiFi Network

- The SDE21/22 Organisers will install a WiFi network on the Solar Campus.
- The Teams should provide themselves with their own internet connection for the automation control of the house.
- If Teams want to install their own network, they should protect their system with a password.

Smart Speaker / Webcam / Surveillance Camera

- Teams are allowed to use Smart Speaker inside their House Demonstration Units (HDU), it can be used during public tours. But Teams should be aware that visitors can activate the Smart Speaker by their voice at any time.
- Webcam and Surveillance Cameras are allowed inside the house and on the Teams lot.

Technical Requirements

Smart Home/ Building Automation

- Teams need to equip their HDU with Building Management Systems (BMS) to participate in sub-contest 3.5.
- The interface specification will be communicated via SDEWAT.

50.7 Technical Building Services

a) Plumbing

General Requirements

Plumbing installations

- The hot water supply of the House Demonstration Unit (HDU) may not be compatible with the Design Challenge. An adapted system solution must be installed and justified according to Rule 7 (e.g. instantaneous water heater or thermal solar system).

Drawing Requirements

- Provide a labelled isometric diagram of the proposed plumbing system for review. Clearly indicate waste lines, vent lines and water supply.
- The equipotential bonding and main earthing rail must be shown in the drawings.
- Provide a key for symbols used in the drawings.

Safety Requirements

Water Hygiene and Temperature

- Maintaining drinking water hygiene is one of the building's operator duties.
- For hygienic reasons (legionella) in residential buildings, a temperature of at least 60 °C must be maintained at the water outlet of the water heater with circulation.
- The return flow of the circulating drinking water must be set so that no more than 5 °C temperature reduction occurs. (Return flow greater than 55 °C).

- If the water temperature of 60 °C in the water circuit cannot be reached for various reasons, it is also possible to use other technical measures and procedures to ensure water hygiene. In these cases, the conditions must be proven by microbiological tests (DIN 1988-200).
- For smaller hot water systems with less than 3 litres of water, at least regular flushing of the system is required.
- The mixed water temperature at the tapping point should not exceed 45 °C to prevent scalding (EN 1111).

Equipotential Bonding

- In each building, the metal parts, which can cause a dangerous potential difference, and which are not part of the electrical installation, must be connected to the main earthing rail by protective equipotential bonding conductors (DIN VDE 0100-410).
- Examples of such metal parts are pipelines and supply systems inserted into buildings (e.g. water pipes, heating forward and return flow, metal sewage system) and foreign conductive parts of the building structure.

Waste-water

- All substances used in combination with water to clean the house, dishes, utensils, etc., must be nontoxic and preferably biodegradable. Teams may incur a point penalty for any toxic substances that are found in the wastewater tank.

Non-Potable Water

- As a reminder: The water provided for the water containers used during the competition is not drinkable (see Rule 8.2).
- It must be ensured that the tap water (e.g. in the kitchen or bathroom) must not be drunk by warnings in English ("No Potable Water!") and in German ("Kein Trinkwasser!").
- In addition, Teams can also place expressive pictograms to illustrate the risk.

Water Basins

- For reasons of security, water basins in and outside the HDU are not allowed.

Technical Requirements

Supply

- No additives of any kind may be added to the water in the Team's supply tank. This water is not for consumption at any time.
- For more Information see Rule 8.2 Water Delivery.

Main Water Connection

- No requirements.

LIVING LAB: Additional requirements in Rule 50.9 – Attachment for Living Lab

Water Closet Demonstration

- Water closets are installed for demonstration only and shall not be connected to any portion of the sewage disposal system.
- The water closet shall be attached to a DN 100 (diameter of 10 cm) water closet flange provided with a capped end for use in the post competition period. The cap shall be located as close as possible to the flange fitting.
- No structural member shall be cut or otherwise damaged to accommodate the water-closet flange assembly.
- It must be ensured that the Water closet must not be used by warnings in English ("Not in function – do not use!") and in German ("Nicht in Funktion – Nicht benutzen!").

LIVING LAB: Additional requirements in Rule 50.9 – Attachment for Living Lab

Greywater

- Water coming from bathtubs, showers, bath sinks and clothes washers is considered greywater.
- Greywater may be reused to water vegetation or for cleaning purposes if it is first processed by an approved greywater reuse system which avoids undesired organisms (see Rule 9.2).
- Teams are not permitted to transport manually greywater from the tanks to the vegetation's location.
- Teams that intend to use any water treatment system must send the appropriate information to the SDE21/22 Organisers, indicating the fixtures connected to the greywater system, the pipes system and tanks and any other discharge points.
- A note must be included, indicating the safety label for any greywater reuse system. Additionally, they must submit documentation that certifies that the selected water treatment is safe, and the treated water does not pose a risk for human health, in their proposed use.
- The approval of the greywater system by the SDE21/22 Organisers will only be effective on the Solar Campus in the Host City during the public event.
- No black water source can be connected to a greywater storage or distribution system. Water coming from kitchen sinks and dishwashers is considered black water.
- Pipelines for greywater and wastewater must run separately in the building in the case of greywater use.

Valves

- The valves must be self-locking so that no backflow occurs.

Vent Lines

- Ventilation of the sewage pipes is required to prevent pressure in the pipes and to discharge duct gases.
- Every downpipe must be provided with a vent line up to the roof. They can be connected 10 cm above the last connection of the highest pipeline.
- If there is no downpipe, at least one vent line through the roof is required.
- The opening of the ventilation duct must have at least an orthogonal distance of 15 cm to the water-bearing layer of the roof.
- The ventilation must not be interrupted by odour traps, sludge traps or similar devices.

b) Thermal Solar System

General Requirements

Collector and Thermal Storage Unit Labelling

- Collectors and storage units shall be listed and labelled to show: the manufacturer's name, collector type, serial number, year of manufacture, gross collector area, dimensions of the collector, maximum working pressure, standstill temperature (at 1000 W/m² and 30 °C), Volume of the heat transfer fluid, empty weight of the collector, place of manufacture (EN 12975-1).

Drawing Requirements

- Provide plan details for any proposed thermal solar systems.
- Provide details on collectors, fluid distribution, heat exchangers, etc.
- Indicate the type of the heat exchange fluid.
- Provide a key for symbols used in the drawings.

Safety Requirements

Heat-Transfer Media

- Flammable gasses and liquids shall not be used as heat-transfer fluids.
- All Heat-Transfer Media must be properly disposed of after the competition phase.

Maximum Temperature Limitation

- Systems must be equipped with means to limit the maximum temperature of the system fluid with any pressurized vessel inside the dwelling to 95 °C (EN 12897).
- A temperature-relief valve must be provided.

Vacuum Relief

- A vacuum relief valve shall protect system components that might be subjected to pressure drops below atmospheric pressure during operation or shutdown.
- Plans shall indicate if this system is subject to vacuum conditions.

Pressure Relief

- A pressure relief valve must be provided to drain the fluid from the system in an emergency in the event of overpressure.
- All liquid from the collector circuit must be able to be safely discharged into a storage system.

Expansion Tanks

- Expansion tanks in solar systems shall be installed in closed-fluid loops that contain heat-transfer fluid (EN 12897).

Pressure Test

- All solar hydronic piping shall withstand for at least 10 minutes a pressure equal to 2 times the maximum design pressure specified by the manufacturer without leakage or cracking (EN 12897).
- Temperature and pressure relief devices operating at or under the tested pressure shall be separated by removal and capping during the test.

Collectors

- The collectors must be flame-retardant.
- Solar collectors carrying hot fluids must be avoided over accessible areas.

Technical Requirements

Cross Connection

- Thermal solar systems are not allowed to use water from the water tanks.
- Separated fluid circuits are required.

Access

- Solar collectors, controls, dampers, fans, and pumps shall be accessible for inspection, maintenance, repair, and replacement.

Roof-Mounted Collectors

- The roof shall be constructed to support all loads imposed by the collectors.
- If the collectors are to serve as a roof covering, they must fulfil the requirements of a roof (water drainage, etc.).

c) Mechanical

General Requirements

Ventilation of the Building

- It must be ensured that the building has a balanced volume balance. (The supply air volume must correspond to the exhaust air volume).
- The ventilation in the House Demonstration Units (HDU) should be as consistent with the Design Challenge as possible.
- For more Information see Rule 7.

Heating Demonstration

- As a reminder: Heating systems might be installed for demonstration causes (e.g. heat pumps) but are not allowed to be activated and must be blocked.
- The heat delivery component of the system must be installed (radiators, floor heating panels, air-to-air heat exchangers etc.) to visualise the approach and to allow a post-competition connection to a central heating system.
- For more Information see Rule 7.

Drawing Requirements

- Provide a labelled isometric diagram of the proposed mechanical system for review.
- Use the colours for air-types (EN 12792):
  - > Outside air: green
  - > Supply air, number of thermodynamic treatments:
    - None: green
    - One: red
    - Two or three: blue
    - Four: violet
  - > Indoor air: grey
  - > Transferred air: grey
  - > Extract air: yellow
  - > Recirculation air: orange
  - > Exhaust air: brown
- Provide a key for symbols used in the drawings for the ventilation and the heating.

Safety Requirements

Ventilation lines

- Ventilation lines must be corrosion-resistant and must not be hygroscopic (water-absorbing).
- Ventilation Lines must be easy to clean.

Outside Air Intake

- The opening must be at least 50 cm above the ground for air hygiene reasons.
- For safety reasons, ventilation grilles must be fitted.
- Outside air and exhaust air should not mix.

Technical Requirements

Outside Air Inlet (Outside Air Vent Opening)

- Air diffusers must be easy to maintain and easy to clean.
- Outside air diffusers must be designed or installed in such a way that they are protected against driving rain.
- Any condensation water must be drained off.
- Outside air diffusers should protect against the ingress of insects.

Bathroom Ventilation

- Bathrooms shall be provided with mechanical ventilation systems capable of providing 60 m^3/h for intermittent ventilation or 40 m^3/h for continuous ventilation (DIN 18017-3), or with windows allowing opening for natural ventilation.
- In the case of toilet rooms, the minimum exhaust air volume flows mentioned may be halved.

Sound Insulation

- The permissible sound insulation level of ventilation systems in living rooms and bedrooms must not exceed 30 dB at a distance of one meter from the valves (DIN 4109).
- 5 dB higher values are permissible for ventilation systems if no conspicuous individual tones are produced.

Blower-Door-Test

- The ventilation openings to the outside must be able to be closed during the blower-door-test to provide reliable results.

50.8 Building Physics

General Requirements

LIVING LAB: Additional requirements in Rule 50.9 – Attachment for Living Lab

Technical Requirements

Thermal transmittance

- The values of the thermal transmittance for residential buildings and non-residential buildings with internal temperature ≥ 19 °C must be lower as the following values:

TABLE 36. THERMAL TRANSMITTANCE.

COMPONENT	MAXIMAL THERMAL TRANSMITTANCE
Exterior walls	0.24 W/m²K
Windows / window doors	1.30 W/m²K
Skylight windows	1.40 W/m²K
Glazing	1.10 W/m²K
Glass roofs	2.00 W/m²K
Window doors with hinged, folding, sliding or lifting mechanism	1.60 W/m²K
Rooftops / walls against unheated attic / uppermost floors	0.24 W/m²K
Flat roof tops with waterproofing	0.20 W/m²K
Walls against soil or unheated rooms (with the exception of attics) and Ceilings downwards towards the ground or unheated rooms	0.30 W/m²K
Ceilings downwards on outside air	0.24 W/m²K

Solar Protection

- Glazing to solar exposed orientations must be equipped with efficient solar shading.

50.9 Additional Requirements for Living Lab

The additional requirements for the Living Lab may need to be expanded as further requirements for the building application arise.

a) Structural Safety

- A frost-free foundation will be prepared by the SDE21/22 Organisers regarding the document 'Solar Campus Specification'.
- Exact type and position of the planned foundation and the resulting foundation sizes (according to the document 'Solar Campus Specification') must be given by the Teams in Deliverable #4.

b) Electrical Safety

Utility Compatibility

- Please note the document 'Solar Campus Specifications' with further information regarding house inlets.
- The electrical system of the houses for the Living Lab must be planned and built according to German standards, as they are directly connected to the German grid.
- All houses that participate in the Living Lab necessarily need to be equipped with receptacles and home appliances, that fit to the German standards.

Overvoltage Protection

- Overvoltage protection must be installed for the PV system and in the sub-distribution of the HDU.

Lightning Protection

- Not required.

Earthing

- The Buildings of the Living Lab must connect the earthing to a foundation earth electrode or to a rod/strip earth electrode which will be prepared by the SDE21/22 Organisers on the Teams lot.

Smart Home/ Building Automation

- The Living Lab requires documentation and a user manual for the system. Whether there will be a uniform user interface for the BMS will be decided later and published on the SDE21/22 WAT.

c) Technical Building Services

- Please note the document 'Solar Campus Specifications' with further information regarding house inlets and a distinction between parts in responsibility of the Teams and parts in responsibility of the SDE21/22 Organisers.
- Living Lab Teams must connect to the fresh water supply directly (counting meters will be provided by the SDE21/22 Organisers), the waste-water system (including toilets) and the rainwater system via the 'HDU Connection Box' and are not allowed to use temporary freshwater tanks or waste-water tanks. Water tanks that serve the use of rainwater, for example, are permitted. An overflow must be connected to the rainwater system.
- All water plumbing systems should be anti-frost and anti-freezing planned (including water tanks).
- The connection points for drinking water, waste-water, heat and electricity should be planned at the same point (the position must be clearly provided by the Teams in HDU drawings).
- The water tightness of the water plumbing must be checked. A leak test protocol must be provided.
- Sufficient space for the maintenance of the technical systems is required.
- Applicable laws, ordinances, regulations and technical rules must be observed. This must be ensured above all by the specialist planners working with you (choice of materials, installation and connections, etc.). Please draw our attention to this from D#3 onwards if you want to use components or systems that do not have European approval.

Drinking water

- The connection to the network of the drinking water is to be planned by using a DN 20 stainless steel pipe. The connective pipe ends with an external pipe which has a thread of R 3/4 " (Whitworth pipe thread, also known as BSP = British Standard Pipe Thread). The water flow rate is 0.5 l / s (118pprox.. 2 showers or 1 shower and 2 washbasins).
- To avoid stagnant water and in order to prevent water contamination (against legionella) during the project Living Lab, automatic flush fittings must be provided at the end points of the respective water pipes. This point must be identifiable in your Deliverables.

Wastewater

- The connection to the sewage system is made via a DN 100 pipe: The exterior diameter of the wastewater pipe attached on the building must be between 100-115 mm.

Local heating network

- It is planned to connect all houses to a local heating network after the Competition phase of the SDE21/22. Corresponding connections for this are defined in the document 'Solar Campus Specifications'. The corresponding space requirements are to be taken into account by the Teams.

d) Building Physics

- Not required due to new approval basis for the Living Lab.

RULE 51 _ HEALTH & SAFETY (HS)

The main objective regarding Health & Safety (HS) is to prevent incident or accident to occur during each phase of the Competition, including the assembly phase. Each Team is responsible for the safety of its operations and each Team member and Team crew member shall work in a safe manner at all times during the project. Due safety is of major importance for the SDE21/22 Organisers; great emphasis is going to be made to confirm that the Teams are complying with:

Planning and executing a safe process of production:
All along the project development Teams must plan and develop every single phase of the Competition considering Health & Safety requirements.
The European and/or German law for the prevention of labour risks:
This is absolutely mandatory, since the event is located in Wuppertal, Germany.

51.1 German Applicable Regulation

a) Legal Basis for Health & Safety

- **ArbZG** – Arbeitszeitgesetz
  - > Date of issue: 6.6.1994
- **ArbSchG** – Gesetz über die Durchführung von Maßnahmen des Arbeitsschutzes zur Verbesserung der Sicherheit und des Gesundheitsschutzes der Beschäftigten bei der Arbeit/ Arbeitsschutzgesetz (Act on the Implementation of Occupational Health & Safety Measures to Improve the Safety and Health Protection of Employees at Work)
  - > Date of issue: 07.08.1996, Bundesregierung (federal government)
  - > Last update: 31.08.2015

  [**Note:** Requirements for employers according to ArbSchG.]
- **ArbStättV** – Verordnung über Arbeitsstätten/ Arbeitsstättenverordnung (Regulation on workplaces)
  - > Date of issue: 12.08.2004, Bundesregierung (federal government)
  - > Last update: 18.10.2017

  [**Note:** The ArbStättV forms the legal basis for every working environment in Germany.]
- **DGUV Vorschrift 1** – Grundsätze der Prävention (Accident prevention regulation – Principles of prevention)
- **BaustellV** – Verordnung über Sicherheit und Gesundheitsschutz auf Baustellen/ Baustellenverordnung (Ordinance on safety and health protection on construction sites)
  - > Date of issue: 10.06.1998, Bundesregierung (federal government)
  - > Last update: 27.06.2017
- **RAB** – Regeln zum Arbeitsschutz auf Baustellen (Rules for Occupational Safety on Construction Sites)
  - > Date of issue: 12.11.2003, Bundesministerium für Wirtschaft und Arbeit (Federal Ministry of Economics and Labour)

  [**Note:** For Construction Sites the BaustellV is in place. In addition, the RAB31 describes in detail the specifications from the Construction Site Code.]

b) Health & Safety Protection Coordinator

- As a precaution and in order to make sure the work of the Teams doesn't endanger other Teams, a person is designated to coordinate the work and has the authority to issue instructions to avert particular dangers.

c) General Prevention Principles

- Teams shall be aware of the following prevention principles:
  - > Avoid risks and evaluate unavoidable risks;
  - > Combat risks at source;
  - > Adapt work to manpower;
  - > Consider the technical evolution;
  - > Replace dangerous items with safe ones or less dangerous ones;
  - > Plan safety measures before the work begins;
  - > Use collective protection prior to individual ones;
  - > Give the appropriate instructions to the workers.

d) Workplace Safety

- Considering HS in workplaces, the actions to be done before and during the Competition are regulated by the SDE21/22 Organisers. They are applicable for all Team members and the contracted staff.
- HS regulation focus on the analysis of risks for persons related to construction works, and the way to resolve them.
- Teams need to do a detailed risks analysis of their construction process, see Rule 51.2.

e) Health & Safety Coordination on Site

- For the operation's design and implementation phases, a Health & Safety Coordinator needs to be appointed by Teams in order to organise the Health & Safety coordination between the various participants in the workplace.

51.2 Work Phases

To comply with the two aforementioned objectives (complying with the German regulation and developing a safe process) there are four different steps to be made:

Step 1: HS Risk Analysis
Step 2: Health & Safety Plan (HS Plan)
Step 3: Preparing for Construction Work
Step 4: Construction Works

a) Step 1: HS Risk Assessment

The Risk Analysis must cover not only the construction process, but all the activities of the SDE21/22 Competition: Project development, Previous works at university, Decathletes training, Transport, Assembly, Maintenance during Competition, Disassembly, etc. During the assessment it is essential to regard the unfamiliar situation and the pressure of time and competition during the construction work. If some of the Team member may be part of vulnerable groups like pregnant women, young people under 18 years, people with previous illnesses, allergies etc., it is important to consider particular effect of hazards and specific measures. Figure 22 shows the Process of Analysis explained below, a template can be found on SDE21/22 WAT. The suggested process is as follows:

Breakdown to WORK-UNITS

- Teams should breakdown the Project in work-units or activities.
- For example: foundation execution, façade assembly, installation of PV panels, etc.

Identify the TASKS

- Tasks to be developed in each work-unit, among others must be identified: transport, unloading, stock up, on- site layout, assemble, etc.
- For example, the structural tasks for a modular house will consist of:
  - Transporting the module;
  - Unloading the module;
  - Stocking the module;
  - Making the on-site layout;
  - Laying the module on site;
  - Assembling the module with the rest of the structure;
  - …

Identify the AGENTS

- Agents that take part in each task have to be listed (human resources, machinery, materials, etc.)
- According to the following example:
  - The truck;
  - The load;
  - The Health &Safety Operations'coordinator responsible for managing the work;
  - The workers;
  - …

Identify the HAZARDS and determine the RISKS

- Identification of hazards associated to each task and assessment of each risk depending on the severity of the damage and the probability of occurrence.
- Consideration of risks for other persons in the range of the tasks.
- If there is work that has to be done at the same time and are in proximity to each other, is also necessary to identify collective risks, that could endanger the other workers and work.

- Following this example:
  - > **Task 1:** Unloading module
    - **Risk 1a:** getting knocked down by the transport truck in the working area (very dangerous, but low probability)
    - **Risk 1b:** ...
  - > **Task 2:** laying the module on site
    - **Risk 2a:** getting knocked down by the load (risk of severe injuries, if there are many people on the construction site/ parallel activities, there is a medium high risk)
    - **Risk 2b:** ...

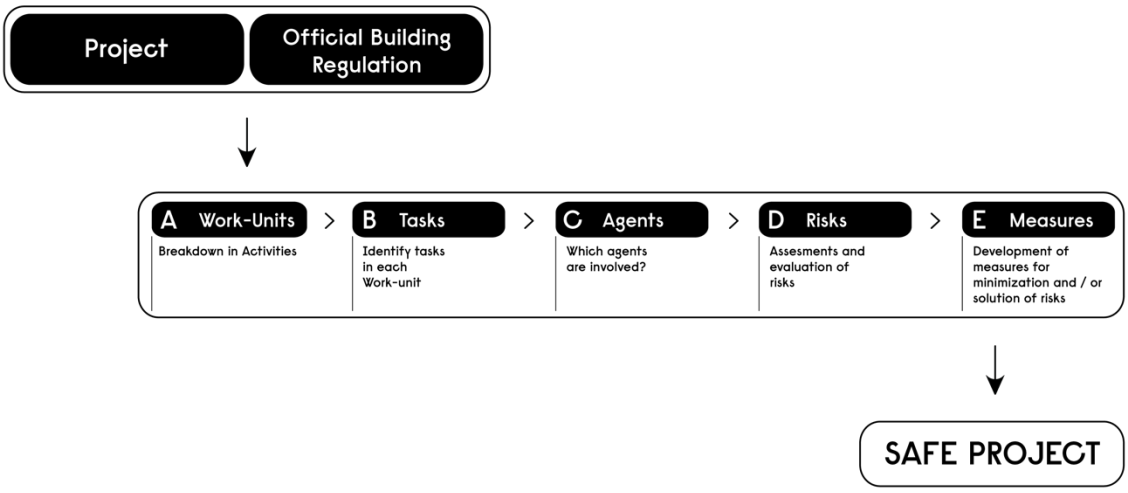
Develop MEASURES

- Advising of the measures to take for solving them.
- Determination and documentation of the responsibilities for the implementation of safety measures and appropriate controls.
- Following this example:
  - > **Task 1:** Unloading module
    - **Solution 1a:** Certified truck driver, marking circulation ways separated from the worker's path, etc.
    - **Solution 1b:** ...
  - > **Task 2:** laying the module on site
    - **Solution 2a:** controlling the load with ropes from at least four opposite points, keeping workers far away from the module; Crane controller with specific license, etc.
    - **Solution 2b:** ...

Identify RESIDUAL RISKS

- Identification of potential risks after the implementation of measures. These risks should be trivial or tolerable. Otherwise, there is a need of further measures.

FIGURE 22. PROCESS OF ANALYSIS OF THE HEALTH & SAFETY PLAN.



b) Step 2: Health & Safety Plan (HS Plan)

The main objective of the Health & Safety Plan (HS Plan) is preventing and solving any incident that may arise during the construction works in SDE21/22 Solar Campus. It must include Assembly and Disassembly, Maintenance during Contest week, and Vehicles accesses and exits to the Solar Campus.

Decathletes may be subject to the risk of accidents during the construction of the houses. Prevention of risks is in focus of the SDE21/22 Organisers, therefore Teams must apply to the HS requirements. The HS Plan is an open-ended document that is reviewed by the SDE21/22 HS Officials and needs to be updated by the HS Team Coordinator based on the progress of the work.

- The HS Plan must explain and describe the aforementioned process of analysis. HS Plan will be required from Deliverable #3 onwards.
- The HS Plan is a documentation and consists of:
  - > **HS Drawings** to be included in the corresponding section of the Project Drawings;
  - > **HS Report** to be included in the Project Manual (HS Plan Section). Proper reference to drawings location should be made every time needed;
  - > **HS Specific Terms and Conditions Document** to be included in the Project Manual (HS Plan Section).
- Information will be updated and specified along with the project development, including further details in each Deliverable. The HS Plan will be analysed and continuously reviewed by the SDE21/22 HS Coordinator.
- All the HS documents will be a useful guide for the Team about the know-how to carry out the activities.

HS Drawings

The HS Drawings must clearly define the safety measures to adopt in every work phase. As a minimum, they must consist of:

Assembly Sketches of Work-Phases

- Identification of the Work Phases, determining the Activities to be developed in each one, the Risks associated, and the Safety Measures adopted to solve them.
  - > Specify the Number of Team members and their corresponding task.
- Positions of Protections
  - > Collective protections to be used (position in each phase, details for its installation, etc.);
  - > Individual Protections to be used.
- Determine the location of the most important elements for each work phase:
  - > movement of trucks;
  - > movement of modules (any heavy load in movement);
  - > position of crane;
  - > position of scaffolding, etc.
- Signposting
  - > Location of signposting and fencing.
- First Aid Area
  - > Location of first aid area inside the lot;
  - > Location of first aid bag;
  - > Delimit the different areas inside the lot.

Evacuation Plan

- Emergency Evacuation Plan during Assembly and Disassembly (corresponding to the HS Report).
- The evacuation plan must show the procedure in case of emergency or accident and must include at least: Drawings indicating the evacuation path.
- Route to the closest health centre Procedure to follow in case of accident Emergency phones, assurance ID, etc.
- As mandatory, the Evacuation Plan must be kept visible inside the lot (using, for example, a waterproof mobile signpost) during the final phase of the Competition. Moreover, each Team member must have a copy of it and keep it with him during their working periods.

[**Note:** The SDE21/22 Organisation suggests Teams to develop the HS Drawings as assembly sketches of each unit, step by step, including all the aforementioned information for a better understanding of the adopted measures and its effectiveness.]

HS Report

The HS Report is the document that complies the application of laws about HS Coordinator activity.
For the SDE21/22 Competition, a report with the following sections will be considered compliant:

Template

1. Health & Safety Checklist
2. General Data of the Project
3. Health & Safety Plan Objectives
4. Instruction Concept Including Contents

5. Conditions of the site where construction will take place and interesting data related to the prevention of risks during the construction process:
   - Constructive process;
   - Type and characteristics of the materials and elements;
   - Site description;
   - Climate description;
   - Accesses and paths for vehicles;
   - Determining factors for the house placing;
   - Overlaps with the affected services and other activities of the environment, able to cause risks during the construction;
   - Planned activities;
   - Trades whose intervention is affected by the risk's prevention;
   - Auxiliary resources planned for the construction;
   - Machinery planned for the construction;
   - Construction site installations;
   - Characteristics Table for the stocks.
6. Activities for Risks Prevention
   - Construction plan: determination of work effective timing;
   - Overlaps and incompatibilities in the construction;
   - Number of Team members taking part in the construction;
   - Contracting planned.
7. Critical work phases for risks prevention
8. Risks identification and efficacy evaluation of the adopted protections
   - Location and identification of the areas where the works involving special risks will be developed;
   - Risks identification and efficacy evaluation of the adopted protections.
9. Collective protections to use
10. Individual protection resources to use
    - Signposting of the risks according to DIN EN ISO 7010.
11. Safe working procedures of every Team member
12. Machinery and auxiliary resources
13. Planned Measures in case of accident:
    - First aids;
    - First aids bag;
    - Preventive medicine;
    - Accident victim evacuation.
14. Risks identification for works on construction-site
15. Useful plans and information for works
16. Adopted system for the level of health and safety control during works
17. Formation and information about health and safety
18. Emergency evacuation plan during the assembly and disassembly periods

TABLE 37. HEALTH & SAFETY CHECKLIST.

LEGAL CONTENTS	LOCATION IN THE REPORT OR IN DRAWINGS
Name and address of SDE21/22, HS Coordinator, Prevention authorities, Team	
Number of workers	
Contact information of the Site Operations Coordinator	
Description of works	
First aid procedure	
Name and number of first aid certificated worker	
Description of the Team's first aid kit.	
Description of hygiene conditions (toilet, changing room, restroom...)	
Detailed description of operating modes	
Risk assessment – risks generated by other	
Risk assessment – risks generated by environment	
Risk assessment – risks generated on other	
Risk assessment – self-generated risks	
Procedures to adapt collective protection	

HS Specific Terms and Conditions Document

For the SDE21/22 Competition the following documents are required:

Template for Team members

1. Health & Safety Statement
   - > A statement in which the Team commits itself to avoid or minimize the risks derived from the work process;
   - > A statement in which the Team commits itself to envisage the health and safety demands from all the people taking part in the project (Decathletes, sub-contracted workers, etc.), and in which the Team declares to have considered those demands in the HS Plan.
2. Medical Statement
   - > A statement that all the Team members have passed specific medical examinations for the works that they will carry out and have the necessary qualifications. All Team members shall be properly identified in this statement and it shall clearly specify that all are of legal age.
3. Training Statement
   - > The statement must list all important contents of the instruction, indicating which person has completed which training. In addition, each Team member must confirm his or her presence at the training with signature.
4. Technical Specifications
   - > Complete technical specifications of the collective protections that shall be used;
   - > Complete technical specifications of the individual protections that shall be used.
5. Terms and Condition description
   - > A description of the terms and conditions of the Safety Plans that each Team member has to comply with.
6. Operating instructions
   - > Operating instructions must be drawn up for work equipment, machinery, work procedures, use of PPE and hazardous or biological substances. These must be written in a form and language that is understandable to the Team members. If possible, the content should fit on one Din A4 page and include occupational Health & Safety signs for better clarity.

- The following colour scheme should be observed:
  - Operation of machines or for work procedures = blue
  - Hazardous substances = orange
  - Use of personal protective equipment = green
- The operating instructions, together with the risk assessment, form an important basis for the occupational Health & Safety training of Team members. When preparing operating instructions, the following points in particular can be taken into account:
  1. Scope of application;
  2. Hazards to man and the environment;
  3. Protective measures and rules of conduct;
  4. Behaviour in case of malfunctions;
  5. Behaviour in case of accidents, first aid;
  6. Maintenance;
  7. Consequences of non-observance.

  For hazardous substances the following structure is mandatory:
  1. Work areas, workplace, activity;
  2. Hazardous substance (designation);
  3. Hazards for humans and environment;
  4. Protective measures, rules of conduct;
  5. Behaviour in case of danger;
  6. First aid;
  7. Proper disposal.

Template for contracted staff

1. Health & Safety Statement
   - A statement of compliance with the Health & Safety Plan;
   - If necessary, a specific description of the adaptation of their own procedures to the Health & Safety Plan;
   - Examples of the documents will be available through the SDE21/22 WAT.
2. Medical Statement
   - Medical examinations of the workers.
3. Training Statement
   - Specific training;
   - A statement that the contracted staff have received the specific training to work safely during their tasks.

c) Step 3: Preparing for Construction Works

Teams need to develop all the previous measures planned to prevent risks. As described in the HS Report, in order to prevent risks, all the staff shall:

- Receive the appropriate training for the tasks that they will have to carry out: using machinery, power tools, etc.
- Obtain driving licenses and the necessary certificates (or licenses) for trucks, motorized platforms and all the necessary auxiliary measures.
- Attend first-aid courses.
- Undergo medical examinations.

All the certificates and documents derived from these activities shall be included in the HS Report, and in the HS Specific Terms and Conditions Document.

[**Note:** The SDE21/22 Organisers encourage all Teams to practice the Assembly and Disassembly processes prior to the Final Phase of the Competition in Wuppertal. This training may help minimize the hazard chances at SDE21/22 Solar Campus by facing real risks', having realistic feedback and identifying improvement areas. The Team training is an important safety measure.]

d) Step 4: Construction Works

General Requirements

During the final phase of the Competition, Teams shall always keep in mind the measures described in the HS Plan, which are those that they have decided to assume. Every Team member and contracted staff must receive the necessary information and training, for example in the use of protective equipment, to behave in a safe manner that keeps themselves and others free from harm.

- The Teams shall analyse all the solutions before starting with the works in order to avoid unexpected risks. The effectiveness of the safety measures have to be proved and recorded. Accordingly, Teams may modify the actions described in the HS Plan. For this end, Teams have to inform the SDE21/22 HS Officials immediately and wait for their approval, as any change shall at least ensure the same safety level.
- During the Assembly, Maintenance and Disassembly the Team must identify and provide all the safety and associated controls that are necessary to ensure a safe work site and activities such as:
  - Providing adequate lighting to safely perform work;
  - Establishing work schedules/shifts to ensure Team members have adequate rest to safely work on site;
  - Identifying other considerations related to the work each Team member will be performing.
- It is mandatory to obey all the orders and instructions given by the SDE21/22 HS Officials.

51.3 SDE21/22 HS Officials

As part of the SDE21/22 Organisation, the SDE21/22 HS Officials is the group of people in charge of Health & Safety, working to help Teams comply with the HS established objectives.

a) Members of the SDE21/22 HS Officials

HS Coordinator

Person in charge of the SDE 21 HS Officials is the Health & Safety Coordinator of SDE21/22 Solar Campus during the construction, in compliance with German Regulations.

HS Inspectors

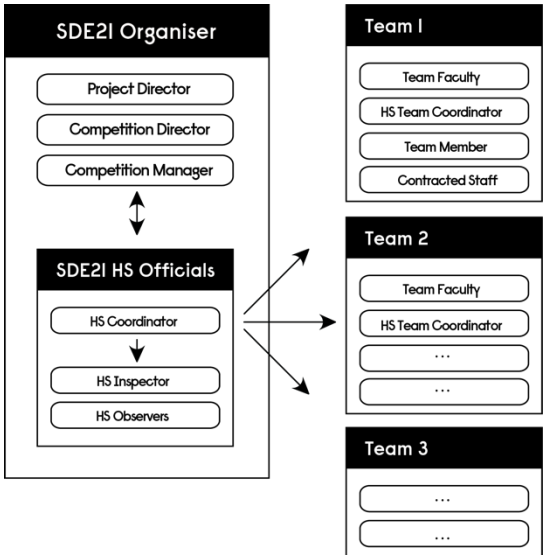
People helping the HS Coordinator with the Health & Safety activities: checking out Deliverables, realizing inspections during the construction, etc. During the HS Coordinator's absences, HS Inspectors have the same authority.

HS Observers

As a complementary preventive measure, during the construction, the SDE21/22 HS Officials will be supported by Observers, which will inform of any incident taking place to the HS Coordinator. They may not give any type of orders to the Teams.

The HS Inspectors and Observers will be in constant contact with the SDE21/22 HS Coordinator. In case the works involve serious and imminent risks, the HS Coordinators or HS Inspectors will have the power to stop the works.

FIGURE 23. SDE21/22 HS OFFICIALS – ORGANISATION CHART.



51.4 HS Plan Approval

The Final HS Plan will be considered acceptable only when the SDE21/22 HS Coordinator certifies that all items are properly developed. In this case Teams will get an approval.

[**Note:** Without the approval, the Team will not be authorized to assemble the house at SDE21/22 Solar Campus.]

Once the HS Plan has been accepted, the participating Teams are responsible for making updates whenever the parameters change and ask for a new approval.

FIGURE 24. CONDITIONS FOR SITE ACCESS AND WORKING AUTHORIZATION.

51.5 Construction Works Control

During the Competition, the SDE21/22 HS Officials will participate in daily meetings with all the Teams. The SDE21/22 Organisers will give specific instructions based on the activities to perform throughout the day. Therefore, according to the experience during the previous days, the actions to be repeated or avoided will be indicated. Throughout the Competition, the HS Coordinator, HS Inspectors and/or HS Observers will supervise the lots of all the Teams.

The objectives of these supervisions will be:

- Helping the Teams to solve any problem related with the HS Regulations.
- Verify compliance with the HS measures.
- Accordingly decide if bonus and/or penalties are to be applied.
- If necessary, stop the works immediately (some activities or all of the works).
- Review of the approved HS Plan, which needs to be signposted on the Team's lot.
- Approval of functionality and safety of special features/ movable elements once they have been completed.
- Review of functionality and safety of special features/ movable elements during competition.

51.6 HS Bonus and Penalties

Complying with the safety measures is a prerequisite for participation in the Competition.
The SDE21/22 HS Officials have the authority to apply bonus, penalties and/or act on the Competition according to the following:

a) Bonus

After Deliverable #5, Teams complying with the three following items will obtain up to 5 points of bonus for the total score of the Competition:

- All the documents required for Deliverable #5 regarding Health & Safety are received on time.
- No explanations or additional documents are needed to complete the Health & Safety Deliverable.
- The SDE21/22 HS Coordinator considers that the documentation submitted by the Team is complete enough to receive the certificate to work in SDE21/22 Solar Campus.

b) Penalties

- Teams will not receive any penalty if working in safe manner and following their HS Plan.
- No penalties will be applied to trivial situations which are immediately corrected.
  However, Penalties may be applied in case of repetitive trivial situations.
- To avoid risks and possible penalties Teams must confirm with the SDE21/22 HS Officials that the planned measures are adequate and sufficient.
- Penalty Points will be applied only during assembly and maintenance phases.

c) Degree of the Faults

Grade 1. Trivial Fault

- Temporary lack of individual protections or incorrect use of them.
- Temporary incorrect work procedure.
- Temporary lack of the necessary signs.
- Examples:
  - > Not wearing a protected helmet, without works taking place in higher levels;
  - > Carrying excessive loads;
  - > General signs in the entry of the lot removed and not replaced.

Grade 2. Tolerable Fault

- Lack of collective protections, or ineffective ones, with tolerable risks as a consequence.
- Repetitive Grade 1 Fault.

Grade 3. Moderate Fault

- Lack of collective protections, or ineffective protections, with moderate risks as a consequence.
- Systematic Grade 1 Fault, or repetitive with moderate risks as a consequence.
- Not following the SDE21/22 HS Officials instructions, with moderate risks as a consequence.

Grade 4. Important Fault

- Lack of Collective protections, or ineffective ones, with important risks as a consequence.
- Systematic grade 1 fault, or repetitive with important risks as a consequence.
- Not following the SDE21/22 HS Officials instructions, with important risks as a consequence.

Grade 5. Intolerable Fault

- Negligent attitudes.
- Deliberate actions that cause or may cause important risks for the Team member or any other person.
- Not following the HS Officials orders given to the Safety Officers to resolve an expected serious and imminent risk.

TABLE 38. TABLE OF PENALTIES

GRADE	QUALIFICATION OF FAULT	POINTS PENALTY UP TO (1)	WORK TO BE STOPPED (MINUTES)
1	Trivial	1	0
2	Tolerable	2	30
3	Moderate	5	50
4	Important	10	100
5	Intolerable (2)	20	240

Procedure in Case of Non-Trivial-Faults (Grade 2-5)

Detection of the Fault

If the HS Officials detects any non-trivial fault the procedure will consist of:

- HS Officials will order the Team to stop the works immediately.
- Decision about the number of Team members stopping (all the Team or only those involved in the fault).
- Decision if it is necessary to solve the fault before stopping. In this case, only the minimum number of Team members necessary will resolve the fault and will leave the lot once they have finished.
- The HS Officials will decide for how long the work is to be stopped.

Work to be stopped

- If the HS Officials stops all the works, it is absolutely mandatory to keep out of the lot for the time established. This time counting will start immediately after the last Team member called to stop is out of the lot. The Team shall wait for instructions to resume the works again.
- In order to prevent recurrence, the HS Officials will meet with the Team to analyse the fault and indicate the measures to be taken to resolve this type of risk.

Consequences in the Event of a Serious Situation

- Moreover, in case of a more serious fault they may recommend the SDE21/22 Organisation to adopt another kind of action.
- In case of intolerable fault, or reiterative faults that compromises the Health & Safety of students, the SDE21/22 HS Coordinator will meet the SDE21/22 Organisation to discuss a possible disqualification of the Team from the Competition.

Report about the Fault

- The HS Observer will fill in a report signed by the Safety Officer and the SDE21/22 HS Officials in which the degree of the fault, the details of the incident, and the measures taken, etc. are defined.
- The SDE21/22 Organisation, through the SDE21/22 HS Coordinator, has the authority to determine the grade of every fault, and the penalty to apply (type and quantity).

Economic Sanctions

- Any economic sanction will be applied as a deduction of the economic support derived from the SDE21/22 Organisation.
- The German Administration may impose sanctions (including economic, civil and/or penal), regardless those applied by the SDE21/22 Organisation.

51.7 HS Teams General Requirements

a) Team members in charge of Health & Safety

HS Team Coordinator

- HS Team Coordinator is the Team member in charge of Health & Safety at SDE21/22 Solar Campus and has the ultimate responsibility for the development and enforcement of the Team´s HS Plan.
- This person is responsible for Health & Safety of the whole Team: including every operation of each of the Team members. This includes students, faculties, contracted staff, etc.

- The HS Team Coordinator is the person who signs the HS Plan, certifying the truthfulness of the information submitted, and is responsible for every decision established in the HS Plan.
  - > It is mandatory that the HS Team Coordinator has a qualified university degree, e.g. Architect, Building Engineer, Engineer, Technical Engineer or equivalent.
- Teams must clearly identify the HS Team Coordinator in the HS Plan.

[**Note:** The SDE21/22 HS Officials suggests that a faculty or another person with authority in the Team assumes the role of HS Team Coordinator, during design and construction.]

Teams Safety Officers

- The Safety Officers are in charge of the safety measures observance and are therefore preventive resources.
- Teams must clearly identify them in the HS Plan.
- Safety Officers need to be persons with:
  - > Enough knowledge of the assembly/disassembly process;
  - > Enough experience to identify risks and to look for the best way to solve them;
  - > Enough authority inside the Team to lead the rest of the Team members, and to stop the activities if necessary.
- The HS Team Coordinator (or at least one of the HS Officers) must be in the lot while any activity is going on.
- The SDE21/22 Organisation will provide special hard hats for the Safety Officers and the HS Team Coordinator.

Relationship with the SDE21/22 HS Officials

- The SDE21/22 HS Coordinator and SDE21/22 HS Inspectors will announce the orders only to the HS Team Coordinator or Safety Officers, who will be responsible for informing the rest of the Team.
- The SDE21/22 HS Officials will only talk to the rest of the Team in case of imminent important risks.
- The HS Team Coordinator and/or Safety Officers will participate in daily briefings at SDE21/22 Solar Campus. Moreover, they are encouraged to hold a similar daily briefing with the rest of the members of the Team to inform them of the instructions given by the SDE21/22 Organisation.

Contracted Staff

- Any contracted staff will be considered as another Team member. It is mandatory for all the contracted staff (truck drivers, crane controller, etc.) to comply with the SDE21/22 Rules and the German Regulations (see Rule 51.1).
- It is important to demand the contracted staff the observance of German Regulations (and include them as mandatory items) before signing the contract with them.
- The Team shall ensure that contracted staff have received appropriate instructions regarding the safety and health risks that might occur during their specific work on the construction site (DGUV Regulation 1 – Sec. 6).
- SDE21/22 Organisation may apply penalties to the Team because of the actions of their contracted staff. HS Plan must include the activities to be developed by the contracted workers.
- Teams and the contracted staff shall cooperate on safety and health matters to avoid safety and health risks that occur on the basis of the collaboration.
- Teams may ask the contracted staff to develop a HS Plan and do a risk assessment with their own measures in compliance with the German law for the Prevention of Labour Risks.
- The HS Specific Terms and Conditions Document must include a reference to these documents.

b) Working Shifts and Resting

General Requirements

- A basic measure to reduce risks is to watch out and take care for the rest of the Team members, as a high number of accidents are due to the tiredness or lack of concentration.
- A strict planning of activities and shifts among the Team members is required and help to prevent this risk and fulfil the mandatory German Regulations.

Working Hours

- The working hours on the Solar Campus are limited to the period between 7 am and 11 pm.
- Working during the night is forbidden and the Solar Campus is closed for this period.
- In compliance with the German Regulation, the maximum number of working hours is 8 hours per day and worker. In exceptional cases, the working time may be increased up to 10 hours per day.
- A worker must rest more than 11 hours before starting a new shift.

Working Shifts

- Teams are recommended to organise two working shifts of 9 hours, including 1 hour for lunch/dinner/meal and a 15 minutes' break for each shift. If necessary, the frequency and/or duration of the break times have to be increased because of climatic or working conditions, such as wearing a FFP2 mask. There are special rules for pregnant women or people under 18 years. Teams are also encouraged to have a specific area for having lunch or resting, or even better, to order Team members to leave the lot while resting. In these resting areas, the exposition of hazards, like dust, noise, and/or vibration, should be as low as possible.
- The working shift regulation must be considered to decide the number of Team members and/or HS Officers that will be necessary at SDE21/22 Solar Campus. As stated, a HS Officer or the HS Team Coordinator must be in the lot while any activity is going on.
- During the construction works, the SDE21/22 HS Officials may demand Teams the daily list of Team members for every shift, as well as the schedule for each one.

c) Emergency and Accident Procedures

Procedure Description

HS Plan shall include all the information concerning this subject:

- HS Drawings: location of first aids bag, route to the health centre, planned signposting, etc.
- HS Report shall indicate the following information: insurance that will cover their stay in Wuppertal, the health centre (in accordance with the insurance instructions), etc.
- HS Specific Terms and Conditions Document: If appropriate, when indicating the Team members' education/training, Teams shall include information about accident procedures, first aids, etc.

Before Starting

Teams are encouraged to realize an emergency training prior to the final phase of the Competition, including a visit to the H+S centre on the solar campus (in order to familiarise all Team members with the fastest way to get there) in accordance with the insurance instructions. Teams must participate in the H&S lecture and training on the day before the start of the assembly phase. A second H&S lecture and training session will be offered at the beginning of the second assembly week. Team members who could not attend one of the two appointments before entering the construction site must be informed of the contents by the Team's H&S coordinators. The exact dates can be found in the SDE21/22 Event Calendar.

During the Construction Works

- As stated, the Evacuation Plan must be kept visible inside the lot (using, for example, a waterproof mobile signpost) during the final phase of the Competition.
- Regardless the HS measures of the SDE21/22 Organisation, every Team shall have a first-aid box inside their lot. During each shift, there must be a Team member responsible for first aid, being a qualified trained person on the subject.
- Moreover, all the Team members are encouraged to have first-aid training.

In Case of Accident

- The German emergency phone numbers are:
  - 110 Police;
  - 112 Fire brigades / ambulance.
- Act as described in the HS Plan: evaluation, first aid, etc. Evaluate the emergency. Take in the whole picture.
- Call or notify the SDE21/22 Organisation. If necessary, ask the SDE21/22 Organisation for any type of additional help.
- Information regarding the actions protocol in case of accident, in coordination with the SDE21/22 Organisation, will be available through the SDE21/22 WAT.

d) Protection Equipment

Collective protections

- All Teams shall provide every work unit with collective protections, during the Assembly, Maintenance and Disassembly phases of the house. All Team members, crew and volunteers that will use the collective protections need to be trained on their proper use, inspection, and limitations.
- Concerning complete technical specifications of the collective protections: in accordance with the current German Legislation, all the protection equipment, auxiliary means, machinery, etc. shall have the «CE» branding, guaranteeing their adaptation to the regulation in force.
- When working on the roof and on the façade (from a height of 2 m), either a scaffold must be provided, or the Team members must secure themselves on the roof with a rope securing system.
- At a height of 1 m, measures are required at exposed flights and landings of stairs, wall openings, and all traffic routes.
- Ladders may be used up to a height of two meters, but only if they are secured all the time by a second person. Ladders above a height of 2 m are prohibited. Before using a ladder there must be proof of any possible and realisable alternative, such as a mobile scaffolding or any other safer alternative.
- For moving modules or larger elements with the crane, safe attachment points and slings must be used. This is the responsibility of the Teams.
- Open fires and barbecues are strictly forbidden on the construction site. Smoking is permitted in designated areas.
- The storage of flammable and toxic hazardous substances must meet the following requirements:
  - lockable storage
  - provide a drip tray for liquids

Individual protection

- Each Team must provide their staff (Team members and crew) with protective and safety equipment, “Personal Protective Equipment” (PPE), during the Assembly and Disassembly phases of the house.
- The equipment should also be available whenever considered necessary (for example during maintenance operations). All Team members, crew and volunteers need to be briefed on the proper use, inspection, and limitations of the PPE.
- Concerning complete technical specifications of the individual protections: in accordance with the current European Legislation, all the protection equipment, etc. shall have the “CE” branding guaranteeing their adaptation to the regulations in force.
- Teams will have to clearly identify the crane signal person writing in black-coloured capital letters the term ‘BANKSMAN’ on the back of the reflective jacket of the designated people.
- During the Assembly, Maintenance and Disassembly phases, a minimum level of PPE is mandatory and required at all times:
  - Protective helmet;
  - Safety glasses (with UV protection);
  - A shirt with sleeves and long trousers;
  - Safety boots with ankle supports;
  - Reflective jacket;
  - Gloves and ear protection.

- Additional PPE or safety equipment must be used if required for the task being performed.
- The SDE21/22 Organisation will provide specific Protective helmet for the following Team members in order to easily identify them on the workplace:
  - The Site Operation“ Coordinators;
  - The HS Team Coordinator“
  - The Safety Officers.

TABLE 39. COLOUR-CODE FOR HARD-HATS (ACCORDING TO EN 397 AND DGUV 112-193).

COLOUR	OFFICIAL USE	USE FOR SDE21
White	Visitor, Architect, Site Manager	SDE21/22 Organisers
Yellow	Worker, Bricklayer	Team Member, Contracted Staff
Blue	Sanitary, Metalworker	Site Operation Coordinator
Red	Foreman, Electrician	HS Team Coordinator
Green	Carpenter	Team Faculty
Orange	Safety Officer, Concrete Builder	SDE21/22 HS Officials

[**Note:** only the SDE21/22 Organisation will use the white colour for hard hats. Teams are not allowed to use this colour for this equipment.]

e) Loads operation

German Regulation establishes specific limitations on the loads to be carried out by people. In accordance with the law for the Prevention of Labour Risks, the maximum load to be carried out by one single person is 10 kg.

f) Vehicles in the SDE21/22 Solar Campus

Speed Limitations

Regardless the additional measures to adopt, in order to guarantee all risks are resolved, when trucks or any other vehicle is moving in SDE21/22 Solar Campus:

- The speed of the trucks will adapt to the step of a man.
- Driving on the Solar Campus should be reduced to a minimum.
- Vehicles should have a rear-view camera, sensors and an acoustic signal when reversing.

Guidance

- In addition, the trucks need to be guided on the Solar Campus as follows:
  - One person must walk in front of the truck;
  - Another person must walk behind the truck.
- These two people will have to:
  - Establish the maximum speed of the vehicles;
  - direct the movements of the truck;
  - avoid the accidents with people, with the rest of vehicles and/or with the different elements of SDE21/22 Solar Campus.

RULE 52 _ ANNEX FOR BUILDING CODE

52.1 Required Drawings

Please refer to rule 30.2 c).

52.2 Overview on DIN / EN Codes

TABLE 40. TABLE OF BUILDING CODES.

DIVISION	CODE NO.	DESCRIPTION
Accessibility	DIN 18040	barrier free design
	EN 17210	accessibility and usability of the build environment
Building Physics	DIN 4109	sound insulation
Electrical	DIN 18015	electrical installation
	DIN VDE 0100	electrical testing
Fire Safety	EN 1363 ff.	fire classification tests
	EN 13501-1	fire classification
	EN 13501-2	fire classification
	EN 50575	power, control and communication cables
	EN 3-7	portable fire extinguishers
	DIN ISO 23601	fire protection plan
Glazing	DIN 18008	glazing
Roofing	DIN 18531–flat - roofs	
Staircases	DIN 18065	stair treads
	DIN 17210	hand–ails - accessibility and usability of the build environment
	EC/EN 1991-1 (1)	handrails
Structural	EC/EN 1991-1 (3-4)	wind- snow factors
	EC/EN 0-9 / 1990-1999	Eurocodes
Technical Building Services	DIN 1986-100	plumbing: drawing symbols
	DIN 1988-200	plumbing: water temperature
	EN 1111	plumbing: water temperature
	EN 12975	technical building services
	DIN 18017-3	mechanical ventilation
	DIN 28000-4	thermal solar s–stem - drawing requirements
	EN 12897	thermal solar s–stem - safety: temperature- relief valve
Mechanical	EN 12792	drawing / colours / key symbols of air types

52.3 Building Code Checklist

The following checklist can be used by Teams for self-check concerning compliance with the SDE21/22 Building Code. It serves as an assistance but does not replace the requirements of the previous Building Code. If there are any inconsistencies between the Building Code and the Checklist, the requirements of the SDE21/22 Building Code is the rule that is in charge.

TABLE 41. BUILDING CODE CHECKLIST / COMMENTS GUIDELINES AND INFORMATION.

✔	NO.	REQUIREMENT
	1.0	Building Planning and Construction: Building Requirements
	1.1	staircases: minimal usable width 100 cm, min./max. dimensions checked
	1.2	steeper ladders or stairs (not useable) secured with a chain or other devices
	1.3	equal and appropriate access to second level for people with special needs
	1.4	correct handrail height between 85-90 cm
	1.5	continued handrails: horizontally at the beginning/end 30 cm
	1.6	protection against the undermining of stairs / less than 2.20 cm headroom must be protected against the risk of injury
	1.7	minimal ramp width 120 cm
	1.8	maximal ramp slope of 6%
	1.9	maximal ramp length without a platform: 600 cm
	1.10	landing zones /platforms of ramps with 150 cm x 150 cm
	1.11	ramp handrails on both sides
	1.12	guardrail/fall protection: distance between railing parts in one direction max. 12 cm
	1.13	guardrail/fall protection height ≥ 90 cm
	1.13	guardrail/fall protection: protection for children to a minimum height of 70cm
	1.14	ceiling height minimum 2.40 m (with some exceptions)
	1.15	correct conditions slip resistance of the floors
	1.16	use of safety glass in the necessary parts of construction
	1.17	approval from a SDE21/22 HS Official - if there are large unusual moveable features
	1.18	thermal storage: all thermal storage devices / phase change materials nontoxic and with material data sheets
	1.19	no paint disposing on the competition site
	1.20	no use of the prohibited groups of pollutants
	1.21	flat roofs with a connection height in relation to rising building elements
	1.22	for used roofs ≥ 0,15 m over the waterproofing layer
	1.23	for unused roofs with a roof pitch of up to 5° (8.8 %) ≥ 0.15 m as well as with a roof pitch of more than 5° (8.8 %) ≥ 0.10 m over the waterproofing layer
	1.24	flat roofs with at least two water outlets (one gutter outlet and one emergency outlet)
	1.25	emergency outlet: values for a rain duration of 5 minutes in Wuppertal: dimensioning: r (5,5) = 352 l/s*ha emergency dewatering: r (5,100) = 684 l/s*ha

	2.0	Building Planning and Construction: Accessibility
	2.1	access: route for people with special needs (public area), no barrier on the public tour, needed width etc.
	2.2	roof deck, loft or upper levels accessed via stairs are not part of the public tour
	2.3	all changes in elevation (including even minor changes in areas such as door thresholds) are considered along an accessible route – ramps, no steps
	2.4	if there is an upper level for public –ours - only via elevator or lift
	2.5	elevator: min. size 1.10 m x 1.40 m, min. door width 0.90 cm, handrail on at least one side
	2.6	if it is not possible to turn with a wheelchair in the elevator, a mirror on the opposite of the door is required
	2.7	minimal door height 2.05 m in clearance
	2.9	minimal door width for the public tour 90 cm clearance
	2.10	correct movement areas for wheelchair users
	2.11	safety requirements: glazed walls and fully glazed doors clearly marked with visual indicators
	3.0	Fire Safety
	3.1	fire protection plan
	3.2	one responsible Team member for compliance with the safety rules
	3.3	written operations plan and fire protection plan approved by SDE21/22 Organizers
	3.4	maximum 20 visitors at once in the HDU
	3.5	at least one fire extinguisher (foam fire extinguisher with extinguisher rating: 21A, 144B according to DIN EN 3-7 recommended)
	3.6	interconnected smoke alarms inside the HDU
	3.7	fire protection concept and evaluated fire resistance classes and components checked by a safety engineer
	3.8	at least two independent escape routes to the open air on each floor
	3.9	correct escape route distances on each floor
	3.10	correct dimensions of all components on each of the escape routes (windows, steps etc.)
	3.11	minimum width for escape routes 1.00 m (including stairs)
	4	Structural Safety
	4.1	all structural drawings and calculations stamped and signed by a qualified and licensed design professional
	4.2	all structural calculations using Eurocodes (EC 0-9/EN 1990-1999)
	4.3	special design challenges for the SDE21/22 considered
	4.4	structural drawing requirements checked
	4.5	technical requirements for building and structure checked: material regulations
	4.6	technical requirements for building and structure checked: foundation and levelling
	4.7	technical requirements for building and structure checked: uplift design
	4.8	technical requirements for building and structure checked: loads/load combinations
	4.9	technical requirements for building and structure checked: correct safety factors

	5.	Electrical Safety
	5.1	all electrical installations planed by an installation engineer and approved by a professional electrical engineer
	5.2	drawing requirements for electrical plans checked
	5.3	grid: nominal voltages ad frequency checked
	5.4	grid: maximum overvoltage checked
	5.5	grid: maximum over frequency checked
	5.7	TN-C-S requirements: neutral conductor: blue
	5.8	TN-C-S requirements: protective conductor: green-yellow
	5.9	TN-C-S requirements: AC phase conductor: brown, black or grey
	5.10	short circuit protection installed: RCD in the fuse box of the HDU
	5.11	earthing system installed for all conductors
	5.12	all installed receptacles with a building inspectorate approval – CE marking
	5.13	all installed receptacles with three poles
	5.14	all installed receptacles with a child safety lock
	5.15	high current power connection/fixed connection (≥3.5kW) e.g. for the oven in the kitchen fused separately
	5.16	one phase current socket (3.6kW) installed for heating test
	5.17	all in house tour areas with a minimum illumination of 20 lux exterior and 100 lux interior and in path/traffic areas
	5.18	minimized light emissions to the sky
	5.19	no coloured lighting in outdoor areas
	5.20	correct installation space for the electricity meter
	5.21	all electrical equipment certified for the European market – CE mark
	6.0	Photovoltaic System PV
	6.1	all drawing requirements checked
	6.2	'Electric and PV Chart and Checklists' document for project manual
	6.3	correct emergency switch installation
	6.4	PV System connected to its own equipotential bonding
	6.5	correct galvanic separation between low voltage distribution network and photovoltaic system
	6.6	delivered project documents and certificates of the manufacturers for approving the correct requirements
	6.7	correct configuration for grid interconnection
	6.8	inverter configuration checked
	6.9	over/under voltage and frequency checked
	7.1	Telecommunications / Building Management System
	7.2	all systems in compliance with the general data protection regulation (DSGVO)
	7.3	photography and filming permissions checked
	7.4	password protection for own Wi-Fi in the HDU (if installed)

	8.0	Technical Building Services: Plumbing
	8.1	hot water supply installed and justified per rule 7
	8.2	drawing requirements checked
	8.3	concept for water hygiene via temperature or other technical solutions
	8.4	equipotential bonding installed
	8.5	signs or pictograms 'non-potable water'/'Kein Trinkwasser' installed
	8.6	no water basins in and outside the HUD
	8.7	no additives in the Team's water supply tank – no consumption of the water at any time
	8.8	water closet for demonstration only with correct warnings to prevent usage – signage in English and German
	8.9	greywater use for cleaning or watering vegetation only in compliance with rule 9.2
	8.10	no manual transport of greywater on the site
	8.11	if there is a greywater treatment system – approval by the SDE21/22 Organizers
	8.12	no black water source connected to a greywater storage or distribution (water from kitchen sinks and dishwashers)
	8.13	rain and greywater pipelines running separately in the building
	8.14	ventilation of the sewage pipes
	8.15	downpipes provided with at least one vent line up to the roof
	8.16	ventilation opening with an orthogonal distance of 15cm to the water bearing layer of the roof
	9.0	Thermal Solar System
	9.1	collectors and storage units listed and labelled
	9.2	compliance with the drawing requirements
	9.3	no flammable or liquid used as transfer media
	9.4	maximum system temperature inside the dwelling 95°C
	9.5	temperature relief valve provided
	9.6	vacuum relief valve provided
	9.7	pressure relief valve provided
	9.8	expansion tanks installed in closed fluid loops
	9.9	pressure test of the system
	9.10	collectors flame retardant
	9.11	collectors carrying hot fluids avoided over accessible areas
	9.11	no cross connections to the water tanks
	9.12	provided access to the system for inspection, maintenance, repair and replacement
	10.0	Mechanical
	10.1	ventilation in compliance with Rule 7
	10.2	not connected heating systems if they are for demonstration causes (e.g. heat pumps)
	10.3	heat delivery components of the system installed (radiators, floor heating panels etc.)
	10.4	compliance with the drawing requirements
	10.5	ventilation lines corrosion-resistant and hygroscopic
	10.6	correct installation of air inlets and ventilation components checked
	10.7	sound insulation for air conditioning in living- and bedrooms not exceeding 30 dB
	10.8	closable ventilation outlets to the outside for the blower door test

	11.0	Building Physics
	11.1	correct values of thermal transmittance
	11.3	solar protection shading for solar exposed glazing
	12.0	Living Lab: Additional Requirements
	12.1	structural safety: anchoring not limited to a depth of 50 cm
	12.2	electrical safety: all receptacles and home appliances fitting to German standards
	12.3	lightning protection: for the later use phase designed and prepared
	12.4	correct earthing/equipotential bonding: connected to a foundation electrode or rod/strip earth electrode on the lot
	12.5	documentation and user manual for smart home and building automation
	12.6	main water connection: frost proof fresh- and wastewater connections for use without water tanks after the competition
	12.7	information for the SDE organizers regarding energy performance
	13.0	Health & Safety
	13.1	compliance with all German health and safety regulations
	13.2	general coordination plan for the construction site checked
	13.3	Health & Safety protection coordinator appointed
	13.4	the whole Team being aware of the general prevention principles for the construction site
	13.5	SDE21/22 Organizers in charge of the workplace safety - all requirements applicable for Team members and contracted staff
	13.6	detailed risks analyses of the construction process see Rule 51.5
	13.7	HS Work Phase 1: correct/complete Health & Safety Risk Analysis
	13.8	HS Work Phase 2: correct/complete Health & Safety Plan
	13.9	HS Work Phase 3: preparations for construction works
	13.10	HS Work Phase 4: general requirements for construction work complied with
	13.11	all Team members aware of the roles of SDE21/22 HS Officials
	13.12	HS Plan approved
	13.13	HS Bonus and Penalties checked

index

Revised with each version.

appendix a: sde21/22 wat

Introduction

The Solar Decathlon Europe 2021 (in 2022) Workspace Area for Teams (SDE21/22 WAT) is the main communication platform between the Teams and the SDE21/22 Organisation. The SDE21/22 WAT is a secure educational website, which is only accessible to the participating Teams, the SDE21/22 Organisers and the Energy Endeavour Foundation (SDE21/22 Organisation). A personal password is required for each user. All Teams must be registered in order to be informed on the project. The platform can be reached through this link: https://moodle.sdeurope.uni-wuppertal.de/ or www.teams.sde21.eu

The primary functions of SDE21/22 WAT are:

- disseminate all official communications;
- provide calendar updates;
- request and receive information or clarification;
- submit questions;
- upload and download files.

This user manual explains you how to use the Solar Decathlon Europe 2021 (in 2022) Workspace Area for Teams (SDE21/22 WAT). Teams are responsible for the communications made by their Team members through the SDE21/22 WAT.

Login

For the first access to the SDE21/22 WAT, the SDE Organisers will give each Team one username only, with a corresponding individual personal password. This user-login is for the Faculty Advisor Contact. After the first access, the Team may request additional users to the platform. For each Team the number of users is limited to 3 personalised logins per Team. The SDE21/22 Organisers recommend the following designated Team representatives:

- FA – Faculty Advisor
- PM – Project Manager
- STL – Student Team Leader

Each Team can apply for an additional user account. This is a read-only account and is meant for all other Team members who do not have a personalized WAT-account. It is named after the Team name and the Team ID (e.g. Team SUM [TUD-Delft]). To request additional users the Faculty Advisor shall send an e-mail to sde21wat@uni-wuppertal.de filling in the excel format table, named "*[Team Abbreviation, e.g. CHA]*-New Wat Users", available through the SDE21/22 WAT, including the personal details of the new members. Teams may request additional users at any time throughout the project development. Once you have your Username and Password, go to the login page, insert your Username [1] and Password [2], and press "Enter" [3] in order to access the main page. It is important that you edit your user information when you first log in.

Edit your profile

When you first login, you need to change the default password. After that, click on your name and edit your user information with accurate data (select the "Edit profile" tab). Please set the following values to these settings:

- Email display: Allow everyone to see my mail address;
- Email activated: The email address is enabled.

Before updating your profile, press the "Show Advanced" button and fill in the following fields:

- Web page;
- Institution;
- Department;
- Phone;
- Address;
- Description (Logo, name, or any relevant information).

In order for the login information to be retained it is IMPERATIVE that all areas have information. In case some information is still being developed by your Team, please fill in the words 'under construction'. In the area called 'description', place your name or whatever information you wish; either way, you must insert some text. If you want to upload an image, photo or logo, a png-file shall be uploaded with an aspect ratio of 1:1, 100x100 px and a maximum file size of 300KB.

Main Screen

Once you are logged in you will have access to the screen showing the SDE21/22 WAT Main Screen. The following SDE21/22 WAT Main Areas are visible in the middle section of the main screen and a shortcut to view all competition participants (People->Participants) in the left side of the screen:

- **Main Board**
  - > Official Communications
  - > Global Workspace
  - > Private Team Area
- **Deliverable #1 (...#2,#3,..)**
  - > Deliverable – Upload Area

On the right side of the main screen there are some useful tools, such as:

- **Latest announcements:** displays information about news posted in official communication area
- **Upcoming events:** displays upcoming events and a link to the user calendar
- **Tags:** displays the most popular tags and a link to tag search by clicking on a tag
- **Search forums:** quick search for the question and answers area

On the left side of all the different areas, the following tools are available:

- **Course – Navigation**
  - > Participants – List of all SDE21/22 WAT Members
  - > Main Board – Link to Official Communications & Documents area
  - > Deliverable – Link to Deliverable Upload Area
- **Website – Navigation**
  - > Dashboard – Course Overview
  - > Site Home – Landing Page
  - > Calendar – Shows all of the contests' relevant dates (including Deliverable deadlines).
  - > Private files – Displays individual user files
- **My Courses – SDE21WAT link to Main Screen**
  - > Site administration – User settings

Official Communications

Access to these message boards is granted to all users but only SDE21/22 Organisation may create or modify posts.
The Official communications area has four message-boards:

- **Announcements**
  - > including relevant information for the Competition, such as changes in Rules or deadlines, required documentations, Deliverables and events (meetings, workshops, etc).
- **Rules and Related documentation**
  - > will include the latest version of the SDE21/22 Rules and related documentation needed for the project development.
- **Glossary/ FAQ**
  - > will include definitions of the most important terms, frequently asked questions (FAQ) and the Organisers' answers.
- **Building Energy Competition & Living Lab Knowledge Platform**
  - > link to the Knowledge Platform, where Teams will upload their project documentation after the event.

Global Workspace

The SDE Organisation as well as all Teams, may create posts in this area. This is the SDE21/22 WAT's main work area and is the space where questions and answers are posted.

- **Questions to the Organisers**
  - > Working as a public forum, open to all Teams, for posting any question regarding the Competition. (For private questions, Teams must use their Private Team Area).
  - > The SDE21/22 Organisers may create sub-forums to different topics in this area.

Private Team Area

The Private Team Area is a space where the Team can communicate with the SDE21/22 Organisers.
Only the Team and Organisation members have access to this message board.

- **Communications to & from the Organisers**
  - > Team members may use this message board to ask private questions to the SDE21/22 Organisers.
  - > The SDE21/22 Organiser may create sub-forums to different topics in this area.

Team Privacy Levels at SDE21/22 WAT

Privacy levels are defined as follows:

- **Official Communications Area (public, read)**
  - > User access: organisation, all Teams;
  - > Teams may only read posts.
- **Global Workspace (public, read/write)**
  - > User Access: Organisation, all Teams;
  - > Teams may read and write posts, as well as upload files, in every message board.
- **Private Area for Team X (private, read/write)**
  - > User access: Organisation, Team X;
  - > Each Team may read and write posts, as well as upload files, in every message board.

appendix b: definitions

General Definitions

Assembly
Period of time between the arrival of trucks and the beginning of the Contests on SDE21/22 Solar Campus.

Brief Reports
Brief report with maximum 4 pages to inform a Jury on the key issues of a Team project related to a specific Contest.

Building Challenge
Designing, building and operation of a full functional demonstration unit as representative part of the whole building design project.

Building Energy Competition and Living Lab Knowledge Platform
An international web-based knowledge platform to add and secure information from new competitions and Teams: https://building-competition.org/. This platform runs under the Annex 74 within the Energy in Buildings & Communities Programme of the International Energy Agency IEA.

Climate Neutrality
The calculated balance of equivalent carbon emissions resulting from the operation of the whole building including all energy carriers and sources. A standardized emission factor for the EU28 power grid is provided reflecting a 2030 energy system outlook.

Competition
All aspects of the Solar Decathlon Europe 2021 (in 2022) related to the 10 Contests and the scoring of those Contests, along with the project development of the Competition House Demonstration Units (HDU).

Contest
The Solar Decathlon Europe Competition consists of 10 separately scored Contests, each containing one or more sub-Contests. See Rule 13 _ General Contest Information.

Contest Period
Period of days on SDE21/22 Solar Campus when some or all Contests are active.

Decision
The SDE21/22 Rules Officials' interpretation or clarification of a Rule.

Design Challenge
Planning of a whole building transformation addressing one of the three urban situations: renovation & extension; closing gaps; renovation & adding of storey.

Disassembly
Period of time between the conclusion of public tours and the completion of SDE21/22 Solar Campus clean-up.

Dissemination Materials
All printed or electronic publications designed to convey information supporting the Competition goals. Please refer to the SDE21/22 Graphic Chart & Brand Manual.

Division Manager
SDE21/22 Organiser who carries definitive responsibility for one of the divisions depicted in the Organisation Chart. See Rule 1.2 _ SDE21/22 Organisation Chart.

Energy Endeavour Foundation
The Energy Endeavour Foundation is the non-profit, legal platform managing and directing Calls for Cities and Calls for Teams, designating and stewarding SDE host cities in the organisation and promotion of the SDE Competition event. The EEF provides transfer of knowledge, branding and stewardship services, providing continuity from one SDE edition to the other. The Energy Endeavour Foundation is appointed by the U.S. Department of Energy.

Electric and Photovoltaic Chart – Interconnection Application
Form submitted by the Team's electrical engineer to the Site Operations Coordinator, which provides the technical details needed to determine the suitability of the Team's electrical and photovoltaic systems for interconnection to the Campus grid. This form is part of the Electric and PV Chart and Checklists document.

Electric and PV Chart and Checklists
Document that includes the 'Electric and Photovoltaic Chart', 'Electric System Design Checklist', 'Photovoltaic Checklist' and 'Electrical Storage System Checklist'. It must be completed and submitted by Teams from Deliverable 3 onwards.

Event
Activities that take place on SDE21/22 Solar Campus including, but are not limited to, registration, assembly, inspections, Contests, special events, public exhibits, and disassembly.

Event Calendar
The timetable establishing the dates of the final phase of the Competition and the daily activities assigned.

Event Sponsor
An entity selected by the SDE21/22 Organisation to support the SDE21/22 project and help to ensure its success.

Final phase of the SDE21/22 Competition
The period of days including assembly, disassembly and Contest week periods.

Grid-Tie Assembly
Period of time during assembly after the House Demonstration Unit ((HDU) has been interconnected to the Campus grid.

House Demonstration Unit (HDU)
Complete assembly of physical components installed on SDE21/22 Solar Campus, in compliance with the SDE21/22 Rules.

Inspection
Each of the inspections realized to all the Competition House Demonstration Units on SDE21/22 Solar Campus verifying compliance with the SDE21/22 Rules. See Rule 11.6 _ Inspections.

Inspections Card
Official card indicating the Teams' inspections' status.

Penalty Referee
Individual, appointed by the SDE21/22 Organisation, to examine and assess the Team's Rule infringements, and propose to the Competition Manager all penalties with respect to the Rules. She/he shall determine the severity of Rules infractions in consultation with the SDE Organisation, classifying them as minor or major, and report them to the Competition Manager. Penalty Referee shall be independent of the SDE21/22 Organisation and shall have a nationality other than the nationality of the competing Teams.

Project
All activities related to the Solar Decathlon Europe 2021 (in 2022) in from the initial meetings to the conclusion of the event.

Protest Resolution Committee
Group of individuals selected by the SDE21/22 Organisation to resolve Team protests during the Competition. The Protest Resolution Committee consists of people who are familiar with the project, but not part of the SDE21/22 Organisation or the Teams.

Public Showcase
Areas of the SDE21/22 Solar Campus open to the public during designated hours.

Rule
Principle or regulation governing conduct, action, procedure, arrangement, etc., for the duration of the project.

Scored Period
Any period of time during which a particular measured Contest is in progress.

Scoring Server
Digital application that collects data from the central data logger server, includes forms for manually entering Jury and task-based Sub-Contest results, and calculates composite scores.

SDE21/22_EEF Supervisory Board
Supervisory entity consisting of the SDE21/22 Project Director, SDE21/22 Host City & Stakeholder representatives, an SDE legacy member, the EEF director, an EEF Rules official and an EEF Board Member.

SDE21/22 Graphic Chart & Brand Manual
A document that describes, defines and illustrates how the SDE's visual identity elements, when used correctly, can help to create consistent and memorable communications programmes and actions, thus building a distinct personality for the SDE brand. This document guides users to present the brand in various visual media such as print, internet and broadcast.

SDE21/22 Jury
Group of individuals selected by the SDE21/22 Organisation to make evaluations on a specific aspect of each Team's project according to SDE21/22 Contests.

SDE21/22 Organisation
The SDE21/22 Organisation is the joint SDE21/22/EEF consortium consisting of the Energy Endeavour Foundation, the SDE21/22 Organisers and the corresponding supervisory board and divisions according to the Organisation Chart. See Rule 1.2 _ SDE21/22 Organisation Chart.

SDE21/22 Organisers
The designated SDE21/22 officials responsible for the implementation and execution of the divisions described in the SDE21/22 Organisation Chart. See Rule _1.2 SDE21/22 Organisation Chart.

SDE21/22 Solar Campus
Competition Site, where the Teams' House Demonstration Units (HDU) are assembled along with the common areas needed for the Competition development.

SDE21/22 Workspace Area for Teams (SDE21/22 WAT)
The SDE21/22 WAT is the official communication tool of the Competition. See Rule 2.4a _ SDE21/22 Workspace (SDE21/22 WAT)

Site
The site is where the Competition will take place, where House Demonstration Units are located. The main site for SDE21/22 is located in Wuppertal, district Mirke; other, individual sites may be chosen by the Teams in the country of origin as inspiration for their SDE21/22 projects to be assembled in Wuppertal.

Solar Decathlon Europe 2021 (in 2022) (SDE21/22) Building Code
A set of design and construction standards set forth and enforced by the Solar Decathlon Europe 2021 (in 2022) (SDE21/22) Building Official for the protection of public health and safety during the event.

SDE Council of Experts
The SDE Council of Experts is a contributing group of SDE legacy experts supporting the EEF's Solar Decathlon Europe mandate, committed to the long-term impact & vitality of the SDE. Members provides initial, voluntary input to the EEF, bringing experienced counsel for SDE-related topics.

Speed Peer Review
A platform for exchange and knowledge to improve presentation skills, public speaking, professional pitching. Teams make short presentations of their projects in front of their peers, Juries and broader communities. They synthesise their concepts, learn from other Team projects and from each other.

Stand-Alone Assembly
Period of time during assembly before the House Demonstration Unit (HDU) has been interconnected to the Campus grid.

Sub-Contest
An individually scored element within a Contest.

Sub-Contest - Juried
Sub-Contest based on jurors' assessment.

Sub-Contest – Measured
Sub-Contest based on task completion or measured performance.

Solar Campus Grid
Bi-directional, AC electrical network system installed on the Competition site which will constantly and individually measure the contribution and consumption of electrical energy of each House Demo Unit (HDU).

Urban Situation
The specific urban situation of choice ('renovation & extension', or 'closing gap', or 'renovation & adding of storey).

SDE21/22 Organisation Functions & Roles

The following roles and functions are to be implemented into a clear organisation chart. In each instance, one specific individual must carry definitive responsibility for each function.

Communication Management
The division responsible for the project´s public outreach, communication activities and special events.

Communication Manager
The head of the Communication Management division.

Competition Director
Competition Director is the SDE21/22 official responsible for the management of the Competition and responsible for mobilisation of all necessary resources for the achievement of its objectives, with decision-making authority in aspects related to the scope, planning, Rules and quality of the Competition.

Competition Management
The division planning, coordinating and controlling all the activities related to the Competition including Deliverable reviews. This entity enforces the Rules and states its content, conducting a fair and compelling Competition, assigning penalties and scoring.

Competition Manager
The head of the Competition Management division.

Design Reports
Comprehensive report of a Team to describe all aspects of the Team entry regarding a specific Contest.

Event Production
The designated SDE21/22 organising division responsible for the organisation of the SDE21/22 event, in cooperation with the Energy Endeavour Foundation and supported by the U.S. Solar Decathlon Organisation from the U.S. Department of Energy (DOE).

Event Production Manager
The head of the Event Production division.

HS Coordination
Evaluating the Teams' Health & Safety plans and consequently developing the Competition's Health & Safety Plan and supervising the Demonstration Units' assembly and disassembly works on the SDE21/22 Solar Campus.
The HS Coordination is part of the Infrastructure Management division.

Infrastructures Management
Planning, execution, development and control of all the activities related to the assembly, functioning and disassembly of the SDE21/22 Solar Campus.

Infrastructure Manager
The head of the Infrastructure Management division.

Inspector
Carrying-out the House Demonstration Unit's inspection and filling out the corresponding Inspection Card, according to the SDE21/22 Building Code.

Jury Manager
Organiser, liaison between the SDE21/22 Organisation and the Jury, responsible for accompanying the Jury during the House Demonstration Units' visits, the deliberation process, the evaluation reporting; and reporting to the Competition Manager.

Monitoring & Scoring Coordinator
Member of the Competition Management division responsible for the instrumentation system, monitoring and scoring of the Competition.

Observer
An Organiser assigned by the Competition Manager to observe Team activities during the Contest week.
While an Observer reports observed Rules infractions to the Rules Officials and records the results of specific Contest tasks, she/he does not provide interpretations of the SDE21/22 Rules.

Office Services Coordinator
Member of the Project Management division responsible for planning, coordinating, and directing a broad range of services that allows the SDE21/22 Organisation to operate efficiently.

Press & External Communications Coordinator
Member of the Communication Management division responsible for communication issues between the internal and external parties of the SDE21/22, acting as proxy between the participating Teams and the media.

Project Director
SDE21/22 Organiser responsible for the management of the project and responsible for the mobilisation of all necessary resources for the achievement of the objectives, with the final decision-making authority in all the aspects related to the scope, planning, costs, quality, resources, communication, risks, sponsorship, and acquisitions of the project.

Public Events Coordinator
Member of the Event Production division responsible for planning, coordinating, executing and developing all the public activities and events related to the Competition and for public outreach of the project.

Rules Official
Member of the Competition Management division authorized to interpret the Rules. The Competition Manager is the lead Rules Official and reports to the Senior Rules Official of the Energy Endeavour Foundation.

Scientific & Educational Outreach
The division responsible for planning, coordinating and analysing activities concerning scientific & educational outreach.

Scientific & Educational Outreach Manager
The head of the Scientific & Educational Outreach division.

Scorekeeper
Individual selected by the Competition Management division to operate and maintain the scoring server during the Competition.

Site Operations Coordinator
Member of the Infrastructure Management division responsible for the evaluation of the Teams' Site Operations plans, consequently developing the Competition site operation plan and the coordination and supervision of the Demonstration Units' assembly and disassembly works at SDE21/22 Solar Campus.

Social Media & Marketing Coordinator
Organiser Member of the Communication Management division responsible for managing the Social Media platforms and producing the official SDE21/22 multimedia files (videos, photos, presentations, etc.). This coordinator is also responsible for administrating the SDE21/22 Website, working efficiently under the direction of the Energy Endeavour Foundation.

Sponsorships and Exterior Relations Coordinator
Member of the Sponsorship Management division responsible for developing and implementing a long-range corporate giving strategy, to identify, cultivate, solicit and steward relationships with business supporters, fostering strong worldwide awareness and support.

Sponsorship Management
Division responsible for the strategy, recruitment and development of the project's sponsorship relations and the support of the Teams' sponsorship activities.

Sponsorship Manager
The head of the Sponsorship Management division.

Staff
Individuals working for the SDE21/22 Organisers on the project.

Team Communication Manager
Member of the Competition Management division responsible for the communication with the participating Teams, helping them through the project development.

Team Members

Communications Coordinator
Team member responsible for the Team's communications with the media and for developing all the communications materials (please refer to the SDE21/22 Graphic Chart & Brand Manual), including updating information concerning the communications activities through the SDE21/22 WAT; works in conjunction with the SDE21/22 Organisers to coordinate the Team's interactions with the media.

Contest Captain
Team member responsible for the Team's primary strategies and coordination of Tasks Contests; is also responsible for demonstrating the compliance of equipment and appliances with the Rules.

Decathlete
Team member who is an enrolled student –undergraduate or post graduate studies, at a participating school or has graduated from a participating school within 12 months of the beginning of assembly.

Electrical Engineer
Team member responsible for completing the Electric and PV Chart and Checklists and working in conjunction with the SDE21/22 Organisation electrical engineer to interconnect the Demonstration Unit to the grid on SDE21/22 Solar Campus. Must be a licensed professional, which approves and signs the unit's electrical systems (drawings and specifications).

Faculty Advisor
Team member who is the lead faculty member and primary representative of a participating university in the project; also provides guidance to the Team on an as-needed basis throughout the project. Responsible for signing the official document certifying the compliance of the codes of the country of origin.

HS Team Coordinator
Team officer who is responsible for developing and enforcing the Team´s Health &Safety Plan during the Competition phases, assembly and disassembly of the House Demonstration Unit. See Rule 51.

Instrumentation Contact
Team member collaborating with the SDE21/22 Organisers' instrumentation Team to develop a plan that accommodates the equipment used to measure the performance of the dwelling during the Competition.

Project Architect
Team member responsible for the architectural design effort; license not required.

Project Engineer
Team member responsible for the engineering design effort; license not required.

Project Manager
Team member responsible for the planning and execution of the project.

Safety Officer
Team member responsible for the safety measures observance during the event. See Rule 51.

Site Operations Coordinators
Team members responsible for developing and enforcing the Teams' Site Operations Plan during the Competition phases, assembly and disassembly of the House Demonstration Unit.

Student Team Leader
Student Team member responsible for the coordination among the Team. Ensures that official communication from the SDE21/22 Organisers are routed to the appropriate Team member(s).

Structural Engineer
Team member responsible for approving the Demonstration Unit's structural systems; license required.

Team Crew
Person who is integrally involved with a Team's project but is unaffiliated with the participating schools; contractors, volunteers, and sponsors are examples of Team crew.

Team Member
Enrolled student, recent graduate, faculty member, or other person who is affiliated with one of the participating universities and is integrally involved with a Team's project activities; Decathletes, Faculty Advisors, and involved staff from participating universities are all considered Team members.

items to be revised

For Internal purposes only. Suggestions for corrections can be sent to info@solardecathlon.eu.

Supporting Entities

energy endeavour FOUNDATION

The Energy Endeavour Foundation supports the mandate, vision & objectives of the original U.S. Solar Decathlon, initiated by the U.S. Department of Energy.