

MTC Competition Information Pack

WSC2011_TP03_pre_EN

Proposal submitted by: France

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1 **PROJECT BRIEF**

Pocket Bike, also known as Minimoto, is a miniature motorcycle that is ridden around kart tracks. It is a popular sport in Japan and Europe and is gaining in popularity in other parts of the world.

A typical Minimoto is approximately one-fourth the size of a regular motorcycle, and is powered by a two-stroke internal combustion engine of between 40–50 cc producing somewhere between 2.4 and 17 hp (1.8 and 11 kW). The machines have no suspension, relying on the tyres to absorb bumps and handle cornering, and weigh approximately 50 lb (23 kg).

The ease of transportation and the low cost of the bikes (they are priced from approximately US\$200 for a basic model built in China to around US\$7,000 for a top of the line Italian model), make them an affordable way for children (some as young as six) to learn about motorcycle riding and for adults to live out their fantasies of racing stardom without the high costs and risks associated with full-sized motorcycle racing. In most countries, a licence is not required to ride miniature bikes. However, they are usually not street legal and should be ridden on private land, such as car parks, gardens or on race tracks. A notable racer who learned his craft on a Minimoto is Valentino Rossi.

So the Minimoto is a means of entertainment for lovers of motorsports. Around the world, you can find indoor and outdoor race tracks offering rental pocket bikes. Up till today, the Minimotos are powered by thermal engines making this a noisy and polluting practice. In order to eliminate that noise and pollution it would be great to implement a concept of a Minimoto with electric motorization, as exists for karting. This would continue the practice of Minimoto while respecting the environment.

This project details the production of a Minimoto that has electric motor and also the production of a test bench to test the performance of the pocket bike. The evaluation of each project should cover the following characteristics.

1.1 **Electrical pocket bike**

To comply with the international motorbike federation, rules defining the Minimoto certain dimensional and physical characteristics must be respected:

- The Minimoto must have handlebars for steering
- The Minimoto must have a foot rest for each of the riders feet
- The Minimoto must have a seat for the rider
- The length of the Minimoto must be between 960mm and 1060mm
- The seat height of the Minimoto must be between 360mm and 460mm
- The total height of the Minimoto must be between 520mm and 620mm
- Minimoto wheelbase must be between 575mm and 675mm
- The diameter of the wheels/tyres must be between 250mm and 300mm
- Width of wheels/tyres must not exceed 100mm
- Minimoto must be able to be ridden by the team members
- The Minimoto has to withstand a weight of 100kg, weight corresponding to the rider. Each team member riding the bike must have a weight pack so that that rider is at least 100kgs
- To increase the efficiency the weight of the Minimoto should be as small as possible. Points will be awarded in order of ranking competitors.
- The Minimoto must include the following manual controls:
 - Speed control by progressive handle order
 - Front wheel brake lever
 - Rear wheel brake lever
 - On/off switch

All these riding instruments must fit on the handle bar and be easily used in riding position.

- The rider must be able to control the direction of the Minimoto with a handlebar, controlling the rotation of the front wheel steering must rotate at least 30 degrees to the right and then 30 degrees to the left.
- The traction of the Minimoto shall be carried out by a power train to the front or rear wheel (or both). The wheels must include tyres.

The Minimoto must have a braking system to the front and rear wheels, controlled manually. The brake power must be sufficient to stop the Minimoto with a 100kg rider as quick as possible, considering a maximum speed of 30km/h. The bike must be capable of reaching a speed of 30km/hr, but this will be tested ONLY on the test bench and not on a test track. This is for safety reasons.

- All elements of the Minimoto in motion must be protected, wheels not included. No electric conductive part should be apparent.

Performance measurements will be treated on the test bench that must be also produced by competitors. It will include the following evaluations:

- The Minimoto must provide a maximum speed superior or equal to 30km/h.
- The time required for acceleration of the Minimoto from 0km/h to the maximum speed (30km/h) should be as small as possible. Points will be awarded in order of ranking competitors.
- The Minimoto must have charge life of 15 mins at maximum speed (between 25 to 30 km/h).
- The performance of the brake system will be evaluated by the deceleration. The time required for the deceleration of the Minimoto from the maximum speed (30km/h) to 0km/h must be as small as possible. Points will be awarded in order of ranking competitors. This will be done on the driving wheel of the pocket bike.
- Minimoto must be able to climb a 1 in 10 incline from a standing start.

1.2 Test bench

The test bench must fit with the following characteristics:

- The test bench must include a system for attaching the Minimoto in a position to test safely and without any degree of leisure. The implementation of this setting will take the least time possible. Points will be awarded in order of ranking competitors.
- The driving wheels of the Minimoto must drive an element on the test bench. The grip of the wheel on this element must avoid slippage and not distort the measures.
- The test bench must include a system of measurement on the element rotated by the driving wheel, allowing to indicate the speed equivalence of the Minimoto (consider the tangential speed of the wheel).
- The test bench shall include a power ON-OFF switch, a button for emergency stop and a display showing instantly the speed equivalence of the pocket bike, measured in km/h.
- All elements of test bench in motion must be protected. No electric conductive part should be apparent.

2 **ASSESSMENT CRITERIA**

| SECTION | CRITERIA | MARKS |
|---------|--|------------|
| A | Main project performances (including section B of portfolio) | 50 |
| B | Main project costs (including time to complete section B of portfolio) | 15 |
| C | Portfolio (section A only) | 5 |
| D | Surprise project | 30 |
| | Total | 100 |

3 **COMPETITION REQUIREMENTS**

Each team will provide at the event:

- A electrical powered Minimoto
- A test bench for the Minimoto
- Section B of the portfolio
- A surprise project – the surprise project will be released to competitors just before the start of the competition. This project can consist of any combination of the skills outlined in the MTC technical description. This project will be selected by experts prior to competition.

4 **ACTIVITIES TO BE DONE BEFORE THE COMPETITION**

- Section A of the portfolio.
- Poster with team details.
- Materials may be rough cut into billets, or length but may not be machined to size. Burrs or sharp edges are not to be removed.
- Manufacture of electronic circuit boards, but these boards may not be mounted before the competition (if required)

NOTE: Purchased items are not to be modified in any way prior to the competition.

5 **ACTIVITIES TO BE ATTEMPTED DURING THE COMPETITION**

- Section B of the portfolio, including drawings.
- Manufacturing of all components of Minimoto and test bench
- Electricity/electronic assembly – all individual components must be assembled during the competition.
- Mechanical assembly of complete Minimoto and test bench
- Tests of Minimoto and test bench
- Surprise project.

6 EQUIPMENTS PROVIDED BY ORGANISERS

- All equipment, tooling and materials in the Infrastructure list – see MTC forum and technical description.
- All materials for surprise project as listed in the technical description.
- Testing equipment for pocket bike, master test bench and surprise project.

7 ITEMS TO BE PROVIDED BY TEAMS

Each team must provide and wear team identification (e.g. coloured shirt) and armbands that indicate the region. These must be worn at all times during the competition.

It is the responsibility of the team to supply all the components and raw materials to manufacture the Minimoto and test bench. This would include the following items, but each design may require supplying additional components or material:

- Electrical motors.
- Battery.
- Electronic circuit board – not mounted (circuit board components must be assembled on the board at the competition).
- All electric and electronic components.
- Electric cables, connectors and couplings.
- Jigs, fixtures, formers and clamping devices.
- All materials with which to construct Minimoto and test bench and all other associated equipments and consumables (sheet metal, screws, nuts, pins, pegs, etc...).
- Machining consumable tooling required for manufacturing the components.
- Lathe and mill tools and hand tools for manufacturing components.
- All hand tools, cutting tools and measuring equipments.
- All hand tools for assembly.
- All personal protective equipment.
- Standard tooling kit as described in the MTC technical description
- Other specific manufacturing equipment required that is not in the infrastructure list.

8 EQUIPMENT AND MATERIALS NOT PERMITTED

- Laptop or portable computers.
- PDAs e.g. Palm, IPAQ, etc
- Memory sticks/MP3 Player/Digital Storage.
- Walkman radio/CD Player.
- Electronic organizer/diaries.
- Wireless communication devices.
- Non approved CDs or floppy discs – approval by experts or delegate is required for all CDs and floppy discs.
- Any additional software not supplied by organisers unless approved by experts.
- Pre-programmed IC's
- Purchased items modified in any way prior to the competition.
- Equipment that is similar or operates in similar manner as supplied equipment. Example – if metal cut-off saw is provided by organisers, then no team may provide own metal cut-off saw.

- During the competition duration, no tools, equipment, stationary, components, manuals, drawings or digital storage devices may be removed from or brought into the competition venue, unless approved by Chief Expert.

9 SURPRISE PROJECT

The surprise project may contain skills in manufacturing, design, assembly and quality control not necessarily covered in the main project elements. The surprise project can consist of any combination of the skills outlined in the MTC technical description. This project will be selected by experts prior to the competition and an evaluation scheme developed. The surprise project will be released to competitors just before the start of the competition. Teams can be awarded a maximum of 30 marks in this section.

10 MAIN PROJECT – COMPLIANCE TO SPECIFICATIONS

10.1 Electrical Powered Minimoto

10.1.1 Able to be ridden

“Minimoto will have to be ridden by a 100kg Rider”

Maximum Marks: 1 mark

Assessment procedure

- team member weighing or weighted to 100kg can ride a simple test track without their feet touching the ground. All riders must wear helmets and long sleeved jackets, long trousers and boots when riding the bikes.

Evaluation process

- A team member weighing or weighted to 100kg will have to ride one (1) lap of a simple test track without their feet touching the ground.
- If the rider's feet touch the ground during the test lap, the lap must be restarted. Five (5) attempts only will be permitted.
- If rider is not properly attired with all specified safety clothing, no marks will be awarded

Note: The Minimoto must have a minimum of handle bars, a seat, brakes and foot rests to participate the performance tests 10.1.1, 10.1.3, 10.1.10, 10.1.11, 10.1.12, 10.1.13 and 10.1.14

This test should not be a test of riding ability

10.1.2 Dimensions

“To fit with the international motorbike federation rules defining the Minimoto certain dimensional characteristics must be respected

Maximum Marks: 3 marks

Assessment procedure

The dimensions of a Minimoto must be:

- Overall length from front to back of Minimoto with steering wheels to be in neutral position: 960mm to 1060mm - 0.5 marks if respected
- Seat height from the ground (without rider): 360mm to 460mm - 0.5 marks if respected
- Overall height measured from ground to highest component of Minimoto: 520mm to 620mm - 0.5 marks if respected
- Wheels/Tyres width – both front and rear wheels/tyres to be measured: 70mm to 100mm - 0.5 marks if respected
- Wheels/Tyres outside or maximum diameter: from 250mm up to 300mm - 0.5 marks if respected
- Distance between wheels axes: 575mm to 675mm - 0.5 marks if respected

Evaluation process

Marking team to measure and record all specifications.

10.1.3 Weight

"To increase the efficiency the weight of the Minimoto should be as light as possible. Points will be awarded in order of ranking competitors."

Maximum Marks: 3 marks

Assessment procedure

The Minimoto has to be as light as possible. Its weight will be measured, and marking will be digressive from 3 marks for the lightest pocket bike

- 3 mark for lightest unit

- Marks reduced by 1 mark for every two (2) kgs (proportional) heavier than lightest unit

Note: Marks will be calculated using calculations in the CIS scoring system.

Evaluation process

Bikes in full operational condition will be weighed and the weights will be entered into the CIS marking system

10.1.4 Load capacity

"The Minimoto has to withstand a weight of 100kg maximum corresponding to the rider."

Maximum Marks: 1 mark

Assessment procedure

The minimum weight of the Minimoto rider is 100kg. This means the Minimoto must resist to a 100kg weight on the seat or 50kg on each foot rest.

-1 mark if unit can withstand a 100kg rider

Evaluation process

- A person of 100kg or weighted to 100kg will sit on the seat with feet off the ground and hands off the handlebars to check weight bearing. The rider will then stand on the foot rest.
- If there are no foot rest, zero marks to be awarded
- The Minimoto or the foot rest may distort but must still be operational after this test.

10.1.5 Riding instruments

"The Minimoto must include the specified manual controls"

Maximum Marks: 2 marks

- Speed control by progressive handle order – 0.5 marks
- Front wheel brake lever – 0.5 marks
- Rear wheel brake lever – 0.5 marks
- On/off switch – 0.5 marks

All those riding instruments must fit on the handle bar and be easily used in riding position, and operate without releasing hand from handlebar grip.

Assessment procedure

The manuals controls must be apparent on the handle bar an in order of work. Each function will be tested.

Evaluation process

- Marking team to inspect location and function of controls
- All manual controls must be clearly labelled
- The function of each control must be demonstrated. The brakes must demonstrate they can slow down the wheels – the efficiency of the braking system will be tested separately.

10.1.6 Steering system

"The rider must be able to control the direction of the Minimoto with a handlebar, controlling the steering of the front wheel (or rear wheel if rear wheel steering) up to an angle of 30 degrees from the centre position to right and also 30 degrees to the left."

Maximum Marks: 1 mark

Assessment procedure

-1 mark if the steering can be rotated 30 degrees from centre to the left and then 30 degrees to the right

If steering does not comply in both directions then zero (0) marks will be awarded

Evaluation process

The steering must be done by rotation of the steering wheel. The angle of steering rotation must be minimum 30 degrees on both sides, measured from the centre position.

Measurements will be taken about the steering axis

10.1.7 Power train

The traction of the Minimoto shall be carried out by a powertrain to the front or rear wheel (or both). The wheels must include tyres.

Maximum Marks: 1 mark

Assessment procedure

- 1 mark if the drive is transmitted to the wheel(s) by any mechanical system. The wheels must include tyres.

Evaluation process

Check the drive is transmitted to the wheel(s) by any mechanical system. The Minimoto must demonstrate the drive by operation and also a visual examination of the drive mechanism.

10.1.8 Brake system

"The Minimoto must have a braking system to the front and rear wheels, controlled manually. The brake power must be sufficient to stop the Minimoto with a 100kg rider as quick as possible, considering a maximum speed of 30km/h."

Maximum Marks: 2 marks

Assessment procedure

- 1 mark if the bike has a brake that will stop the front wheel rotating
- 1 mark if the bike has a brake that will stop the rear wheel rotating

Evaluation process

- Brakes will be applied individually and the wheels will be checked for the ability to rotate.
- Minimoto to be able to stop using only the front brake and then again using only the back brake, when ridden down an incline of 1 in 10. When testing, the bike will be ridden by a rider weighing or weighted to 100kg
- A maximum of three (3) attempts of front wheel and then maximum of three (3) attempts of the back wheel braking only permitted
- Test ramp will need to be supplied by the London organisers and this ramp must comply with any safety regulations regarding guarding and have a non slip surface fixed to the surface

10.1.9 Safety

"All elements of the Minimoto in motion must be protected, wheels not included. No electric conductive part should be apparent."

Maximum Marks: 2 marks

Assessment procedure

All moving parts must be protected and not be accessible by anything bigger than a 12mm diameter rod 75mm long, except for the wheels/tyres. All the conductible parts of the electrical circuit must be protected to not be accessible at all.

- 2 marks if no rotating component or component that could cause injury (Wheels/tyres excluded)
- reduce marks by 0.5 mark for each area not complying (3 experts must agree to confirm an area that could cause injury)

Evaluation process

- All exposed components will be checked or edges that may be touched by operator in normal operating condition
- All chains and pulleys to be checked with a rod 12mm in diameter and 75mm long (simulating a finger). If the rod touches any rotating component it is to be considered a pinch point.
- Guards must not be physically distorted or moved during this test

10.1.10 Speed

"Performance measurements will be treated on the test bench that must be also produced by competitors. It will include the following evaluations:

The Minimoto must provide a maximum speed superior or equal to 30km/h."

Maximum Marks: 3 marks

Assessment procedure

- 3 mark if the Minimoto has a maximum speed of 30km/h or greater

Evaluation process

- The maximum speed of the Minimoto must be superior or equal to 30km/h, measured during a test period of thirty (30) seconds on the master test bench.
- Speed will be tested with three (3) tests and the speeds averaged.

10.1.11 Acceleration

"The time required for acceleration of the Minimoto from 0km/h to speed of 30km/h should be as small as possible. Points will be awarded in order of ranking competitors."

Maximum Marks: 2 mark

Assessment procedure

- The time to go from 0km/h to 30km/h will be measured on the test bench and marking will be digressive from maximum mark for the best acceleration.
- Two (2) marks to fastest time then reduce 1 marks (proportional) per five (5) seconds slower than fastest time for other teams

Note: Marks will be calculated using calculations in the CIS scoring system

Evaluation process

Minimoto will be timed from stop condition to 30km/h on the master test bench. Three (3) tests will be done and the average time entered

10.1.12 Charge Life

"The Minimoto must have battery life superior or equal to 15mins at maximum speed (greater or equal to 30km/h)."

Maximum Marks: 6 marks

Assessment procedure

6 marks - if Minimoto can travel a distance of 10 kms during test as specified below.

5 marks - if Minimoto can travel a distance of at least 9.0 kms during test as specified below

4 marks - if Minimoto can travel a distance of at least 8.0 kms during test as specified below

3 marks - if Minimoto can travel a distance of at least 7.0 kms during test as specified below

2 mark - if Minimoto can travel a distance of at least 6.0 kms during test as specified below

1 mark - if Minimoto can travel a distance of at least 5.0 kms during test as specified below

0 marks - if Minimoto cannot travel a distance of at least 5.0 kms during test as specified below

No proportional marks – marks only in whole marks

Evaluation process

- A track of a specified distance is to be set up. Each Minimoto is to ridden around this track for a distance of ten (10) kms.
- For safety reasons this is not a speed race but rather an endurance test so maximum speed should be restricted.
- When testing, the Minimoto must maintain a speed of greater than 10km/hr but not greater than 15km/hr. Each lap will be timed to confirm speed is within these limits and riders will be warned if slower or faster lap times are being recorded. If a lap is not within the speed limits these laps will not be considered
- Depending on the track and the number of MTC teams more than 2 Minimotos could be tested at the same time, but specify a certain overtaking area, which would be wider than the rest of the track, and any overtaking must be done in these areas or zones only.
- All riders must wear helmets and long sleeved jackets and trousers and boots when riding the bikes
- When testing, the bike will be ridden by a rider weighing or weighted to 100kg

10.1.13 Brake system performance

"The performance of the brake system will be evaluated by the deceleration. The time required for the deceleration of the Minimoto from the maximum speed (30km/h) to 0km/h must be as small as possible. Points will be awarded in order of ranking competitors. This will be done on the driving wheel of the Minimoto

Maximum Marks: 1 mark

Assessment procedure

- The time to go from 30km/h to 0km/h will be measured on the test bench and marking will be digressive proportionally from maximum mark for the best deceleration."
- 1 marks to fastest time then reduce 1 mark (proportional) per five (5) seconds slower than fastest time for other teams

Note: Marks will be calculated using calculations in the CIS scoring system

Evaluation process

Minimotos will be timed from 30km/h to 0km/h on the master test bench. Braking on the driving wheel only will be tested. Three (3) tests will be done and the average time entered

10.1.14 Incline ability

Maximum Marks: 2 marks

Assessment procedure

- 2 marks if the Minimoto can climb a 1 in 10 incline.

Evaluation process

- Minimoto will have to climb a 1 in 10 incline from a standing start under its own drive. The Minimoto must start on the incline.
- When testing, the bike will be ridden by a rider weighing or weighted to 100kg
- Team members are allowed to support the bike for starting, but not permitted to give any assistance to accelerate the Minimoto.
- This test will be done three (3) times and Minimoto must demonstrate incline ability in each test
- Test ramp will need to be supplied by the London organisers and this ramp must comply with any safety regulations regarding guarding and have a non slip surface fixed to the surface

10.2 Test bench for pocket bike

We test only the speed with the test bench made by the teams. We compare this with an official or master test bench. Then the difference should not be bigger than 5%. There needs to be some comparison between the two test benches so that we are able to compare the 2 speeds. Test the 'maximum speed' on the official test bench at maximum throttle, and then the throttle is locked in this position (or able to be held up against a stop), the Minimoto is transferred to the team's test bench and the test is repeated at exactly the same throttle setting.

Teams must have access to the official or master test bench during the competition to calibrate their test bench.

Drawings and photos of the master test bench to be made available to all teams at least three (3) months before competition. Teams make manufacture a suitable mounting fixture before the competition and will not be considered to be a part of this competition; this fixture will only be used for mounting on the master test bench and must not be used on the team test bench.

10.2.1 Fixation of the pocket bike

"The team's test bench must include a system for attaching the Minimoto in a position to test safely and without any degree of movement. The implementation of this setting will take the least time possible. Points will be awarded in order of ranking competitors."

Maximum Marks: 3 marks

Assessment procedure

- The time to set and attach the Minimoto on the test bench will be measured and marking will be digressive from maximum mark for the smallest time. Then experts will check if the Minimoto cannot move of its test position.
- 3 marks to fastest time then reduce 1 mark (proportional) per 15 seconds slower than fastest time for other teams.

Note: Marks will be calculated using calculations in the CIS scoring system

Evaluation process

- Teams will start 1 meter from the test bench.
- Teams will be timed to get the Minimoto set up ready for testing. Minimoto must be operational. All fixing of the Minimoto to the test bench will be checked

10.2.2 Drive simulation

“The driving wheels of the Minimoto must drive an element on the test bench. The grip of the wheel on this element must avoid slippage and not distort the measures.

Maximum Marks: 1 mark

Assessment procedure

- 1 Mark if the test bench has an element driven by the driving wheel or wheels.

Evaluation process

Teams will demonstrate drive simulation of the test bench.

10.2.3 Measurement

“The test bench must include a system of measurement on the element rotated by the driving wheel, allowing to indicate the speed equivalence of the Minimoto (consider the tangential speed of the wheel).”

Maximum Marks: 3 marks

Assessment procedure

- 3 marks if indicated speed on the team's test bench is within +/- 5% compared with the master test bench
- 2 marks if indicated speed on the team's test bench is within +/- 10% compared with the master test bench
- 1 mark if indicated speed on the team's test bench is within +/- 15% compared with the master test bench
- 0 marks if indicated speed on the team's test bench is NOT within +/- 15% compared with the master test bench

Evaluation process

- Teams will demonstrate the test bench's speed measurement system Test bench must have a system for measuring the speed of the Minimoto during testing
- The Minimoto will be tested at maximum speed on both the team's test bench and then also on the master test bench. Throttle will be locked or fixed before transferring to other test bench

10.2.4 Interface machine/operator

“The test bench shall include a power ON-OFF switch, a button or switch for emergency stop and a displayer showing instantly the speed equivalence of the pocket bike, measured in km/h.”

Maximum Marks: 3 marks

Assessment procedure

- 1 mark for a power ON-OFF switch.
- 1 mark for emergency stop – button or switch must be clearly labelled
- 1 mark for speed display – may be digital or analogue and display speed in km/hr

Evaluation process

- Teams will demonstrate the functions of the Power ON-OFF switch, emergency stop and speed display.
- All controls must be clearly labelled

10.2.5 Safety

“All elements of test bench in motion must be protected. No electric conductive part should be apparent.”

Maximum Marks: 2 marks

Assessment procedure

All moving parts must be protected to not be accessible by anything bigger than a 12mm diameter and 75mm long, excepted for the wheels and rollers of the test bench. All the conductible parts of the electrical circuit must be protected to not be accessible at all.

- 2 marks if no rotating component or component that could cause injury

- reduce marks by 1 mark for each area not complying (3 experts must agree to confirm an area that could cause injury)

Evaluation process

- All exposed components will be checked or edges that may be touched by operator in normal operating condition
- All chains and pulleys to be checked with a rod 12mm in diameter and 75mm long (simulating a finger). The rod must not touche any rotating component causing a pinch point.

11 MATERIALS AND PRODUCTION COSTS

NOTE: all costs to be calculated in euro (€)

11.1 Working hours

NOTE: when one member of a team is working, all the team members will be counted, therefore team cost would be 90€/hour. Labour and equipment costs when working on the surprise project are to include with main project labour and equipment costs.

11.2 Additional cost for using equipments

- For using workshop equipment, E.G. welding, computer, grinding, sheet metalwork, drilling and saw: 15€/hour
- For using a conventional mill and lathe: 25€/hour
- For using a CNC mill: 35€/hour
- Consultant or training services: 60€/hour

The minimum time for each machine is fifteen (15) minutes.

NOTE: After using a machine, the machine must be cleaned, i.e. swarf removed from working area of the machine. Each machine will be inspected by an expert after each team's use of that machine and a penalty of 22.50€ (representing 15 minutes of cleaning time) will be applied if machine is not cleaned. If a machine is considered not cleaned, experts will be called to inspect that machine – three experts must agree. Their decision is final. Equipment use cost only to be applied to equipment supplied by the organisers. No cost for using portable equipment provided by teams.

11.3 Raw materials

Each team will provide weight of raw materials used and also cost of raw material using cost per kilogram listed below. The list of raw material details including weight and cost is to be presented in spreadsheet format and to be included in section A of portfolio. Extrusions and profile will be priced by length. Cost must be verified by experts to reflect commercial cost. Cost for raw materials to be applied:

- Mild sheet – 7€/kg
- Aluminium – 10€/kg
- Brass – 37€/kg
- Stainless steel – 28€/kg
- Plastic – 20€/kg

NOTE: Currency conversion rates will be fixed at Monday, 1st August 2011 and will be taken from <http://www.xe.com/>. These exchange rates will be posted on the MTC discussion forum on this date.

11.4 Cost Calculations

Step 1

The total cost of equipment, materials and Labour will be modified by project compliance to specification

$$\text{Final Build Cost} = \frac{\text{Total Cost}}{\% \text{ compliance to specification}}$$

Example

- If total cost is €2,500 and compliance is 100% then build cost would be €2,500
- If total cost is €2,500 and compliance is 80% then build cost would be €3,125
- If total cost is €2,500 and compliance is 60% then build cost would be €4,167
- If total cost is €2,500 and compliance is 40% then build cost would be €6,250
- If total cost is €2,500 and compliance is 20% then build cost would be €12,500
- If total cost is €2,500 and compliance is 0% then no marks awarded for cost section.

Step 2

The build costs will then be compared between teams. The cheapest team will receive 15 marks. For every 10% more expensive than the cheapest cost, deduct 1 mark proportionally.

Note: Marks will be calculated using calculations in the CIS scoring system

12 **PORTFOLIO ASSESSMENT**

The portfolio will consist of two sections, section A and section B:

The section B includes documentation prepared during the competition. The time taken to complete this section will be costed as part of the main project. Assessment of section B is included in the main project assessment.

The section A will be presented prior to the competition and will be assessed during the competition. All portfolios are to be in English language.

SECTION A: This section should be produced before the competition. The section A is to be in electronic format but presented in both hard copy and electronic form, and should include:

- Team member details
- Team preparation
- Poster display
- Design Calculations
- Computer generated 3 day competition manufacturing schedule
- List of all materials and components and their costs (with evidence) provided by the team.
- Operation and troubleshooting manual

NOTE: When assessing the portfolio using the above criteria, it is sufficient to award marks for inclusion of the information when it comes up the minimum requirements, rather than consider the actual detail contained within it. Marks are awarded for each item as if acceptable – full marks, or if not acceptable – zero mark (there will be no graduated marks).

12.1 **Details of team and team members**

Maximum Marks: 0.25 marks

This section should contain the following details for each team member:

- Your country
- Name
- Date of birth
- Home location
- Educational and vocational background
- Employer's name and business location

- 0.25 mark if the team details are complete and meet minimum requirements
- 0 mark if incomplete or does not meet minimum requirements

12.2 **Team preparation**

Maximum Marks: 0.25 marks

This section should contain the following details for each team member:

- Worldskills regional competitions results
- Specific role and skills provided by each member of the team
- Details of training undertaken by individuals or the team in preparation for the competition.

- 0.25 mark if the team preparation is complete and meets minimum requirements
- 0 mark if incomplete or does not meet minimum requirements

12.3 Poster display

Maximum Marks: 1.0 mark

A poster is also to be displayed explaining to the public how each unit operates and explaining the reason for using electric pocket bikes.

To Include:

- Minimum size 500mm x 700mm
- Explanation of basic operation of the pocket bike
- 3D model drawing of pocket bike
- Performance specifications of team's pocket bike
- Poster in English language (may also have duplicate in team's language)
- Poster complete and displayed to the public during the competition.

- 1.0 mark if the poster is complete and meets minimum requirements

- Minimum poster size – 0.15 marks
- Explanation of basic operation of the Minimoto – 0.2 marks
- 3D model drawing of Minimoto – 0.2 marks
- Performance specifications of team's Minimoto – 0.15 marks
- Poster in English language (may also have duplicate in team's language) – 0.15 marks
- Poster complete and displayed to the public during the competition. – 0.15 marks

- 0 mark if incomplete or does not meet minimum requirements

12.4 Calculations

Maximum Marks: 1.0 mark

Design calculations must include:

- Minimoto electrical motor size
- Minimoto battery size
- Test bench resistance conception
- Test bench measurement conception
- Theory calculation of weight of the complete pocket bike
- Estimated cost of complete Minimoto and test bench

- 1 mark if calculations are complete and meets minimum requirements

- Minimoto electrical motor size – 0.2 marks
- Minimoto battery size – 0.2 marks
- Test bench resistance conception – 0.1 marks
- Test bench measurement conception – 0.1 marks
- Theory calculation of weight of the complete Minimoto – 0.2 marks
- Estimated cost of complete Minimoto and test bench – 0.2 marks

- 0 mark if incomplete or does not meet minimum requirements

12.5 Computer generated 3 day competition manufacturing schedule

Maximum Marks: 0.5 marks

A computer generated manufacturing schedule for the 3 days competition, also including the activities involved with the section B of the portfolio, is to be presented in printout format and electronic format also. This manufacturing plan will need alteration after the surprise project is known to the teams. A spreadsheet format is acceptable

- 0.5 mark if the manufacturing schedule is complete and meets minimum requirements – must include working hours, machine requirements and tasks for all team members
- 0 mark if incomplete or does not meet minimum requirements

12.6 List of all materials and components provided by the team

Maximum Marks: 1.0 mark

Each team will provide weight of raw materials used and also cost of raw material using cost per kilogram listed below. The list of raw material details including weight and cost is to be presented in spreadsheet format and to be included in section A of the portfolio. Refer to the raw material cost section to know the prices applied. Extrusions and profile sections will be priced by length. Cost must be verified by experts to reflect commercial cost. Cost for raw materials to be applied:

- Mild sheet – 7€/kg
- Aluminium – 10€/kg
- Brass – 37€/kg
- Stainless steel – 28€/kg
- Plastic – 20€/kg

For each used purchased item a receipt or a current catalogue price (without discounts or goods and services taxes applied). A printout of a website is acceptable if website address and date are included on printout.

A list of purchased items, raw materials and their costs is to be presented in Spreadsheet format

- 1 mark if the spreadsheet contains all raw materials and purchased items and is complete and in spreadsheet format and meets minimum requirements – drawings will be checked for materials and components.
- 0 mark if incomplete or does not meet minimum requirements

12.7 Operation and troubleshooting manual

Maximum Marks: 1.0 mark

“A operation and troubleshooting manual for the Minimoto is to be provided”

Should include

- Set up of pocket bike
- Operation of speed control
- Operation of braking system
- Replacement of motor
- Replacement of braking components
- Safe operating procedures
- Presented in a folder

- 1.0 mark if the troubleshooting guide is complete and meets minimum requirements

- Set up of Minimoto – 0.15 marks
- Operation of speed control – 0.15 marks
- Operation of braking system – 0.15 marks
- Replacement of motor – 0.15 marks
- Replacement of braking components – 0.15 marks
- Safe operating procedures – 0.15 marks
- Presented in a folder – 0.1 marks

- 0 mark if incomplete or does not meet minimum requirements

13 PORTFOLIO ASSESSMENT PART B

13.1 2D detail drawings

CAD generated manufacturing drawings (2D detail drawings) of all components (Minimoto and test bench) are to be created during the competition and be presented for assessment in a folder.

Maximum Marks: 4.0 marks

Assessment process

- 4 marks if drawings acceptable and for at least 90% of components
- 0 marks if not acceptable or is incomplete

Evaluation process

NOTE: only manufactured items by the team during the competition must be drawn on 2D.

STEP 1

- Count the number of drawings required for all manufactured components - check Minimoto and test bench all manufactured components
- Count the number of drawings presented and calculate the % of drawings submitted
- 0.8 marks if more than 90% of drawings are presented
- 0.2 marks if drawings are presented in a folder (may be in a one drawing folder with all drawings)

STEP 2

Select FIVE (5) drawings randomly (independent expert to select) - assess these drawings only - each drawing 0.6 marks maximum. Marking to be recorded on a chart which is to be verified by all members of the marking team

Mark Allocation for drawings 1 to 5

0.15 mark if drawing has title block drawing title, drawing number and drawing border

0.15 mark if drawing contains correct views and projection

0.15 marks if drawing is accurate to the pocket bike.

0.15 marks if drawing has appropriate dimensions with tolerances, and machine finishes (where required)

13.2 Electrical/Electronic Circuit Drawing

Maximum Marks: 1.0 mark

Assessment process

- 1 mark if drawing acceptable and meets assessment checklist
- 0 mark if not acceptable

Evaluation process

NOTE: labelled block representation also accepted if electrical/electronic graphics library not available

- 0.2 marks if drawing has drawing title, drawing number and drawing border
- 0.2 marks if drawing uses electrical/electronic symbols or block representation with component values
- 0.2 marks if drawing is CAD/electronically generated
- 0.2 marks if drawing contains battery, motor, & switches
- 0.2 marks if drawing contains test bench electronic control circuit.

13.3 3D Assembly drawing

Maximum Marks: 3.0 marks

“A CAD generated 3D assembly drawing (3D model) of the complete unit(s) is to be created during the competition and a printout to be presented for assessment in a folder.”

- 3 marks if drawing is acceptable

Evaluation process

- 0.2 marks if drawing has drawing title, drawing number, and drawing border
- 0.4 marks if drawing is CAD/electronically generated – i.e. drawing created on the computer and not a freehand drawing.
- 0.4 marks if drawing has parts/material list and parts/material list to be referenced to drawings
- 0.5 marks if drawing contains 90% of manufactured components
- 0.5 marks if drawing has Minimoto frame - should contain the chassis or frame or base – this should be included in the drawing.
- 0.5 marks if drawing has Minimoto drive mechanisms - The drawing should contain any drive mechanisms, such as chains, sprockets, gears
- Purchased items may be drawn as a block and not drawn in detail.
- 0.3 marks if drawing has Minimoto seat/saddle/handlebars
- 0.2 marks if drawing is presented in folder (may be in a one drawing folder with all Drawings)