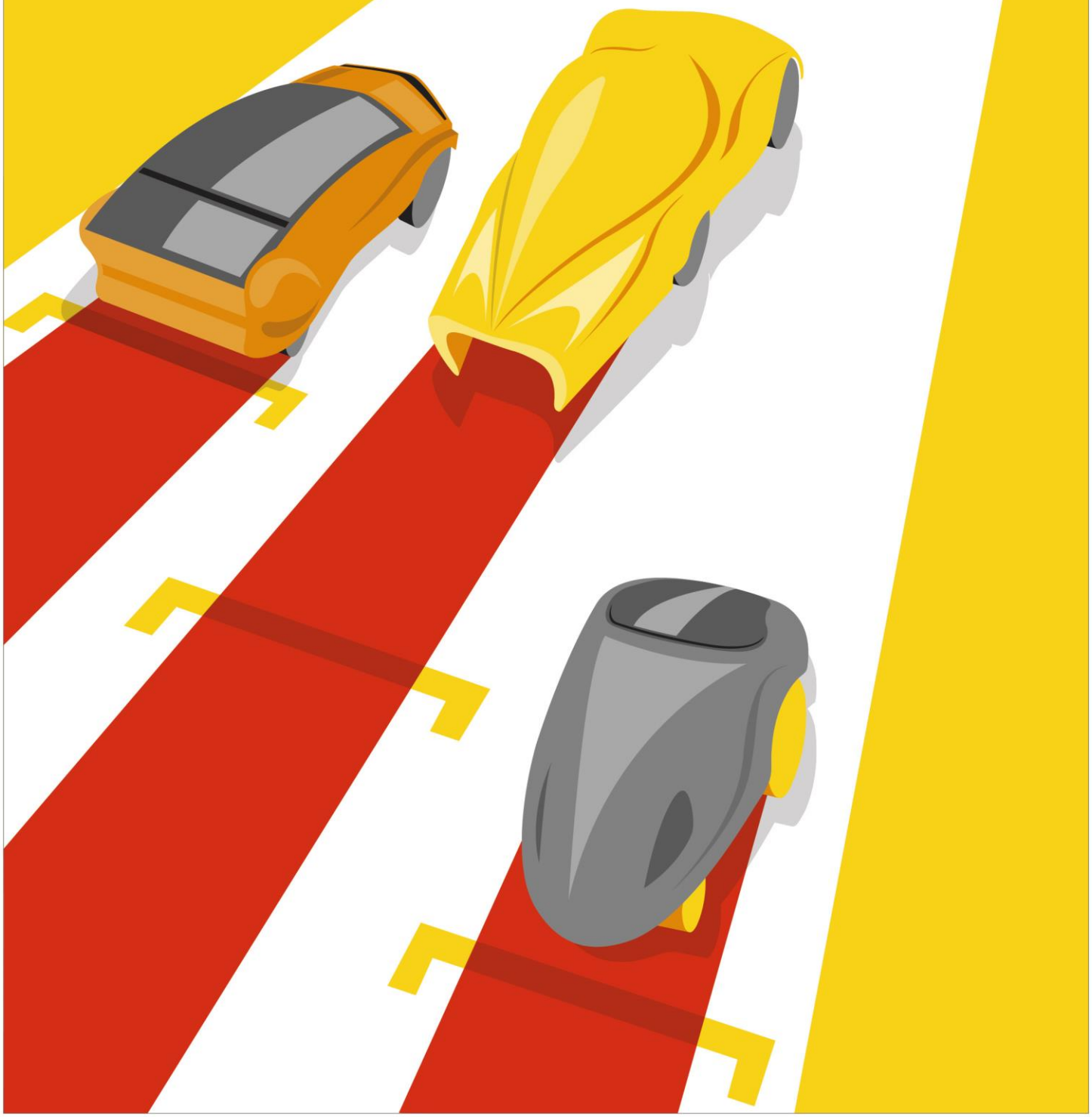
Shell
Eco-marathon

DRIVERS'
WORLD
CHAMPIONSHIP

OFFICIAL RULES

CHAPTER III



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1. GENERAL

ARTICLE 200: DEFINITION OF COMPETITION

The Shell Eco-marathon Drivers' World Championship (DWC) is an invitational competition for the world's best UrbanConcept teams that will compete together in the same location to find out who is the fastest energy-efficient driver.

a) The DWC will take place on Sunday, July 3 2016 on the **full Shell Eco-marathon Europe track.**

b) Competitors shall be grouped into **three energy classes**, Battery Electric, Hydrogen and Internal Combustion Engine.

c) The DWC is a tournament style competition composed of 3 semi-final heats of 8 teams, one heat per energy class, and one final.

d) Each vehicle will be given a fixed quantity of energy based on their SEM Europe performance. This will be done by having an energy measurement and control systems provided by the organisers. From a grid start, teams shall race to finish 3 laps of 2,250 m in the fastest time possible.

e) Team grid starting positions for the semi-final heats shall be calculated based on SEM Europe energy efficiency.

f) The two fastest teams from each of the 3 energy class heats will qualify for the final. The two fastest runners up from all three heats will also go on to the final.

g) The DWC winner shall be first vehicle to cross the finish line of the final.

ARTICLE 201: CHAPTER I AND CHAPTER II RULES APPLY

For each participant Chapter III of the Official Rules applies in addition to the Chapter I of Shell Eco-marathon and Chapter II of Shell Eco-marathon Europe.

ARTICLE 202: TERMS IN THIS DOCUMENT

DWC:	Drivers World Championship
Visiting Team:	One of the Teams invited to participate in the DWC from Shell Eco-marathon Asia and Americas.
Parc Fermé:	Designated area under control of the Organisers where vehicles are stored.

ARTICLE 203: VEHICLE TYPES

The DWC is open only to UrbanConcept category vehicles.

ARTICLE 204: ENERGY TYPES

Only one of the following energy types may be used:

- Shell Fuel Save Unleaded 95;

- Shell Fuel Save Diesel;
- Ethanol E100 (100% Ethanol);
- Shell Gas to Liquid (100% GTL);
- Hydrogen; or
- Battery-electric.

CNG is not permitted to compete in the DWC. All teams that are invited to compete in the DWC that used CNG in their regional competitions are required to convert their vehicle to either gasoline or ethanol prior to the DWC.

ARTICLE 205: ENERGY CLASSES

The competition is divided in three energy classes:

- Internal Combustion Engines (ICE) - Gasoline, Ethanol, Diesel, GTL;
- Hydrogen (H2); and
- Battery Electric (BE)

2. ORGANISATION

ARTICLE 206: CRITERIA FOR PARTICIPATION/ACCEPTANCE

Teams may participate in the DWC by invitation only. The Organisers will issue a maximum of 24 invitations to teams. These invitations will be distributed by the organisers as follows:

a) Energy Class rankings.

At each regional competition (Asia, Americas, Europe) the Organisers shall produce a ranking of all valid attempts for each of the UrbanConcept Energy Classes.

b) DWC Invitations.

DWC invitations shall be issued to the teams with the best results in each of the Energy Class rankings.

On the final day of Shell Eco-marathon ASIA 2016 and Shell Eco-marathon AMERICAS 2016 the two UrbanConcept teams with the best results in each Energy Class shall receive DWC invitations.

In the evening of Saturday, July 2 2016 the three UrbanConcept teams with the best results in each Energy Class in Shell Eco-marathon Europe 2016 shall receive DWC invitations.

In the event that there are an insufficient number of valid results in an Energy Class at the end of a regional competition the Organisers shall carry these invitations over to the next regional competition. Invitations that are carried over to future competitions shall remain applicable only to the original Energy Class.

c) Wildcards.

A "wildcard" is an invitation for an UrbanConcept team to compete in the DWC at the sole discretion of the Organisers. A wildcard will be awarded to a team that in the opinion of the

Organisers deserves to compete in the DWC. A total of 3 wildcards shall be issued to teams competing in any Energy Class and at any regional competition.

If a team does not accept a Wildcard invitation, this invitation shall return to the Organisers discretional use.

d) Acceptance of invitations by teams

All teams that receive DWC invitations following the SEM ASIA and AMERICAS events must return their signed invitation acceptance documents by email within 7 calendar days of the date of issue of the invitation.

All teams that receive DWC invitations following the SEM EUROPE competition must return their signed invitation acceptance documents by hand to the Organisers by 20:00 on July 2, 2016.

Any non-response by the specified deadlines will be deemed as a rejection of the invitation.

ARTICLE 207: IDENTIFICATION

All teams participating in the DWC shall receive a new set of official stickers to be fixed to their vehicle body before the vehicle is presented to the Parc Ferme. The official set of stickers provided by the Organisers shall have the same dimensions and be placed in replacement of those provided for the Shell Eco-marathon competition.

ARTICLE 208: ENERGY HANDICAPPING

Energy handicapping is being introduced to level the competition between vehicles to identify which driver and vehicle can perform most successfully in this new head-to-head driving competition.

The Organisers will calculate the qualifying energy value which is the minimum energy required for each team to complete the DWC distance based on their best attempt at Shell Eco-marathon Europe. To allow for the higher competition speeds of the DWC the organisers will then add a fixed percentage of energy to the qualifying energy value.

The fixed percentage of additional energy shall be the same for all teams.

> *For example, if a team consumed 160 ml of Gasoline during the 8 laps of their best Shell Eco-marathon Europe attempt, this represents 20 ml of Gasoline for 1 lap. Therefore the qualifying energy value required to complete the 3 laps of the DWC is 60 ml. The Organisers will then multiply the qualifying energy value by a fixed percentage, P%, of additional energy to allow for the higher race speed. The additional energy allowance for this team will equal 60 ml x P%. The same calculation principle shall apply to all energy types.*

During the competition, when the energy allowance has been exhausted the energy measurement and control systems, installed under Organisers' supervision, will disable the vehicle's propulsion system.

The final value for the fixed percentage of additional energy shall be announced by the Organisers during the first week of June 2016 to allow teams to establish their driving and energy usage strategies.

ARTICLE 209: DRIVER QUALIFICATIONS

All drivers wishing to participate in the DWC must drive their team's vehicle for at least 1 valid attempt during the Shell Eco-marathon Europe competition.

ARTICLE 210: QUALIFICATIONS FOR HEATS

All Visiting Teams:

- Must participate in the Shell Eco-marathon Europe competition and abide by the same rules (Rules Chapter I and Chapter II Europe).
- Must make 3 attempts in the Shell Eco-marathon Europe competition, of which 2 attempts must be valid.
- Must achieve an energy efficiency result on the SEM Europe track that is at least 90% of their best regional result.
- Will not be classified in the final rankings of the Shell Eco-marathon Europe 2016 competition and will not be eligible for any prizes or awards for this competition.

Qualifications for Visiting and European teams

- The best result during the Shell Eco-marathon Europe will be retained to define the DWC starting grid order in the semi-final heats.
- The positions in the DWC starting grid are in descending order of fuel efficiency achieved during the Shell Eco-marathon Europe.
  - The team with the best result will start in first grid position
  - The team with the worst result will start in the last grid position

ARTICLE 211: PARC FERME

Vehicles must be presented at the Parc Ferme on Sunday, July 3 before 08:45.

Teams that are not present in Parc Ferme by this time will be disqualified.

Vehicles will remain in Parc Ferme until they are escorted to start grid for their specific heat and, if qualified, for the final. Only two team members and one driver are allowed to follow the vehicle.

Once inside the Parc Ferme teams may not make modifications to their vehicles. Allowed work is limited to the repair or adjustment of the vehicle to be in same state as it originally entered Parc Ferme.

Any repairs and or adjustments must be approved beforehand and will be supervised by the Organiser.

a) DWC technical inspection

An additional Technical Inspection will be performed on vehicles inside the Parc Ferme prior to their DWC heats. Both the Team Manager and Team Driver(s) must be present.

b) Modifications to vehicles after warm-up, before heats

Teams will have 15 minutes to check their vehicle before their heat. The Organiser will supervise

the previously authorised modifications and provide the 15 minute countdown. Teams will vacate the Parc Ferme immediately at the end of the 15 minute period.

Teams that have not completed adjustments at the end of the 15 minute period will be disqualified if the car is not considered as safe to run.

c) Modifications to vehicles after heat, before final.

Teams that qualify for the final will be permitted 15 minutes to check their vehicles prior to the race. This work will be supervised by the Organiser. During this time, a maximum of 5 team members will be allowed in the Parc Ferme. Teams will vacate the Parc Ferme immediately at the end of the 15 minute period.

Teams that have not completed adjustments at the end of the 15 minute period will be disqualified if the car is not considered as safe to run.

3. SAFETY

ARTICLE 212: MANDATORY BRIEFING

The DWC briefing is mandatory for the Team Manager and driver(s). If the Team Manager and/or Driver(s) are not present at this briefing the vehicle will be disqualified from the DWC. Only the driver(s) attending the briefing will be authorised to compete on track. The Organiser will record the presence of the Team Manager and Driver(s) at the briefing.

ARTICLE 213: DYNAMIC BRAKING TESTS

A dynamic braking test will be performed on designated sections of the track.

All participating vehicles must be fitted with motorcycle disc brakes.

- Teams will be informed of when they are due to complete the Dynamic braking test by the Organisers
- All teams must pass the Dynamics braking tests in order to compete in the DWC is permitted two attempts to pass the Dynamic brake test.
- The Dynamic brake test is performed as follows:
  - Two lines will be clearly marked on the track 20 metres apart
  - Vehicles shall cross the first marked line at a speed of at least 50 km/h
  - At the first marked line the driver must apply their brakes and come to a complete stop before crossing the second marked line, in under 20 metres.
  - Each team shall be permitted to perform a practice brake test, prior to their first attempt.
  - Should a team fail their first attempt, they shall be permitted to make any corrections to their vehicle before a second, final attempt.
- Teams that fail to reach a minimum speed of 50 km/h, during their two Dynamic braking test attempts, must prove that the vehicle is not technically able to reach this speed to

avoid disqualification from the DWC.

- The organisers reserve the right to disqualify teams that are unable to perform the dynamic braking tests within acceptable parameters

ARTICLE 214: MAXIMUM TIRE PRESSURE

The maximum tire pressure allowed by the tire manufacturer must be respected (marked on the tire wall).

ARTICLE 215: FUELLING

All fuelling operations shall be performed in the Parc Ferme including battery charging and Hydrogen cylinder replacement

4. COMPETITION

ARTICLE 216: STARTING GRID AND TRACK ACCESS

A maximum of two team members and one driver may access the track. The Organisers will accompany the vehicle to and from the track for practice and DWC competition. The driver must be in their car while it is pushed by the two team members.

The two team members must be wearing safety vests provided by the Organisers.

One minute before the official start of the DWC heat or final the two team members must exit the track, the time will be notified by the Race Director. Violation of this rule will disqualify that team from the DWC.

ARTICLE 217: QUALIFICATIONS FOR FINAL

a) The two fastest teams from each of the 3 energy class heats will qualify for the final. The two fastest runners up from all three heats will also go on to the final.

b) If less than two cars cross the finish line in any one heat, the winners will be decided based on distance travelled

c) Position on the grid for the final will be defined based on fastest times during qualifying heats *(time to run the 3 laps of qualification)*

d) Teams selected based only on the maximum distance travelled, will start from the back of the grid. If this applies to more than one vehicle, the starting position will be defined by the greatest distance travelled in descending order.

ARTICLE 218: FINAL

In the event where two or more teams cross the finish line at the same time, the team that started the final on the higher start grid position shall be declared the winner.

ARTICLE 219: WEATHER/ENVIRONMENT

If, in the event that the Organisers decide to modify, postpone or cancel the DWC heats or final, as stipulated in Chapter 1 rules, Article 1 Section c, no trophy and title will be awarded. Any prizes shall be distributed using a raffle based system.

ARTICLE 220: PROTESTS AND PENALTIES

Teams have 10 minutes after the end of a heat or the end of the final to lodge a protest with the Race Director.

All decisions of the Race Director and the Organisers once issued are final and non-appealable.

5. DRIVING RULES

ARTICLE 221: SPEED LIMIT

60 km/h is the maximum speed allowed on track during practice or competition. All teams must provide their driver with accurate speed information by speedometer display in the driver compartment.

ARTICLE 222: FLAGS

The same flags as during the Shell Eco-marathon will be used:

- Green flag: track clear, driver can run.
- Yellow Flag: danger on track, apply extra caution, reduce speed, overtaking is not allowed. The green flag will inform drivers of the end of the danger zone.
- Red Flag: stop immediately, Race Marshalls will take charge of drivers and their vehicle.

If a red flag occurs and the lead car has completed more than 2 laps, the current race classification counts as heat or final result. The distance driven will be used for classification.

ARTICLE 223: NON-STARTING VEHICLES

At the starting flag, drivers have 30 seconds to start the vehicle. If the vehicle is not able to move after this time, the team will be disqualified and the vehicle will be removed from the track by the Marshalls.

ARTICLE 224: PENALTIES AND DANGEROUS DRIVING

a) Drivers are not allowed to push another vehicle with their car.

b) Overtaking will follow the same rules as specified in Chapter 1.

c) Blocking another vehicle by changing line is not allowed.

d) If two vehicles arrive at same time in a turn, each driver must keep their line on track.

6. ENERGY MEASUREMENT AND CONTROL SYSTEM

The Organisers will supply and supervise the installation of an energy measurement device and

electrical relay in the energy and electrical systems of participating vehicles. Energy measurement devices shall be installed in competing vehicles, as required, by the morning of Sunday, July 3. See Article 109.

ARTICLE 225: HYDROGEN FLOWMETER

A specific hydrogen flowmeter will be installed for energy (hydrogen) consumption measurement for the DWC.
Teams must have the supercapacitor fully discharged before taking the place in the starting grid. Competitors are allowed to start their Fuel Cell to recharge super capacitors 5 minutes before the official start of the race. The hydrogen allowance will begin at this time not at the official starting flag.

ARTICLE 226: LIQUID FLOWMETER

A liquid flow meter system will be installed in all liquid fuelled vehicles for energy measurement.

ARTICLE 227: JOULEMETER

A joulemeter system will be installed in all battery electric vehicles for energy measurement.

ARTICLE 228: ON-BOARD COMPUTER

A Shell Eco-marathon on-board computer system will be installed in all vehicles competing in the DWC. The Shell Eco-marathon on-board computer will communicate with the respective energy measurement devices, the installed relay system, and the external antennae pod. The Shell Eco-marathon on-board computer will be installed by the organisers on Saturday 2nd and Sunday 3rd of July.

ARTICLE 229: ELECTRICAL RELAYS

For all DWC vehicles, an electrical relay system will be installed in the vehicle. The relay will be controlled by the installed Shell Eco-marathon on-board computer.
The either normally open (NO) or normally closed (NC) contacts of the relay will be wired in the vehicle electrical system such that when the relay is activated, the propulsion system will be disabled.
The installation of the relay system into the specific vehicle wiring will be performed Saturday night after the DWC completion announcement or Sunday morning.

ARTICLE 230: EXTERNAL ANTENNAE POD

An external pod shall be fitted to the outside of team vehicles by the Organiser. This pod will be connected to the internal energy measurement system through a 33mm hole in the vehicle's body. It contains cellular, WIFI and GPS antennae used in the measurement of position and the communication of data.

The installation of this pod is obligatory for all teams wishing to qualify and compete in the DWC.

The Organisers will also request that certain teams install the external antennae pod on their Vehicles during the regional competitions as part of the testing of this system.

ARTICLE 231: EQUIPMENT MALFUNCTION

Participants are informed of the experimental nature of the proprietary technology to be installed in their cars by the Organisers. Teams must accept the risk of malfunction of that technology which may result in their car not completing their heat or final run or may cause an invalid result.

5. SIMPLIFIED AND TEMPORARY EVENT SCHEDULE

The final schedule for the day will be confirmed during briefing on Sunday, July 3. The Organisers reserve the right to change this schedule at any time, in case of poor weather conditions or any other unpredictable event.

SATURDAY JULY 2, 2016

19:00		Announcement of teams selected for the DWC
19:15	19:45	Briefing for selected teams : process of the DWC

SUNDAY JULY 3, 2016

08:30	09:00	Briefing driving rules
08:15	08:45	All Vehicles in Parc Ferme
09:15	12:30	Set up specific equipment and technical inspection
13:00	14:00	Practice DWC
14:30	14:45	First qualifying heat
15:00	15:15	Second qualifying heat
15:30	15:45	Third qualifying heat
16:15	16:30	Final
17:00	18:00	Award ceremony

6. AWARDS AND PRIZES

The Awards and Prizes for the Drivers World Championship will be announced by the Organisers at a time closer to the event.

ANNEX 1: STARTING GRID