

FORMULA FORD

2013 Technical Regulations

Formula Ford EcoBoost 200



Formula
Ford



Technical regulations for Formula Ford **200** with 1600cc EcoBoost Engine

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FORMULA FORD 200 with 1600cc EcoBoost Engine

INTRODUCTION

These ~~2012~~ 2013 regulations for Formula Ford are for the 1600cc EcoBoost engine.

These regulations are intended for use by experienced and competent motorsport teams and manufacturers and assume that anyone attempting a whole car build has a background in this motor sport discipline. In this respect any team building a car should ensure that they have full familiarity with all MSA / Ford regulations relevant to this category of motorsport and in particular that the car is built in conformity with all these requirements.

For safety and security, modifications to the chassis structure or to the roll over hoop should be completed by the original manufacturer. Teams should also ensure that all installed safety equipment meets all MSA or FIA safety standards.

ARTICLE 1: DEFINITIONS

1.1 Formula Ford car (EcoBoost)

Four wheel single-seater racing car fitted with a Ford 1600cc 16 Valve EcoBoost petrol engine, and designed solely for speed races on circuits or closed courses.

1.2 Bodywork:

All entirely sprung parts of the car in contact with the external air stream, except the rollover structures and the parts definitely associated with the mechanical functioning of the engine, transmission and running gear. Airboxes, radiators and engine exhausts are considered to be part of the bodywork.

1.3 Ground Clearance:

The clearance between the ground and the lowest part of the bodywork, and/or of the suspended part of the car, in normal trim with the driver aboard.

1.4 Minimum weight:

The minimum weight must be the weight of the car in the condition in which it crosses the finishing line and enters parc-ferme, or at any time during the competition and/or practice. The minimum car plus driver weight will include the driver dressed for the competition with all required personal safety items.

1.5 Date of car build:

Cars built before 1st January xxxx (or 1.1.xx) is interpreted to indicate cars built for the season indicated as shown by the year code. Consequently cars built to the new or revised specification, but finished before that date will still be defined as new season cars.

1.6 Sprung suspension:

The means whereby all complete wheels are suspended from the body/chassis unit by a sprung medium.

1.7 Wheel:

Wheel: Flange and rim.
Complete wheel: Flange, rim and tyre.

1.8 Induction system:

All the elements between the cylinder head and the external side of the air filter.

1.9 Ceramic materials:

Ceramic Materials (e.g. AL₂O₃, SiC, B₄C, Ti₅Si₃, SiO₂, Si₃N₄) – These are inorganic, non-metallic solids.

1.10 Composite:

Material formed from several distinct components, the association of which provides the whole with properties which none of the components taken separately possesses. High strength composites include components made with Carbon and or aramid fibres.

1.11 High volume components:

Are those from series production vehicles which have been produced in numbers greater than 25,000 in 12 consecutive months.

1.12 Mandatory components

Are those components specified by Ford Motor Company which must be used and remain unmodified.

ARTICLE 2: REGULATIONS

2.1 The role of Ford Motor Company:

The technical regulations for Formula Ford cars are issued by Ford Motor Company.

2.2 Modifications:

Any Ford standard part or Formula Ford mandatory part must be fitted and may not be modified/polished/machined or have any alteration what so ever unless expressly permitted by these regulations.

2.3 Publication date for amendments:

Each year in September, Ford Motor Company will endeavour to publish all changes made to these regulations. All such changes will take effect on the 1st January the following year.

2.4 Permanent compliance with regulations:

Automobiles must comply with these regulations in their entirety at all times during an event. Changes made for safety reasons may come into force without notice. The administrator may authorise and/or remove and/or modify specific technical regulations at anytime during the Championship.

2.5 Controlled Components

The organisers reserve the right to replace any component with a controlled sealed alternative. The replacement must not be removed or replaced without authorisation from the championship technical representative. Any item that has an ASN seal fitted must not be replaced without authorisation, and the seal must remain intact at all times.

ARTICLE 3: BODYWORK AND DIMENSIONS

3.1 Wheel centre line:

The centre line of any wheel shall be deemed to be half way between two straight edges, perpendicular to the surface on which the car is standing, placed against opposite sides of the complete wheel at the centre of the tyre tread.

3.2 Height measurements:

All height measurements will be taken normal to and from the reference plane.

3.3 Overall width:

The overall width of the car including complete wheels shall not exceed 1900mm, with the steered wheels in the straight ahead position.

3.4 Ground Clearance:

The minimum clearance between the ground and the lowest part of the bodywork, and/or any of the suspended parts of the car, in normal trim with the driver aboard is 40mm.

3.5 Width behind the front wheels:

The maximum width of the bodywork situated behind a point lying 280mm behind the front wheel centre line and the rear wheel centre line is 1400mm.

3.6 Overall height:

Except for the rollover structures, and mandatory Ford ROPS cover, no part of the car can be higher than 860mm above the reference plane. However, any part of the rollover structures more than 860mm above the reference plane must not be shaped to have a significant aerodynamic influence on the performance of the car.

3.7 Front bodywork height:

The forward extremity of the nose of the car shall be less than 210mm from the ground (170mm from the reference plane)

3.8 Height in front of the rear wheels:

No part of the bodywork positioned 280mm forward of the rear wheel centre line and more than 550mm above the reference plane may project more than 450mm each side of the car centre line.

3.9 Height between the rear wheels:

No part of the bodywork, except the mandatory rear wing components, between points lying 280mm forward of and 250mm behind the rear wheel centre line and more than 550mm above the reference plane may be more than 210mm from the car centre line.

3.10 Bodywork between and behind the rear wheels:

The bodywork must extend at least to the rearmost point of the gearbox casing and can not extend further than the furthest point of the rear crash structure.

3.11 Bodywork around the front wheels:

In plan view, there must be no bodywork (including stepped floor) in the area formed by longitudinal lines parallel to and 280mm and 925mm from the car centre line and forward of a transversal line 480mm behind the front wheel centre line.

3.12 Bodywork facing the ground:

3.12.1) The bottom of the car must be a flat surface, defining the reference plane, which must:

- extend forward to at least the front wheel centre line
- extend rearward to at least the rear face of the engine and no further than the rear wheel centre line
- be symmetrical about the car centre line

Additionally, between the front wheel centre line and the rear face of the engine, the surface formed by all parts lying on the reference plane must have minimum and maximum widths of 300mm and 650mm respectively.

No sprung part of the car is allowed below the reference plane.

3.12.2) When viewed from below, all the sprung parts of the car situated between the front wheel centre line and the rear wheel centre line, and less than 150mm from the reference plane must be covered either by the flat surface lying on the reference plane or by a flat surface lying on the step plane, parallel to and 50mm above the reference plane.

This surface lying on the step plane must not exceed the maximum dimension defined by Appendix A Drawing 1. Holes for skid strip permissible max number of 2 with dimensions 50mmX25mm max, when not in use the holes in the step plane must be blanked.

Except for the rear crash structure, no part of the bodywork lower than 150mm is permitted behind the rearmost point of the surfaces lying on the step plane.

3.12.3) The peripheries of the surfaces formed by the parts lying on the reference plane must be connected at its extremities vertically to the parts lying on the step plane with no lateral overhang of the reference plane. Any radius which forms the transition between the two planes may have a maximum radius of 25mm.

The shape of the intersection between the stepped plane and front bodywork is free only between the forward most point of the step plane in contact with the bodywork and 100mm rearwards of this point.

The peripheries of the surface formed by the parts lying on the step plane may be curved upward with a maximum radius of 25mm.

3.12.4) All parts lying on the reference and step planes, in addition to the transition between the two planes, must produce uniform, solid, hard, continuous, rigid (no degree of freedom in relation to the body/chassis unit), impervious surfaces under all circumstances.

3.12.5) To help overcome any possible manufacturing problems, a tolerance of +/- 5mm is permissible across these surfaces.

3.13 Bodywork Shape:

3.13.1) The bodywork must totally enclose the inlet manifold and filter with an opening for the passage of air.

3.13.2) The entire engine, all its ancillaries, above the rear wheel centre line, must be fully enclosed.

3.13.3) All bodywork covering the side intrusion panels must have at least a 15mm gap measured from the outer point of the chassis tube to the inner face of the bodywork.

3.13.4) All cars must include the mandatory surface of ROPS cover. Except for fixing holes or separation cut lines between parts, these surfaces must not be modified in anyway, nor be covered by any other part.

The mandatory surface of the ROPS cover must be symmetrical about the longitudinal car centre line. This mandatory surface must cover completely the main chassis ROPS structure from side, plan and rear views.

The mandatory surface of the ROPS cover must be orientated as per diagram in Appendix A Drawing 2.

3.13.5) All cars must include the mandatory surface Ford side pod air intakes on each side. They may not be covered by any other part. They must be orientated as per the diagram in Appendix A Drawing 3.

The forward most point of the mandatory Ford side pod air intakes shall be minimum 800mm and maximum 900mm behind the front wheel centre line.

The minimum width between widest points of these mandatory Ford side pod air intakes must be 1325mm.

No external blanking/taping to optimise cooling is permissible. Blanking must be internal and more than 100mm from exterior surface and not visible from the outside.

3.13.6) Considering a virtual surface lying on a plane parallel to and 240mm above the reference plane, this surface must extend from the rear face of the cockpit entry template to 400mm forward of the rear wheel centre line, and 400mm each side of the car centre line.

When viewed from above, this virtual surface must be entirely covered by the bodywork surface.

3.14 Overhangs:

With the exception of the structure required by Article 15.6 and any jacking point attached to this structure, no part of the car shall be more than 400mm behind the rear wheels centre line or more than ~~770mm~~ 850mm in front of the front wheels centre line.

3.15 Aerodynamic influence:

3.15.1) Other than mandated aerodynamic parts, any device (including bodywork shape) designed to aerodynamically augment the down thrust on the vehicle is prohibited. ~~as are aerofoils, fins or spoilers of any type.~~

3.15.2) No bodywork flat surfaces are permitted within 15° of the horizontal.

3.15.3) All side pod bodywork visible from above must not include external concave surfaces, except where flat or convex surfaces are joined.

3.15.4) Any specific part of the car influencing its aerodynamic performance (with the exception of Ford mandatory parts and non-structural shrouds protecting wheel tethers which are being used solely for this purpose) :

- must comply with the rules relating to bodywork.
- must be rigidly secured to the entirely sprung part of the car (rigidly secured means not having any degree of freedom).
- must remain immobile in relation to the sprung part of the car.

3.15.5) Any device or construction that is designed to bridge the gap between the sprung part of the car and the ground is prohibited under all circumstances.

3.16 Mandatory Aerodynamic parts

The mandatory aerodynamic wings, mounts, flaps, end plates, barge boards, fixings and brackets must be fitted at all times and orientated as per the diagrams in Appendix A Drawing 4.

No additional parts or materials (except decorative finish) may be added to these mandatory components.

3.16.1) Front wing element:

The main wing element must be fitted horizontally and directly to the front wing mounts which must in turn be fitted directly to the mandatory front crash structure. No additional parts may be added except shims on one side of the mount to ensure the wing element is set horizontally.

The angle, in relation to the reference plane, of the main front wing element measured longitudinally on top of the chord, adjacent to the front wing flaps will be $6^{\circ} \pm 1^{\circ}$.

The height of the wing, measured at its lowest point of the underside in the middle of the span, above the reference plane is $37.5 \pm 1.0\text{mm}$.

3.16.2) Front wing flaps:

The front wing flaps must be fitted directly to the main element using the mandatory bracket and must be fitted directly to the inside face of the front wing end plate.

The wing flaps may be adjusted within the scope of that allowed by the mandatory wing end plate. In any case the minimum wing angle in relation to the reference plane is 10° and the maximum wing angle is 24°, measured longitudinally on the flat surface of the flap adjacent to the front wing end plate.

3.16.3) Front wing end plates:

The front wing end plates must be fitted directly to the front wing element, flaps and flap mounting plate with no additional parts.

No additional adjustment slots or holes are permitted.

The maximum width of the front wing assembly including the end plates is 1480mm

3.16.4) Rear wing mount plates:

These mount plates must be situated sandwiching the rear crash structure and the gearbox casing. No additional adjustment is authorised over that in the original part.

3.16.5) Rear wing lower element:

Must be fixed directly to the rear wing end plates with no additional parts. ~~There is no adjustment of this element available between the end plate and the wing.~~

Adjustment for this element is controlled via the adjustment in the wing mount plates, which attach to the transmission and the wing end plates. The angle in relation to the reference plane, measured longitudinally on top of the wing chord will be between -4° and 8°.

3.16.6) Rear wing upper elements:

These elements must be fixed directly to the rear wing end plates and brackets with no additional parts.

They must be considered as one unit and cannot be adjusted separately from each other. The angle difference between the elements, when measured longitudinally on top of the element chords is $32^{\circ} \pm 30'$.

The wing elements may be adjusted within the scope of that allowed by the mandatory wing end plate. In any case the angle, in relation to the reference plane, of the two elements, when measured longitudinally and adjacent to the rear wing end plate on top of the two wing chords is minimum 3° and maximum 23°

3.16.7) Rear wing end plates:

The rear wing end plates must be fitted directly to the upper and lower wing element brackets and elements with no additional parts.

No additional adjustment slots or holes are permitted.

The maximum width of the rear wing assembly including the end plates is ~~895~~ 900mm

3.17 Wheelbase and track:

Minimum wheelbase: 2700mm.

Minimum track: 1200mm.

3.18 Driver's compartment:

Be fitted with bodywork with a driver's compartment isolated from the engine, gearbox, hydraulic reservoirs, transmission

shafts, chains, belts and gears, brakes, road wheels, their operating linkages and attachments, suspension components, petrol/fuel tanks, oil tanks, water header tanks and catch tanks.

3.19 Floor:

3.19.1) Have a complete Floor of adequate strength rigidly supported within the driver compartment.

3.19.2) Have any undertray/floor provided with drainage holes to prevent accumulation of liquids. Max diameter 5mm, max number 4. Cut out permissible for flywheel clearance max size 15mmx50mm.

ARTICLE 4: WEIGHT

4.1 Minimum weight:

4.1.1) The minimum weight of the car, at any time during competition shall be ~~465~~ 475kg

4.1.2) The minimum weight of car plus driver, at any time during competition shall be ~~545~~ 555kg

4.2 Ballast:

Ballast can be used provided it is secured in such a way that tools are required for its removal. It must be possible to fix seals if deemed necessary by the scrutineers.

ARTICLE 5: ENGINE

5.1 General:

5.1.1) This paragraph confirms previous and future statements that no rework may be carried out on any component unless specifically authorised by the regulations. The engine and associated parts must remain exactly as produced by the Ford Motor Company unless expressly detailed in these regulations.

5.1.2) The expressions 'Standard', 'Standard production', or similar are deemed to imply that the part has been manufactured by Ford Motor Company, or a Ford Motor Company Ltd. authorised sub contractor, for specific use on a specific model of the vehicle or engine. Consequently for these championship rules only parts manufactured specifically for the Ford 1600cc, 16 Valve EcoBoost engine in its production form may be used.

N.B. Care must be exercised in the choice of replacement parts, as variations of this engine exist. See Appendix D.

5.2 Permitted Engine:

5.2.1) The only permitted base engine is the Ford 1600cc, 16 Valve EcoBoost engine with nominal bore 79.0mm and stroke 81.4mm, using the standard and Formula Ford specific components listed in Appendix D. Where part numbers are shown in the regulations it is for general information only. The master list of permitted part numbers is contained in Appendix D. No other parts may be fitted to the engine unless specifically detailed in these regulations.

5.2.2) Production tolerances are permitted providing the total swept volume does not exceed 1600.00 cc.

5.3 Engine modifications:

5.3.1) If the regulation allows a change, then that authorization would allow the change to be carried out. However any statement defining minimum weight or dimensions does not grant permission for rework to obtain

these minimum values, unless carried out in accordance with these regulations.

5.3.2) No treatment that alters in any way the surface finish, hardness, or other property of the original production component is allowed.

5.3.3) Ford reserve the right to prohibit the use of specific components introduced as production changes, if in the opinion of the Ford Motor Company Limited, they are deemed to have a performance advantage. If in doubt contact Ford Motor Company or the series scrutineer.

5.3.4) Any machining marks on cast components resulting from manufacturing procedures will not cause disqualification. Only machining and component preparation carried out by Ford Motor Company Ltd or by a Ford Motor Company Ltd authorised sub-contractor is allowed unless otherwise specified. The scrutineers decision will be final (based on advice from Ford Manufacturing) if a dispute arises regarding the amount of tool, or other marks, that are evident in any particular component.

5.3.5) Any production deburring or imperfection removal during initial manufacture may not be modified or extended. The scrutineers decision will be final (based on advice from Ford Manufacturing) if a dispute arises regarding the amount of tool, or other marks, that are evident in any particular component.

5.3.6) The addition of any material (metal, plastic, or composite) whether by welding, bonding, encapsulation or encasement to any component is prohibited. However, specific repair of the mounting points of the cylinder block to the transmission or chassis is allowed, whilst other casting repairs may be allowed with prior written approval of the series scrutineer.

5.3.7) Balancing of reciprocating and rotating parts is permitted only by removal of metal from locations so provided by the manufacturer as detailed in Appendix C. The declaration of minimum weight in the regulations does not permit the freedom to rework a component to achieve this weight. The freedom to balance is specifically for this purpose only therefore at least one piston and connecting rod from the set must remain completely untouched.

5.3.8) The use of non-standard replacement fasteners, nuts, bolts, screws, studs and washers which are not connected with, or which do not support, any moving parts of the engine or its compulsorily retained accessories is permitted. Freedom granted to any fastener does not allow for freedom to move items relative to each other. For components that are granted the freedom for the fitment of a key or dowel, then material may be removed to allow the fitting of the key or dowel. Only one hole or keyway per component is allowed.

5.3.9) The use of thread locking compounds is permitted.

5.3.10) Gaskets are free except for the cylinder head, exhaust manifold, Inlet Manifold and throttle body which must be standard Ford manufacture for the engine. See Appendix E for permitted part numbers.

5.3.11) Any process of cleaning may be used on any component providing the surface finish, which must remain standard, is not affected.

5.3.12) All combustion air must pass through the restrictor, the turbocharger compressor, intercooler and throttle body.

5.3.13) Exterior surfaces only of the complete engine assembly may be protected by paint or similar means. No internal component or surface may be coated by any protective finish. Other Ford produced aluminium components may be protected only on their external surfaces by a transparent clear varnish, or similar.

5.3.14) Engine/transmission mounts attaching to standard Ford components must retain the standard dimensions of the boss or other attachment point without modification.

5.3.15) In the determination of the engine compression ratio it will not be permitted to remove carbon deposits from the pistons, valves the cylinder head.

5.4 Engine Position:

The engine must be mounted upright, and aligned fore and aft in the chassis. The engine crankshaft centre line must be on the longitudinal centre line of the vehicle.

5.5 Cylinder Block:

5.5.1) The standard Ford supplied production cylinder block must be used.

5.5.2) It is permitted, as means of repair, to replace cylinder bores with 'dry' cast iron cylinder liners. 'Nicasil' or any other types of bore plating / treatments are prohibited. All materials and dimensions must remain Ford standard.

5.5.3) The crankcase breather must be blanked off. The Formula Ford specific Crankcase breather blanking plate must be fitted. Ensure that no air and/or oil can escape from the engine other than through pipe-work to a catch tank.

5.6 Crankshaft:

5.6.1) The standard Ford supplied production crankshaft must be used. Spot machining (by radial drilling or milling) to achieve balance is permitted. (Area for balancing defined in Appendix C Drawing 1). Crankshaft minimum weight is 9750g (including gearbox input shaft spigot bearing). Crankshaft journals must remain within Ford positional tolerances if a repair regrind is carried out.

5.6.2) The standard Ford supplied crank damper pulley must be used and can be keyed to the crankshaft in the production position. Note: the pulley is retained to the crankshaft using diamond washers (no woodruff key) and the angular position of the damper pulley relative to the crankshaft must be observed using the Ford standard timing tool. The Ford specified tightening torques and service procedures for fitting, positioning, tightening and removing the pulley must be followed. Failure to do so could lead to failure of the engine.

5.6.3) It is not permitted to alter the number of bearings or fit bearings of less than standard production width. It is permissible, by means of a 5mm peg/dowel, to secure the bearings in place to prevent them from rotating.

5.6.4) The crank journals may be reground for reclaim, as long as the minimum crank weight is respected. Only Ford Standard oversize and undersize bearings are permitted and cannot be modified. Only bearings made specifically for the engine, and marketed by companies that supply Ford with original equipment bearings are allowed. Chamfering of the entry/exit holes of oil ways is permitted.

5.6.5) A marker must be fitted which accurately aligns the crankshaft to the cylinder block at No.1 piston TDC. This marker must be visible and fully accessible to the scrutineers

without removing any component other than external body panels, and without removing the engine from the car.

5.6.6) It is permitted to machine the nose of the crankshaft to fit keys allowing positive location of the cam drive sprocket and crank damper pulley.

5.7 Connecting Rods:

5.7.1) Standard Ford supplied production connecting rods must be used. Note: connecting rod caps are fractured and therefore matched to the connecting rod. Do not mix connecting rod caps.

5.7.2) Connecting rod bolts are free subject to them remaining in ferrous material and their fitment requiring no machining of the connecting rod or bearing cap to fit, and the minimum weights respected.

5.8 Pistons:

5.8.1) Standard Ford supplied production pistons must be used. The pistons may be machined to achieve balance as detailed in Appendix C Drawing 2. At least one piston from the set must remain unmodified. Although balancing is permitted by these regulations Ford does not recommend such machining.

5.8.2) Standard Ford supplied production piston rings must be used and all piston rings must be fitted.

5.8.3) The combustion chamber face of the piston may not be modified.

5.8.4) The minimum weight of the connecting-rod and piston assembly shall be 850g. (Complete piston with rings and pin, and connecting-rod with bolts but excluding crankshaft bearings).

5.9 Flywheel and Clutch:

5.9.1) Flywheel: The mandatory Formula Ford flywheel unmodified in any way, except for balance as specified in Appendix C Drawing 3, must be used. For rectification the clutch mating face may be resurfaced, provided the minimum weight is respected. Flywheel bolts and locating dowel must remain standard production components.

5.9.1.1) The minimum weight of the flywheel shall be 5550g (excluding all flywheel mounting bolts & dowels).

5.9.2) Clutch cover: The mandatory Formula Ford clutch pressure plate must be used.

5.9.2.1) The minimum weight of the clutch cover shall be 3750g (excluding clutch cover bolts and dowels).

5.9.3) Clutch plate: The mandatory Formula Ford clutch plate, must be used.

5.10 Cylinder Head:

5.10.1) No work that removes, adds, replaces, or transfers material is allowed on the cylinder head with the following exceptions:

- i). Simple cleaning which does not alter in any way the shape of the component.
- ii). Minimal material removal from the head face to correct combustion chamber volume and/or reclaim head flatness. Minimum head thickness 116.5mm, measured from combustion gasket face to cam cover gasket face. No internal rework of any combustion chamber is permitted.
- iii). Fitting of replacement valve seat insert to a position that replicates the standard closed valve position.

5.10.2) It is permitted, as a means of repair, to replace damaged valve guides and valve seats by replacement valve guides and valve seat inserts to all standard materials and dimensions.

Valve seat throat dimensions are shown in Appendix C Drawing 4.

Distance apart at centres (inlet) 33.00mm

Distance apart at centres (exhaust) 31.50mm

5.11 Compression Ratio:

5.11.1) The maximum compression ratio will be 10.9:1 and be controlled using the following regulations:

i). Minimum combustion volume in the cylinder head (with the spark plug and fuel injector fitted) = 32.5cm³.

ii). Standard Ford cylinder head gasket with a minimum compressed thickness of 0.45mm, and a minimum diameter of cylinder aperture of 79.60mm. The top of the piston will sit above the block head face by a maximum of 6.15mm when the piston is at TDC, giving a maximum piston clearance volume of 5.5cm³

5.11.2) The cylinder block head face surface may be machined whilst respecting 5.11.1.

5.12 Camshafts:

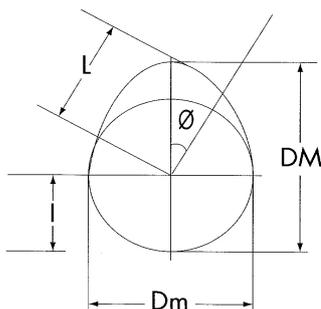
5.12.1) Standard Ford supplied production camshafts must be used and must conform to the lift tables in Art 5.12.6 and 5.12.7. It is prohibited to grind from blanks, regrind, re-profile or change the surface finish. Shot peening, shot blasting or polishing are prohibited.

5.12.2) Standard Ford supplied production cam pulleys must be used. The Standard Ford supplied production cam belt tensioner must be used. The Standard Ford supplied production cam belt must be used.

5.12.3) The cam profile is defined by determination of lift (L minus l) against a flat footed follower at various angles (Ø). Standard Ford tolerances of +0.025mm -0.038mm applies to camshaft drawing and lift tables below.

5.12.4) The standard production angular setting of the camshafts relative to the crankshaft must be respected and the Ford service procedure must be followed when setting the camshafts. See Appendix C Section 5.

5.12.5) The inlet and exhaust camshaft actuators must be fitted and working. It is prohibited to modify the function of the camshaft actuators, cam position sensors or any other part of the cam drive system. The inlet and exhaust cam position sensors must be fitted into the cam cover. The inlet cam position sensor must be connected to the engine harness with the signal to the PCM available at all times. The inlet and exhaust cam position actuators must be fitted to the engine but are not required to be connected to the engine harness.



5.12.6 Intake Camshaft Lift Table:

Ø DEGREES	L mm	open	L close mm
0	7.90		7.90
5	7.83		7.83
10	7.60		7.60
15	7.23		7.23
20	6.71		6.71
25	6.05		6.06
30	5.26		5.27
35	4.34		4.36
40	3.31		3.34
45	2.22		2.27
50	1.19		1.25
55	0.49		0.57
60	0.36		0.43
65	0.27		0.34
70	0.18		0.25
75	0.09		0.16
80	0.01		0.07
84	0.00		0.01
DM	37.90		
Dm	30.00		

5.12.7 Exhaust Camshaft Lift Table:

Ø DEGREES	L mm	open	L close mm
0	6.60		6.60
5	6.53		6.53
10	6.33		6.33
15	5.98		5.98
20	5.51		5.51
25	4.90		4.90
30	4.17		4.18
35	3.32		3.34
40	2.38		2.42
45	1.43		1.49
50	0.68		0.76
55	0.47		0.55
60	0.38		0.46
65	0.29		0.37
70	0.20		0.28
75	0.11		0.19
80	0.03		0.10
84	0.00		0.03
89	0.00		0.00
DM	36.60		
Dm	30.00		

5.13 Tappets, Valves and Valve Springs:

5.13.1) All valve train components must be fitted.

5.13.2) Tappets. The standard Ford bucket tappets must be fitted. Graded tappets are available to allow precise setting of the inlet and exhaust valve clearances (see Appendix C Section 6 for list of available sizes).

5.13.3) Original Ford valves must be fitted. The original seat angle must be maintained. Standard valve stem seals must be retained.

5.13.4) Valve springs must remain standard; no adjustment to rate or free length is permitted. Only 1 spring per valve is allowed.

Maximum face diameter (inlet)	30.25mm
Maximum face diameter (exhaust)	25.05mm
Overall length (inlet)	98.78+0.25 -1.00mm
Overall length (exhaust)	99.65+0.25 -1.00mm
Valve stem diameter, inlet	4.92±0.02mm
Valve stem diameter, exhaust	4.92±0.02mm

5.14 Induction System:

5.14.1) Air Filter: The mandatory Formula Ford air filter must be used. All the air entering the engine must pass through the air filter. No pipe extension or air horn/trumpet/bell mouth is allowed inside the air filter unit.

5.14.2) The induction air filter unit may be placed in a cold air chamber. The whole of the cold air chamber must fit inside the bodywork and respect Art 3. No air trumpets/horns/bell mouths are permitted outside the bodywork.

5.14.3) Compressor Inlet Restrictor: The mandatory Formula Ford compressor inlet restrictor must be used and fitted between the mandatory compressor inlet elbow duct and the turbocharger compressor housing. All combustion air must pass through the restrictor. Maximum internal diameter of the restrictor is 38.00+0.25 -0.50mm. Ford Motor Company reserves the right to change the internal diameter of the inlet restrictor duct.

5.14.4) Compressor Elbow Inlet Duct: The standard Ford supplied production compressor elbow inlet must be used. All the air entering the turbocharger compressor must pass through the inlet duct.

5.14.5) Intercooler: The mandatory Formula Ford intercooler must be used. The mounting pins and unused mounting brackets may be removed.

5.14.6) Intercooler ducting: The intercooler ducting route is free, whilst respecting all bodywork regulations. All intercooler ducting from the turbocharger compressor exit to the intercooler and from the intercooler to the throttle body will be maximum internal diameter 58mm.

The length of the duct, measured along the duct centre line, from the turbocharger compressor outlet to the intercooler inlet will be minimum 740mm and maximum 940mm.

The length of the duct, measured along the duct centre line, from the intercooler outlet to the throttle body inlet will be minimum 470mm and maximum 670mm. The mandatory Formula Ford air charge temperature sensor must be installed as close to the throttle body as possible and must be connected to the engine harness with a signal available to the PCM at all times.

5.14.7) Throttle Housing: The standard Ford supplied production electronic throttle body must be used. The maximum throttle internal diameter is 53.13mm. It must be connected to the PCM loom with a signal available to/from the PCM at all times.

5.14.8) Inlet Manifold: The standard Ford supplied production inlet manifold and inlet manifold gasket must be used. It is

permitted to remove and plug the 16mm vacuum connector located directly above the throttle housing in the manifold.

5.15 Exhaust System:

5.15.1) Manifold: The standard Ford supplied production exhaust manifold and gasket must be used. The manifold must connect via a gas tight joint directly with the turbo charger.

5.15.2) Turbocharger: See Art 5.16

5.15.3) Downpipe: Meaning the exhaust pipe down stream of the turbo exhaust gas exit flange. The downpipe shape is free, but must be a single pipe connected to the turbo using the mandatory exhaust/turbo plate. It must be made from mild or stainless steel tubing with a minimum wall thickness of 0.9mm. The standard Ford production UEGO must be fitted to a boss located in the down pipe and connected to the PCM. The UEGO position must be in compliance with Appendix C Drawing 7.

5.15.4) Catalyst: The mandatory Formula Ford catalyst must be installed in the exhaust pipe, its location in compliance with Appendix C, Drawing 7.

5.15.5) System: The Exhaust Pipe may not extend more than 600mm beyond the rear wheel axis.

5.15.6) Noise: At all times the car must conform to the noise requirements of the circuit, the series regulations, and any ASN specific vehicle regulations as regards position of the exhaust outlet. The exhaust must exit to the rear of the car. The complete exhaust system up to the end of the final pipe shall remain gas tight at all times.

A maximum noise level of 108dB(A), measured at 0.5 ± 0.1 5m from the tail pipe exit, and at 45° to the pipe centre line will be enforced unless a greater degree of silencing is required by the event organisers, in which case this must be specified in advance in the event final regulations. The engine speed for noise measurement purposes shall be 5100rpm.

If specific sporting or technical regulations specify a mandatory silencer it must be used and fitted after the catalyst, irrespective of the exhaust noise generated without it.

5.16 Turbocharger System:

5.16.1) Turbocharger: The mandatory Ford production turbo charger unit must be used. Ford reserves the right to independently test and seal all turbocharger assemblies prior to use on the engines. See art 5.21.2 for sealing details. The turbocharger may be exchanged, at any time (including the time allocated for practice) upon the request of a designated official from the company promoting the championship or from an ASN designated official.

5.16.2) Wastegate actuator: The standard Ford supplied production waste gate actuator must be used and connected to the pressure control valve. The position must be set in accordance with Ford service procedures and to the specification for the engine. The correct operation of the actuator may be tested at any time by application of a pressure signal to the waste gate actuator.

5.16.3) Wastegate Actuator Pressure Control Valve: The standard Ford supplied production waste gate pressure control valve must be connected to the wastegate actuator, turbocharger compressor scroll and compressor inlet elbow using the Ford standard production pipe work. The connecting

pipe work must be airtight. The valve must be connected to the engine harness with the signal from the PCM available at all times. The maximum steady state manifold absolute pressure as measured by the manifold pressure sensor fitted to the inlet manifold of the engine is 2.1Bar.

5.16.4) Oil supply: The standard Ford oil supply and return lines must be fitted and connected to the oil feed and oil drain connections on the side of the head and block respectively.

5.16.5) Cooling: The standard Ford turbo charger water cooling pipes must be fitted. The length of these pipes may be altered to suit the cooling installation.

The turbo charger must be water cooled and connected to the cars radiator cooling system circuit. The water feed (lower pipe) must be fed from the cylinder head outlet and the water return (upper pipe) must feed directly back to the water header tank at the highest point in the cooling circuit.

5.16.6) Compressor Bypass valve: The standard compressor bypass valve assembly mounted on the side of the turbocharger compressor housing must be retained unmodified. The valve must be connected to the inlet manifold via hard/flexible pipework. The connecting pipe work must be airtight.

5.17 Fuel System:

5.17.1) Low Fuel Pressure Sensor: The standard Ford supplied production fuel pressure sensor must be connected to the High pressure fuel pump feed. It must be connected to the PCM loom with a signal available to the PCM at all times.

5.17.2) High Pressure Fuel Pump: The standard Ford supplied (Bosch) production high pressure fuel pump unmodified in any way must be used and remain in its original position. It must be connected to the PCM loom with a signal available to the PCM at all times.

5.17.3) High Pressure Fuel Pipe: The standard Ford supplied production high pressure fuel pipe must be used.

5.17.4) Fuel Rail: The standard Ford supplied production fuel rail must be used.

5.17.5) Fuel Rail Pressure Sensor: The standard Ford supplied production fuel rail pressure sensor must be used and remain in its original position. It must be connected to the PCM loom with a signal available to the PCM at all times.

5.17.6) Fuel Injector: The standard Ford supplied production fuel injectors must be used and remain in their original position. A maximum of 1 per cylinder (total 4) is allowed.

5.17.7) Fuel Pressure: With an engine idling at 800 rpm with a coolant temperature of 70-100°C, the feed to the high pressure fuel pump as measured by the fuel pressure sensor shall be at least 500±10 kPA, (5±0.1Bar). For reference the fuel rail pressure as measured by the fuel rail pressure sensor will be approximately 800±100kPA, (80 ± 1 Bar). At full load the fuel rail pressure as measured by the fuel rail pressure sensor will be up to 2000 kPA, (200 Bar).

5.18 Oil System:

5.18.1) An oil based lubricating system is mandatory. The Formula Ford specific dry sump kit and pump kit must be used. Existing standard production oil ways, linings or oil grooves must remain unmodified, no additional ones are permitted.

5.18.2) Oil Pan: The mandatory Formula Ford dry sump oil pan, must be used. Oil coolers are free. The standard production baffle (windage tray) may be modified, removed, or replaced by another. Any replaced baffle shall have no other function and be no larger in surface area than the replaced production part.

5.18.3) Oil Pump (scavenge): The mandatory Formula Ford scavenge oil pump and mounting bracket must be used.

5.18.4) Oil Pump (pressure): The standard internal engine pressure oil pump must be used. The front cover assembly, within which the standard oil pressure pump is housed, must be used.

5.18.5) Oil Pressure relief valve: The standard internal engine oil pressure relief valve must be used.

5.18.6) Oil Filter: The oil filter is free but must remain connected into the lubricating oil circuit in its standard location on the side of the block.

5.18.7) Piston Cooling Jets: The standard piston cooling jets must be used (1 per cylinder).

5.18.8) Oil pressure sensor: The mandatory oil pressure sensor (same as the standard fuel pressure sensor) must be mounted on the side of the engine block in a tapping in the main oil gallery. It must be connected to the PCM loom with a signal available to the PCM at all times.

5.18.9) Oil temperature sensor: The mandatory oil temperature sensor must be fitted into the scavenge outlet. It must be connected to the PCM loom with a signal available to the PCM at all times.

5.18.10) Oil Lines: All lubricating oil lines, which carry oil at a nominal working pressure of 1 bar or above, must have a minimum burst pressure of 41 bar at the minimum operating temperature of 135°C.

When flexible, these lines must have threaded connectors and an outer braid resistant to abrasion and flame (will not sustain combustion). All other oil containing lines must be made from hose material and fittings that meet the minimum operating temperatures stated above, and have adequate burst strength. No oil lines are permitted in driver cockpit area.

5.19 Cooling System:

5.19.1) A water based liquid cooling system is mandatory.

5.19.2) The standard production water pump and pulley must be retained.

5.19.3) No other pump or motor may be used to circulate or assist circulation of the coolant liquid.

5.19.4) The standard thermostat/pump outlet housing may be replaced by a bespoke part to suit the installation of the engine in the chassis. The thermostat may be removed. If fitted, the thermostat must be in the original standard location.

5.19.5) The production water outlet may be removed and replaced by a bespoke part, oriented to suit the chassis installation. The replacement part must allow the same fixing and location of the engine coolant temperature sensor. The standard Ford supplied production engine coolant temperature sensor must be fitted into the water outlet. It must be connected to the PCM loom with a signal available to the PCM at all times.

5.19.6) Radiator: The radiator and associated pipes are free.

5.19.7) The radiator if mounted in a housing or incorporating a cool air scoop or deflector must comply with bodywork regulations.

5.19.8) Ducting to the radiators, or other items requiring cooling, inside the side pods is free. No ducting after the radiators or other items requiring cooling is permitted. Slots and other openings may be inserted into the side pod bodywork, but these must not be connected to the radiator directly by separate ductwork

5.19.9) Radiator Caps. Only a single pressure control cap is permitted. The cap should be located or shielded in such a way that hot water or steam cannot scald the driver of the vehicle if it becomes opened or broken in an accident.

5.20 Engine Covers:

5.20.1) The standard production camshaft and fuel pump cover must be used. The cam cover colour may be changed. The standard cam belt covers must be used but may be locally modified to allow mounting of a FEAD idler pulley and/or engine mount. Any remaining gaps must be filled.

5.20.2) The standard oil filler cap and breather holes in the cam cover must be replaced by suitable fluid tight blanks.

5.21 Engine sealing and scrutineering:

5.21.1) Access

An access hole of 25mm diameter must be provided in the bell housing to allow the clutch to be sealed to the flywheel without removal of the engine from the car.

5.21.2) Sealing

Tamper proof paint seals or wire seals will be used for all cases when sealing of any component is required. All engines should have provision for scrutineers wire seals.

2mm diameter holes pre-drilled in readily accessible locations on installed engines must be available:-

- i.) Sump - two holes through the cylinder block/ sump joint flange, one either side of the engine.
- ii) Cam Cover - at least two retaining screw heads must be cross drilled.
- iii) Inlet Manifold - at least two retaining bolt heads to the cylinder head must be cross drilled.
- iv) Throttle body - at least two retaining bolt heads to the inlet manifold must be cross drilled.
- v) Turbocharger –The two flange clamp bolts that secure the compressor housing to the turbocharger core (closest to the coolant feed and return pipes) see Appendix C Section 8 and the clamp bolt for the turbine/manifold housing to the turbocharger core must be cross drilled with a 1.5mm or 1/16th holes to accommodate sealing wire.
- vi) Restrictor – at least two retaining bolt heads to the compressor inlet must be cross drilled.
- vii) The exhaust manifold and exhaust pipe containing the catalyst must be capable of sealing with wire seals.
- viii) MAP sensor mounting bolt must be cross drilled for sealing wire.

5.21.3) All valve train components, other than the shims used to adjust valve clearance must be Ford standard production.

ARTICLE 6: FUEL TANKS PIPING & SYSTEM

6.1 Fuel Tanks:

6.1.1) Only FT3 or superior specification FIA specification fuel tanks are allowed.

It is recommended that all new cars built for 2012 should have a fuel cell which is suitable for bio-fuels up to 85% ethanol content.

All rubber bladders shall be printed with the name of the manufacturer, the specifications to which the tank has been manufactured and the date of manufacture.

No rubber bladders shall be used more than 5 years after the date of manufacture, unless inspected and recertified by the manufacturer for a period of up to another 2 years.

6.1.2) All the fuel stored on board the car must be situated between the front face of the engine and the driver's back when viewed in lateral projection.

Furthermore, no fuel can be stored more than 300mm forward of the highest point at which the driver's back makes contact with his seat.

Fuel must not be stored more than 400mm from the car longitudinal centre line.

6.1.3) The fuel tank must be totally isolated from the cockpit area, and the housing must have suitable drain holes to ensure no spilt fuel is retained in this structure. Tanks should be located so that they are given maximum protection by the structure of the vehicle. MSA / FIA recognized vent valves must be fitted to the breather to ensure no fuel spillage in the case of the car inverting.

6.1.4) In the case of a vehicle with the fuel tank placed immediately behind the driver, the liquid proof structure enclosing the fuel tank must be protected by complete bulkheads, ensuring no fuel can reach the driver in the case of an accident or other fuel spillage whilst seated in the car.

6.1.5) Tank Fillers, Vents, and Caps: Tank fillers and caps must not protrude beyond the bodywork or be situated within the driver/passenger compartment. The caps must have an efficient locking action to reduce the risk of opening during an accident and ensure closing after refuelling. Air vents must be at least 250mm to the rear of the cockpit.

6.1.6) At the end of practice and the race at least 3 litres of fuel from the tank of the competing car must be available to the scrutineers (pumped out via the cars standard fuel pump for analysis. Compliance with minimum weight for the car will be taken before the fuel is removed. Any Industry recognised method of fuel checking may be employed.

6.1.7) Cars must be equipped with the facility to enable a fuel sample to be taken. The facility must be a dry break fuel sampling coupling approved by the FIA and located in the low pressure fuel feed. Competitors are to carry and make available a 300mm minimum length of hose to which, where necessary, the appropriate mating part is to be attached.

6.2 Fuel Pipes:

6.2.1) All fuel pipes that contain fuel under pressure must have a minimum burst pressure of 41 bar at the minimum operating temperature of 135°C. It is recommended that all new cars built from 01-01-2009 should have fuel pipes which are suitable for bio-fuels up to 85% ethanol content.

6.2.2) Automatic fuel cut-off: Ford strongly recommend that all fuel feed pipes going to the engine should be provided with automatic cut-off valves located directly on the fuel tank which

automatically close all fuel lines under pressure if one of these lines in the fuel system is fractured or leaks.

6.2.3) No fuel pipes are allowed within the driver cockpit area.

6.2.4) Be equipped with an effective method of stopping Fuel supply operable by the driver when normally seated.

6.3 Fuel Filler:

Should be designed and located to reduce risk of damage. The filler cap should not be liable to open in the case of an accident. The filler pipe to the tank should be of minimum possible length and the cap must not protrude beyond the bodywork. Additionally the filler cap must not be located over any hot object.

6.4 Low Pressure Fuel Pump:

6.4.1) The low pressure fuel pump and fuel collector (maximum volume 1 litre) prior to the high pressure fuel pump must be mounted within the area defined by the chassis rails and not directly in the cockpit area. It shall be capable of maintaining the normal operating feed pressure of 500kPA (5.0 Bar) under all circumstances. It must be controlled solely by the PCM, via the relay incorporated into the mandatory chassis loom.

ARTICLE 7: OIL SYSTEM

7.1 Location of Oil Tanks:

All oil storage tanks must be situated between the front wheel axis and the rearmost gearbox casing longitudinally, and if situated outside the main structure of the car they must be surrounded by a 10mm thick crushable structure.

7.2 Catch Tanks:

The engine and gearbox must only vent into a catch tank of minimum 2ltrs. The catch tank must either be made of a transparent material or include a transparent inspection panel and be capable of being readily emptied. Breather systems and catch tanks must be used in such a way as to prevent oil spilling onto the track. They must be leak proof, with any vent to the atmosphere being via a suitable filter.

No other part of the car containing oil may be situated behind the complete rear wheels.

ARTICLE 8: ELECTRICAL SYSTEMS

All wiring should be secured and well protected to reduce the risk of chafing and damage and the risk of fire from an electrical short circuit.

All electrical cable circuits must be enclosed in fire-resistant material.

No electrical components located in the Cockpit area are permitted which has a working voltage greater than 15 Volts.

8.1 Starter:

8.1.1) Starter Motor

A starter motor, with an electrical source of energy carried on board the car, and able to be controlled by the driver when normally in their seat must be fitted in the original position on the engine. The starter motor itself is free but it must use the standard mountings on the engine without modification.

8.1.2 Starter button:

'Ford Power' starter button with part N° 7S7T-11572-AC, bezel and fascia must be used in conjunction with the normal starter button.

8.2 Alternator:

A 12 Volt (nominal) alternator must be fitted. The alternator must be driven from either transmission drive shaft flange. The minimum output of the alternator shall be 300 Watts. The alternator must be connected to the vehicle electrical system and battery. The installation shall ensure that this output is available at all times whilst the car is circulating on the race track. Only high volume automotive alternators may be used.

8.3 Battery:

8.3.1) Only a single battery may be used and will be of a dry cell construction. 'Wet' batteries and 'gel' batteries are prohibited.

8.3.2) The battery must be capable of demonstrating at least 3 engine starts without external recharge, or assistance, at any time during practice, the race, or in Parc-Ferme.

8.3.3) A supplementary external source of energy temporarily connected to the car may be used to start the engine whilst in the pit area or on the grid prior to the formation lap, but cannot be used whilst checking. See 8.3.2.

8.3.4) The battery terminals must be covered to protect from short circuit / producing sparks in all circumstances. The battery earth lead, if not readily distinguishable, must be identified by a yellow marking along its entire length.

8.4 Powertrain Control Module (PCM):

8.4.1) The mandatory Formula Ford Powertrain Control Module (PCM) must be used, plus any other PCM specifically defined and notified to competitors by the championship organiser's. The Sporting Regulations for the event has the right to specify which, or all, of the PCM calibrations may be used. It is prohibited to modify the software contained in the PCM.

8.4.2) The PCM diagnostic connector must be positioned in an accessible position on the outside of the vehicle, adjacent to the battery master switch trigger button allowing scrutineers free access to it at all times. The free access must allow for the condition of the driver seated in the car and fully prepared to take part in the competition.

8.4.3) The PCM may be exchanged, or electronically interrogated at any time (including the time allocated for practice) upon the request of a designated official from the company promoting the championship or from an ASN designated official.

8.5 Wiring harness:

8.5.1) The mandatory Formula Ford Engine wiring harness must be used. No rework or modification to this loom is permitted, with the exception of replacing damaged connectors (like for like). A table of the pin-out of the wiring harness connections to the chassis loom is shown in Appendix C, Section 9.

8.5.2) The mandatory Formula Ford Chassis wiring harness must be used. No rework or modification to this loom is permitted, with the exception of replacing damaged connectors (like for like).

8.6 Ignition system:

8.6.1 Spark Plug:

The standard production spark plug must be used and place the electrode tip in the standard position in the combustion chamber.

8.6.2 Ignition Coil:

The standard production coil-on-plug units must be used and may not be repositioned. It is prohibited to use any other method or component to trigger, distribute or time the ignition or injection.

8.7 Sensors:**8.7.1) Standard production sensors:**

All standard production engine sensors which have any influence whatsoever on the operation of the engine must be retained in the standard position and in working order. It is not permitted to reposition positional sensors. It is not permitted to change the strength or form of any of the sensor signals to, or the outputs from, the PCM. For the avoidance of doubt this means any / all additional sensors are prohibited as are any modifications to the standard production ones for this engine. The following standard production sensors must be fitted, and connected to the PCM to ensure a signal is available at all times:

Crankshaft Position Sensor (CPS)

Inlet Camshaft Position Sensor

Knock Sensor (2 off)

Engine Coolant Temperature (ECT) Sensor

Air Charge Temperature Sensor (ACT)

Manifold Pressure Sensor (MAP) Sensor

Universal Exhaust Gas Oxygen (UEGO) Sensor

Fuel pressure Sensor

Oil pressure Sensor

Fuel Rail Pressure Sensor

The following mandatory Formula Ford sensors must be fitted and connected to the PCM via the engine and/or chassis wiring harnesses to ensure a signal is available at all times:

8.7.2) Pedal Position Sensor:

The mandatory pedal position sensor must be fitted within the driver compartment and connected to the PCM via the engine wiring harness.

8.7.3) Vehicle Speed Sensor:

A vehicle speed sensor must be fitted on the left front wheel and connected to the PCM via the chassis wiring harness. It is permitted to fit an additional speed sensor to the right front wheel.

The signal from both sensors must be 8 pulses per revolution.

8.7.4) Vehicle Position Sensor:

The Formula Ford GPS box must be fitted **level** on the longitudinal centreline of the car (beneath the damper hatch) **with the connector facing rearwards** and connected to the PCM via the chassis wiring harness.

8.7.5) Gear Position Sensor:

The mandatory gear position sensor must be fitted on the tail housing of the gearbox and be connected to the PCM via the chassis wiring harness.

8.7.6) Gear Shift Sensor:

The mandatory Formula Ford gear shift sensor (load cell) must be fitted on the gear linkage (at the gear lever end) and connected to the PCM via the chassis wiring harness.

8.7.7) Lap Marker/Timing beacon receiver:

A beacon receiver must be fitted and connected to the PCM via the chassis wiring harness. The receiver unit must be positioned such that it can receive the signal from the transmitter at all times.

8.7.8) Steering Wheel Angle (SWA) Sensor:

It is permitted to connect an optional and proprietary steering angle sensor to the engine control unit via the auxiliary

connector on the engine wiring harness. See Appendix C Section 9 for details.

8.7.9) Brake Pressure Sensors:

It is permitted to connect optional and proprietary (front & rear) brake pressure sensors to the engine control unit via the auxiliary connector on the engine wiring harness. See Appendix C Section 9 for details.

8.8 Electronic dashboards and data logging equipment:

The mandatory Formula Ford specific dashboard must be fitted on the steering wheel and connected to the PCM via the chassis wiring harness.

3rd party data logging equipment is allowed during unofficial testing. 3rd party data logging equipment may be connected to the PCM via the CAN or serial data streams to allow recording of engine parameters. All information obtained from any 3rd party data logging or storage equipment shall be made freely available to the Scrutineer on request.

8.8.1) Unless officially requested by the series scrutineer the PCM must be set-up to record the standard logging parameters as supplied in the PCM.

8.9 Data Logger:

The event scrutineers reserve the right to require a competitor to carry a Ford supplied data logger on the car at any time during the event. The unit will be located inside the vehicle near the existing diagnostic connector.

8.10 Pit-Lane Seed limiter:

8.10.1) The pit-lane speed limiter (PCM controlled) must be operable in all gears and must be used whenever the car is in a speed controlled area to limit the vehicle speed to 60 kph.

8.10.2) The pit-lane speed limiter shall be activated by a dashboard mounted switch/button or steering wheel mounted button connected to the chassis wiring harness. The Rear Warning Light will flash to signal that the vehicle is operating in a speed limited mode.

ARTICLE 9: TRANSMISSION TO THE WHEELS**9.1 Four wheel drive:**

Four wheel drive cars are forbidden.

9.2 Type of gearbox:

Will be a sequential shift mechanism gearbox with 6-forward speeds, one reverse and mechanical shift.

All casings and gearbox components must be of original manufacturer supply.

The ratios will be fixed as follows:-

1 st Gear –	12/38
2 nd Gear –	15/32
3 rd Gear –	15/25
4 th Gear –	18/25
5 th Gear –	free
6 th Gear –	free
Reverse Gear -	free

The final drive ratio will be fixed at 12/34.

No forward gear ratio pair may be:

- less than 12.75mm wide when measured across the gear tooth at the root diameter or any point 1mm above or below the root diameter. Above this area each side of the gear teeth may be chamfered by a maximum of 10°. In addition, a

chamfer or radius not exceeding 2.0mm may be applied to the sides and the tip of the teeth.

- less than 78.9 mm between centres.
- less than 1710g for any layshaft and 1st gear assembly.
- less than 750g for any hubbed gear ratio.
- less than 670g (excluding any integral shaft or collar).

If an integral shaft or collar is to be excluded the mass of this may be shown by calculation assuming the gear to be 10.5 mm wide and the shaft geometry to be the same as that where slide-on gears are used.

The minimum weight of the complete gearbox (complete gearbox with differential, without supports, without oil, without clutch, without external control, with drive flanges, without tulips) is 36 kg.

Transversal gearboxes or gearboxes forward of the rear wheel axis are forbidden. Only position for the main gear cluster will be wholly behind the rear axle output shaft centre line, and in line with the crankshaft centre line.

Semi automatic and automatic gearboxes and differentials with electronic, pneumatic or hydraulic slip control are forbidden.

Torque biasing, limited slip and locked differentials are prohibited. Non ferrous differential components are prohibited, with the exception that unmodified OEM supplied, non ferrous bevel gear thrust washers are permitted provided that, at any temperature, they do not provide any form of torque biasing etc. No machining or alterations to the differential are permitted which could cause the differential to act similar to a limited slip system.

At any point during the event the car with one rear wheel lifted from the ground or placed on a roller must be able to reach 3500rpm, when in gear, without the car moving or the lifting device/roller being displaced.

9.3 Reverse gear:

All cars must have a reverse gear which, at any time during the event, can be selected while the engine is running and used by the driver when seated normally.

9.4 Traction control:

The use of traction control is forbidden.

9.5 Driveshafts:

Driveshafts must be made from steel. They must have an outside diameter no less than 21.50mm and no more than 25.00mm and an inside diameter no more than 12.2mm (not including splined ends).

The CV joint assembly must not form an integral part of the drive shaft assembly.

ARTICLE 10: SUSPENSION AND STEERING

10.1 Active suspension:

Active suspension is forbidden as is any system that allows control of the flexibility of the suspension springs, shock absorption and trim height when the car is moving.

10.2 Chromium plating:

Chromium plating of any steel suspension components is forbidden.

10.3 Suspension members:

10.3.1) The wishbones, and push / pull rods must be of steel or other ferrous material. All other suspension members must be made from a homogeneous metallic material with no composite materials allowed. It is permitted to incorporate suspension mounting points on the engine and transmission assembly.

10.3.2) In order to help prevent a wheel becoming separated in the event of all suspension members connecting it to the car failing provision must be made to accommodate flexible cables, each with a cross sectional area greater than 110mm², the purpose of which is to connect each wheel/upright assembly to the main structure of the car. The cables and their attachments must also be designed in order to help prevent a wheel making contact with the driver's head during an accident. The cable must be routed along the lower forward wishbone member of the front suspension and the lower wishbone of the rear suspension.

Each cable must have its own separate attachment which:

- is able to withstand a tensile force of 70kN;
- is able to accommodate a cable end fitting with a minimum inside diameter of 15mm.

Each wheel will be fitted with one cable. It must exceed the FIA requirements of 3.1.1 of Test Procedure 03/05

Each cable must exceed 450mm in length and must utilise end fittings which result in a tether bend radius greater than 7.5mm.

10.3.3) It is not permitted to construct any suspension member in the form of an aerofoil or to incorporate a spoiler in the construction of any suspension member. A symmetrical oval tube is not considered an aerofoil. The push/pull rod from the wheel uprights to the damper mechanism may use an oval tube, but the bottom surface must be a mirror image of the top surface, and the long axis must be parallel to the ground.

10.3.4) Suspension components must be the same effective length on both sides of the vehicle, and their mounting points must be equal distance from the chassis centre line.

10.3.5) In order to prevent intrusion of suspension parts into the chassis cell during a side impact, each member of every front suspension component with two inboard mountings must be joined by a link as close to the chassis cell as practical. The anti-intrusion bars must have a minimum outside diameter of 11mm, and a minimum wall thickness of 1mm. Any slip joints in their construction must be effectively locked with threaded fasteners during competition.

10.4 Sprung suspension:

10.4.1) Be fitted with sprung suspension between the wheels and the chassis. Suspension must be controlled to avoid fouling of wheels on chassis or bodywork.

There must be movement of the wheels to give suspension travel in excess of any flexibility in the attachments.

10.4.2) Dampers:

The damper casing design is free. They must be ferrous or light alloy units and separate reservoirs for fluid and/or gas are permitted. The shock absorber casing is defined as the item which contains the piston, fluid/gas, and moving parts which control the damping action. Any form of active damping is prohibited. Any method of altering the damper performance by the driver whilst seated in the car is prohibited.

10.4.3) Anti-roll bars:

Anti-roll bars for front and/or rear suspension capable of adjustment by the driver when seated in the car are forbidden.

10.5 Steering:

10.5.1) The steering must consist of a mechanical link between the driver and the wheels.

10.5.2) Four wheel steering is forbidden.

10.5.3) The steering wheel, steering column and steering rack assembly must be subjected to an impact test. For the purposes of this test, these parts must be fitted to a representative test structure; any other parts which could materially affect the outcome of the test must also be fitted.

The test structure must be solidly fixed to the ground and a solid object, having a mass of 8kg and travelling at a velocity of 7m/s, will be projected into it. The object used for this test must be hemispherical with a diameter of 165mm.

For the test, the centre of the hemisphere must strike the structure at the centre of the steering wheel along the same axis as the main part of the steering column.

During the test the striking object may not pivot in any axis and the test structure may be supported in any way provided this does not increase the impact resistance of the parts being tested.

The resistance of the test structure must be such that during the impact the peak deceleration of the object does not exceed 80g for more than 3ms.

After the test the steering wheel quick release mechanism must still function normally.

ARTICLE 11: BRAKES**11.1 Separate Circuits:**

All cars must have a brake system which has at least two separate circuits operated by the same pedal. This system must be designed so that if leakage or failure occurs in one circuit, the pedal shall still operate the brakes on at least two wheels. Vehicles must have brakes on all wheels.

11.2 Brake Discs:

Only brake discs made predominantly from ferrous material are permitted.

11.3 Brake Callipers:

Callipers may be ferrous or aluminium alloy castings, forgings, or machined from billet, with a maximum of two working cylinders per calliper with a maximum piston size of 45mm each. Callipers must be of 2 part construction, monobloc callipers are prohibited unless they are forged. Brake pad materials, including carbon metallic are free.

11.4 Hand operated brakes:

For the sole purpose of assisting the driver during gradient starts, a simple cable operated brake assist system may be used. This may not in any way affect the performance of the main braking system and may not be connected to the hydraulic circuits. It must be solely mechanical.

11.5 Cooling Ducts:

Brake cooling ducts are not permitted.

11.6 Brake Pressure Modulation:

Anti-Lock brakes and power braking are forbidden.

ARTICLE 12: WHEELS & TYRES**12.1 Location:**

Complete wheels must be external to the bodywork in plan view.

12.2 Wheel:

The mandatory Ford front and rear wheel designs must be used.

These wheels will have dimensions of (13 inch) 330.2mm ± 1.5mm diameter with a maximum rim width of (7 1/2 inch) 190.5 ± 1mm for the front and (8 1/2 inch) 215.9mm ± 1.5mm for the rear.

The wheel material will be aluminium alloy.

12.3 Wheel Fixation:

The fixing will be via a single centre lock flat nut system with 4 drive pegs.

A safety spring must be in place on the wheel nut throughout the event and must be replaced after each wheel change. These springs must be painted dayglow red or orange.

12.4 Maximum Number of Wheels:

The number of wheels is fixed at four.

12.5 Tyre Type:

The only tyres permitted are those listed in Appendix B. NB. The Slick and Wet tyres detailed in Appendix B are the ONLY tyres that are permitted on these wheels. See Sporting Regulations for the number of tyres permitted per event.

12.6 Pressure Control Valves:

No pressure limiting device of any kind is allowed in the wheel/tyre assembly.

12.7 Tyre heaters:

It is not permitted to pre-heat the tyres by any means. This includes tyre warmers; hot soak cabinets etc. It is not permitted to chemically change the composition of the tyre material from the 'as sold' condition.

12.8 Wheel Spacers:

Not be fitted with any Wheel Spacer exceeding 25mm in thickness or of less than hub diameter. Multiple or laminated spacers prohibited.

ARTICLE 13: COCKPIT**13.1 Cockpit Opening:**

In order to ensure that the opening giving access to the cockpit is of adequate size, the template shown in Appendix A Drawing 5 will be inserted into the survival cell and bodywork.

During this test the steering wheel, steering column, seat and all padding may be removed and:

- the template must be held horizontal and lowered vertically from above the car until its lower edge is 525mm above the reference plane;

- referring to Drawing 5, the rear edge of the template must be no less than 1500mm behind the front wheel centre line.

~~The opening giving access to the cockpit must allow the horizontal template, shown in Appendix A Drawing 6, to be inserted vertically, from above the car into the survival cell and bodywork, with the steering wheel, steering column, seat and all padding removed.~~

~~The rear edge of the template must be no less than 1550 from the front wheel centre line and it must be possible to lower the template 25mm below the lowest point of the cockpit opening.~~

Furthermore, the forward extremity of the cockpit opening, even if structural and part of the survival cell, must be at least 50mm in front of the steering wheel.

The driver must be able to enter and get out of the cockpit without it being necessary to open a door or remove any part of the car other than the steering wheel or cockpit padding. Sitting at his steering wheel, the driver must be facing forward.

The cockpit must be so conceived that the maximum time necessary for the driver to get out from his normal driving position does not exceed 7 seconds with all driving equipment being worn and starting with the safety belts fastened.

13.2 Internal Cross Section:

The free internal cross section of the cockpit from the soles of the driver's feet to behind the seat shall at no point be less than 70000mm². The only thing that may encroach on this area is the steering column. A free vertical section of minimum 250mm width maintained to a minimum height of 250mm with corners of maximum 50mm radius must be maintained over the whole length of the cockpit with the steering wheel removed.

The driver normally seated in their driving position with the seat belts fastened and the steering wheel removed must be able to raise both legs together such that their knees reach the plane of the steering wheel in the rearwards direction; this action must not be obstructed by any part of the car.

13.3 Feet Position:

When he is seated normally, the soles of the driver's feet, resting on the pedals in the inoperative position, shall not be situated to the fore of the vertical plane passing through the front wheel centre line.

13.4 Steering Wheel:

13.4.1) Shape: The steering wheel rim must be continuously closed but the shape is free.

13.4.2) Quick Release: The steering wheel must be fitted with a quick release mechanism. Its method of release must be by pulling a concentric flange installed on the steering column behind the wheel.

13.4.3) Position: No part of the steering wheel or column, nor any part fitted to them, may be closer to the driver than a plane formed by the entire rear edge of the steering wheel rim. All parts fixed to the steering wheel must be fitted in such a way as to minimise the risk of injury in the event of a driver's head making contact with any part of the wheel assembly.

ARTICLE 14: SAFETY EQUIPMENT

General safety recommendation:

Owing to the widely varying nature of competitions and vehicles taking part in them, the Ford Motor Company Limited takes the view that it would not be in the best interests of the competitors to cover all aspects of safety precautions with mandatory regulations. Inevitably such regulations could not necessarily provide for the most appropriate safety precautions in all foreseeable circumstances. The Ford Motor Company Limited therefore draws attention to the following points so that the competitors can consider them and take precautions as seem appropriate to their own particular requirements.

All personal safety equipment: overalls, underwear, helmet, boots etc. must comply with at least the minimum requirements of the ASN for the event being contested.

14.1 Fire Extinguishers:

14.1.1) All cars must be fitted with a fire extinguishing system which must discharge into the cockpit and into the engine compartment.

14.1.2) Any extinguishant which has been specifically approved by the FIA is permitted.

14.1.3) The quantity of extinguishant may vary according to the type of extinguishant used, a list is available from the FIA.

14.1.4) When operated, the fire extinguishing system must discharge 95% of its contents at a constant pressure in no less than 10 seconds and no more than 30 seconds. If more than one container with extinguishant is fitted, they must be released simultaneously.

14.1.5) Each pressure vessel must be equipped with a means of checking its pressure which may vary according to the type of extinguishant used. A list is available from the FIA.

14.1.6) The following information must be visible on each container with extinguishant :

- a) Type of extinguishant ;
- b) Weight or volume of the extinguishant ;
- c) Date the container must be checked which must be no more than two years after the date of filling.

14.1.7) All parts of the extinguishing system must be situated within the survival cell and all extinguishing equipment must withstand fire.

14.1.8) Any triggering system having its own source of energy is permitted, provided it is possible to operate all extinguishers should the main electrical circuits of the car fail.

The driver must be able to trigger the extinguishing system manually when seated normally with his safety belts fastened and the steering wheel in place.

Furthermore, a means of triggering from the outside must be located in close proximity to a circuit breaker switch. It must be marked with a letter "E" in red inside a white circle of at least 100mm diameter with a red edge.

14.1.9) The system must work in any position, even when the car is inverted.

14.1.10) Extinguisher nozzles must be suitable for the extinguishant and be installed in such a way that they are not directly pointed at the driver's face.

14.2 Battery Isolator:

14.2.1) The mandatory Formula Ford electronic battery isolator ("master switch") switch must be used and connected to the vehicle electrical system and chassis wiring harness. When operated, there must be no power source capable of keeping the engine running.

The driver, when seated normally with safety belt fastened and steering wheel in place, must be able to isolate all electrical circuits.

14.2.2) External cut-off switch. 2 external cut-off trigger buttons must be placed one each side of the driver compartment, positioned such that they can be easily operated by safety personnel in event of an incident but are protected from inadvertent operation (people leaning over the side of the cockpit etc).

The locations are to be identified by a Red Spark on a white-edged blue triangle.

14.3 Rear View Mirrors:

14.3.1) All cars must have at least two mirrors mounted so that the driver has visibility to the rear and both sides of the car.

14.3.2) The reflective surface of each mirror must be at least 150mm wide, this being maintained over a height of at least 50mm. Additionally, each corner may have a radius no greater than 10mm.

14.3.3) No part of the reflective surface may be less than 250mm from the car centre line or more than 750mm from the rear of the cockpit entry template.

14.3.4) The scrutineers must be satisfied by a practical demonstration that the driver, when seated normally, can clearly define following vehicles.

For this purpose, the driver shall be required to identify any letter or number, 150mm high and 100mm wide, placed anywhere on boards behind the car, the positions of which are detailed below :

Height: From 400mm to 1000mm from the ground.

Width: 2000mm either side of the centre line of the car.

Position: 10m behind the rear axle line of the car.

14.4 Safety Belts:

14.4.1) Be fitted with a safety harness to be worn at all times by the driver during training practice and competition. All harnesses must be currently FIA homologated.

14.4.2) The safety harness must be of a 'six point' type, incorporating two shoulder straps, one abdominal strap and two straps between the legs, with each strap having a separate fixation point on the chassis of the vehicle. Points must be located one either side of the driver, two to the rear of the driver's seat and two between the legs. The fixation points to the rear should be positioned so that the strap from the shoulder is as near horizontal as possible. It must not be located on the floor directly behind the driver. Seat belts once involved in a serious accident must be discarded. It is not permitted to mix parts of seat belts. Only complete sets as supplied by manufacturers must be used.

14.4.3) Release mechanism: Only one release mechanism is permitted on each seat belt configuration and this must be available for the wearer to operate whilst seated in the competing position. Belts subjected to oil, acid or heat must be replaced.

14.5 Rear light:

The mandatory Formula Ford rear warning light must be used and connected to the PCM via the chassis wiring harness. The light must: face rearwards at 90° to the car centre line, be clearly visible from the rear and not be mounted more than 100mm from the car centre line.

- Is at least 350mm above the ground.
- Is no less than 340mm behind the rear wheel centre line, measured to the face of the lens and parallel to the reference plane.
- Can be switched on by the driver when seated normally in the car.

The three measurements being taken to the centre of area of the lens.

14.6 Headrests and head protection:

14.6.1) All cars must fit the mandatory head restraint system. This head surround system has been designed to comply with the following text and must be fitted to comply with the following, whilst ensuring adequate lateral and

longitudinal support of the head surround system is maintained, by either the chassis tubes or the side intrusion panel.

In any case the top surface of the head restraint system must be a minimum of 655mm measured vertically from the reference plane as per Appendix A Drawing 5.

If the head restraint is being supported by the side intrusion panel then this panel must support the head restraint along its whole length and at a minimum be within 25mm from the top surface of the head restraint measured vertically, when viewed from the side. See Appendix A drawing 6.

All cars must be equipped with three areas of padding for the driver's head which

- are so arranged that they can be removed from the car as one part;
- are located by two horizontal pegs behind the driver's head and two fixings, which are clearly indicated and easily removable without tools, at the front corners ;
- are made from a material which is approved by the FIA ;
- are covered, in all areas where the driver's head is likely to make contact, with two plies of Aramid fibre/epoxy resin composite pre-preg material in plain weave 60gsm fabric with a cured resin content of 50% (+/-5%) by weight ;
- are positioned so as to be the first point of contact for the driver's helmet in the event of an impact projecting his head towards them during an accident.

14.6.2) *The first area of padding for the driver's head must be positioned behind him and be between 75mm and 90mm thick over an area of at least 4000mm².*

14.6.3) *The two further areas of padding for the driver's head must be installed each side of him. The upper surfaces of these areas of padding must be at least as high as the survival cell over their entire length.*

Each area of padding must be between 75mm and 90mm thick over an area of at least 4000mm², at least 2500mm² of which must lie directly alongside the driver's helmet. The thickness will be measured perpendicular to the car centre line.

14.6.4) *All of the padding described above must be so installed that if movement of the driver's head, in any expected trajectory during an accident, were to compress the foam fully at any point, his helmet would not make contact with any structural part of the car.*

Furthermore, for the benefit of rescue crews the method of removal must also be clearly indicated.

14.7 Seat fixing and removal:

14.7.1) In order that an injured driver may be removed from the car in his seat following an accident, all cars must be fitted with a seat which, if it is secured, must be done so with no more than two bolts. If bolts are used they must :

- be clearly indicated and easily accessible to rescue crews ;
- be fitted vertically ;
- be removable with the same tool for all teams and which is issued to all rescue crews.

14.7.2) The seat must be equipped with receptacles which permit the fitting of belts to secure the driver and one which will permit the fitting of a neck support.

14.7.3) The seat must be removable without the need to cut or remove any of the seat belts.

14.7.4) Details of the tool referred to above, the belt receptacles and the neck support are available from the FIA.

14.8 Head and neck supports:

No head and neck support worn by the driver may be less than 25mm from any structural part of the car when he is seated in his normal driving position.

Competitors are advised that the use of Head and Neck Restraint System (HANS) devices are permitted under these regulations. Any HANS device used must comply with the FIA code.

ARTICLE 15: SAFETY STRUCTURES

15.1 Chassis General:

These regulations are based on the FIA Appendix J Article 277.

15.1.1) The model year of the chassis must be clearly and indelibly stamped into a structural member of the main chassis, (or on a steel plate attached by welding on at least 3 sides to the chassis), in an area visible to scrutineers without bodywork or other component removal. All chassis's for a particular model year will be stamped in the same position.

15.1.2) The longitudinal centre line of the chassis must correspond with the longitudinal centre line of the wheel axis'.

15.1.3) The chassis must be of tubular steel construction with no load bearing panels except bulkhead and undertray, curvature of the undertray must not exceed 25.4mm. The undertray/floor (Art 3) extends from the bulkhead forward of the pedals to the bulkhead between the fuel tank and the engine **as a minimum, and to the rear wheel centre line as a maximum.** Monocoque chassis construction is prohibited. Load bearing panels are defined as, sheet material affixed to the frame by welding or bonding or by rivets or by bolts or screws that have centres closer than 152mm. The maximum length of weld attaching the panels to the chassis shall be 25.4mm. The gap between the ends of the each weld shall be a minimum of 152 mm. Bodywork must not be used as stress bearing panels. The use of stabilised materials, composite materials using carbon and/or Kevlar reinforcement is prohibited (unless specifically permitted in these regulations). In the case of a vehicle with the fuel tank placed immediately behind the driver, a Bulkhead (a non-flammable, solid closing panel, attached to the main frame of the chassis with its fixation points less than 152mm apart around the full extremity of the panel), must be placed between the engine and the fuel tank. In addition another closing panel must be fitted between the fuel tank and the driver to prevent any fuel spillage, however caused, from reaching the driver whilst seated in the car. Gaps must be sealed with GRP or Intumescent Putty. Magnesium is prohibited for bulkheads.

The tolerance on the variation in flatness of the under surface of the car between the furthest forward bulkhead, and the rear bulkhead (at the position of the Roll Over protection hoop) will be 5mm.

15.2 Roll Structures:

15.2.1) The basic purpose of safety structures is to protect the driver. This purpose is the primary design consideration. The use of the rollover hoop to achieve or supplement aerodynamic effects is prohibited.

It is not permitted to carry or pass any liquids in or through any tubes comprising part of the chassis structure, or safety ROPS.

15.2.2) All cars must have two rollover structures which must be symmetrical about the lengthwise centre-line of the car.

The principal structure must be positioned behind the driver.

The second structure must be in front of the steering wheel, but no more than 250 mm forward of the top of the steering wheel rim in any position.

The two roll structures must be of sufficient height to ensure the driver's helmet and his steering wheel are at all times at least 70mm and 50mm respectively below a line drawn between their highest points.

The minimum height of this principal structure must be at least 920 mm measured along the straight-line following the driver's spine, from the seat's metal shell to the top of the rollbar.

The width must be at least 380 mm measured inside the rollbar between the two vertical pillars of the sides.

It must be measured at a height of 600 mm above the seat's metal shell on the perpendicular to the straight line following the driver's spine.

15.2.3) Rollover protection:

Both rollbar structures must pass static load tests as prescribed below.

The principal rollbar structure must be subjected to a load equivalent to 12kN laterally, 45kN longitudinally in a rearward direction and 60kN vertically.

The load must be applied to the top of the structure through a rigid flat pad which is 200mm in diameter and perpendicular to the loading axis.

During the test, the roll structure must be attached to the survival cell which is supported on its underside on a flat plate, fixed to it through its engine mounting points and wedged laterally, but not in a way as to increase the resistance of the structure being tested.

Under the load, the deformation must be less than 50 mm, measured along the loading axis, and any structural failure limited to 100mm below the top of the roll structure, measured vertically.

15.2.4) The second rollbar structure must be subjected to a vertical load of 75kN.

The load must be applied to the top of the structure through a rigid flat pad which is 100 mm in diameter and perpendicular to the loading axis.

During the test, the roll structure must be attached to the survival cell which is supported on its underside on a flat plate, fixed to it through its engine mounting points and wedged laterally, but not in a way as to increase the resistance of the structure being tested.

Under the load, the deformation must be less than 50 mm, measured along the loading axis, and any structural failure limited to 100 mm below the top of the roll structure, measured vertically.

These tests must be carried out in the presence of an FIA / ASN Technical Delegate and using measuring equipment verified by the FIA / ASN.

Furthermore, each manufacturer must supply detailed calculations which clearly show that the principal structure is capable of withstanding the same load when the longitudinal component is applied in a forward direction.

Alternatively, and only following a request from the manufacturer, the principal roll structure may be subjected to a further static load test using the same procedure as above but carried out in a forward direction.

15.2.5) The design concept of the principal and second roll structure is free.

However, the principal roll structure must have a minimum structural cross section, in vertical projection, of 10000 mm², across a horizontal plane passing 50 mm lower than its highest point.

15.3 Survival cell and Frontal protection:

In front of the space frame, **the mandatory** ~~an~~ impact-absorbing structure must be fitted.

This structure must be solidly attached to it.

This structure **has been** ~~may be one that is~~ FIA-tested ~~or which~~ **and** has passed the tests as described below.

The space frame must be capable of withstanding a frontal impact test.

For the purposes of this test, the total weight of the trolley and test structure must be 560 kg and the impact velocity at least 12 m/s.

The resistance of the test structure must be such that during the impact the average deceleration of the trolley does not exceed 25 g.

Furthermore, all structural damage must be contained within the frontal impact structure.

This test must be carried out in the presence of an FIA / ASN Technical Delegate in an approved testing centre.

To test the attachments of the frontal impact-absorbing structure to the space frame structure, a static side load test must be performed on a vertical plane passing 400 mm in front of the front wheel axis.

A constant transversal horizontal load of 30 kN must be applied to one side of the impact absorbing structure using a pad 100 mm long and 300 mm high.

The centre of area of the pad must pass through the plane mentioned above and the mid point of the height of the structure at that section.

After 30 seconds of load application, there must be no failure of the structure or of any attachment between the structure and the space frame.

If an FIA-homologated frontal impact structure (see Technical List N° to be defined by technical bulletin) is used, the integrity of the chassis will be tested with this structure.

15.4 Space frame strength:

In addition, the space frame must be subjected to three separate static lateral load tests:

1) In the cockpit area on a vertical plane passing through the centre of the seat belt lap strap fixing.

2) In the fuel tank area on a vertical plane passing through the centre of area of the fuel tank in side elevation.

3) On a vertical plane passing halfway between the front wheel axis and the top of the second rollover structure.

For the tests described above, a pad 100 mm long and 300 mm high, with a maximum radius on all edges of 3 mm and conforming to the shape of the space frame, shall be placed against the outermost sides of the space frame **tubes** with the lower edge of the pad at the lowest part of the space frame at that section.

Rubber 3 mm thick may be used between the pads and the space frame.

A constant transverse horizontal load of 20 kN must be applied in less than 3 minutes to the pads at their centre of area through a ball jointed junction, and maintained for a minimum of 30 seconds.

Under these load conditions, there must be no structural failure of the space frame and any permanent deformation must be less than 1 mm after the load has been released for 1 minute.

The deformation will be measured at the top of the pads across the inner surfaces.

In test 1, deflection across the inner tubes of the space frame must not exceed 20 mm.

During the test, the space frame must be resting on a flat plate and secured to it solidly but not in a way that could increase the strength of the area being tested.

A further vertical static load test must be carried out on the space frame from beneath the fuel tank.

A pad of 200 mm diameter must be placed in the centre of the fuel tank area and a vertical upwards load of 10 kN must be applied in less than 3 minutes through a ball jointed junction.

The load must be maintained for a minimum of 30 seconds.

Under these load conditions, there must be no structural failure of the space frame and the permanent deformation must be less than 0.5 mm after the load has been released for 1 minute, the measurement being taken at the centre of area of the pad.

Two further static load tests must be carried out on the space frame on each side of the cockpit opening.

A pad of 100 mm diameter must be placed with its upper edge at the same height as the top of the cockpit side with its centre at a point 200 mm forward of the rear edge of the cockpit opening template measured longitudinally.

A constant transverse horizontal load of 10 kN will then be applied at 90° to the car's centreline in less than 3 minutes through a ball jointed junction.

The load must be maintained for a minimum of 30 seconds.

Under these load conditions, there must be no structural failure of the space frame, there must be no more than 10 mm total deformation and the permanent deformation must be less than 1.0 mm after the load has been released for 1 minute, the measurements being taken at the centre of area of the pad.

15.5 Side protection:

In order to give additional protection to the driver in the event of a side impact, an FIA-approved panel of uniform construction and thickness (see FIA Technical list in article 277 of the FIA Appendix J Book ~~or contact Ford~~) must be attached to the space frame.

This panel must extend from the front roll structure up to the rearmost edge of the fuel cell.

The panel must also cover the space frame from the bottom / floor chassis rail to the cockpit opening chassis rail.

15.6 Rear protection:

The mandatory ~~An~~ impact-absorbing structure must be fitted behind the gearbox symmetrically about the car's longitudinal centreline with its rearmost point between 550 mm and 620 mm behind the rear wheel centreline.

The mandatory impact-absorbing structure has met the following criteria and must be fitted to comply with the text below:

It must also have a minimum external cross section, in horizontal projection, of 9000 mm² at a point 50 mm forward of its rearmost point.

When calculating this area only those parts situated less than 100 mm from the car's longitudinal centreline may be considered and the cross section may not diminish forward of this point.

The structure must pass an impact test and be constructed from materials which will not be substantially affected by the temperatures it is likely to be subjected to during use.

The structure and the gearbox must be solidly fixed to the ground and a solid object, having a mass of 560 kg and travelling at a velocity of 10 m/s, will be projected into it.

The object used for this test must be flat, measure 450 mm wide by 550 mm high and may have a 10 mm radius on all edges.

Its lower edge must be at the same level as the lowest point of the space frame and must be so arranged to strike the structure vertically and at 90° to the car's centreline.

During the test, the striking object may not pivot in any axis and the crash structure may be supported in any way, provided that this does not increase the impact resistance of the parts being tested.

The resistance of the test structure must be such that during the impact :

- *the average deceleration of the object does not exceed 35 g;*
- *the maximum deceleration does not exceed 60 g for more than a cumulative 3ms, this being measured only in the direction of impact.*

Furthermore, all structural damage must be contained within the rear impact structure.

If an FIA homologated rear impact structure (see Technical List N° to be defined by technical bulletin) is used, the integrity of the car's gearbox will be tested with this structure.

ARTICLE 16: FUEL

16.1 Fuel:

Pump fuel conforming to the MSA Competitors' and Officials' Year Book under the Terminology section must be used or equivalent specification for fuel of the country authorising the competition. It is recommended that cars built for 2011 should have a fuel system fully compatible with bio-fuels which contain up to 85% ethanol.

16.2 Fuel testing:

Random fuel test samples by the scrutineer are permissible. For events that specify a single source fuel, an industry recognised fuel comparison testing machine is authorised. In this case, and on condition that the test is conducted by a qualified technician to the manufacturers instructions, then this test procedure will become the definitive test of compliance for that event.

ARTICLE 17: MISCELLANEOUS

17.1 Materials

17.1.1) Except for any Ford mandatory control parts, the use of titanium, ceramic, high strength composites and similar materials is prohibited. The use of magnesium is prohibited.

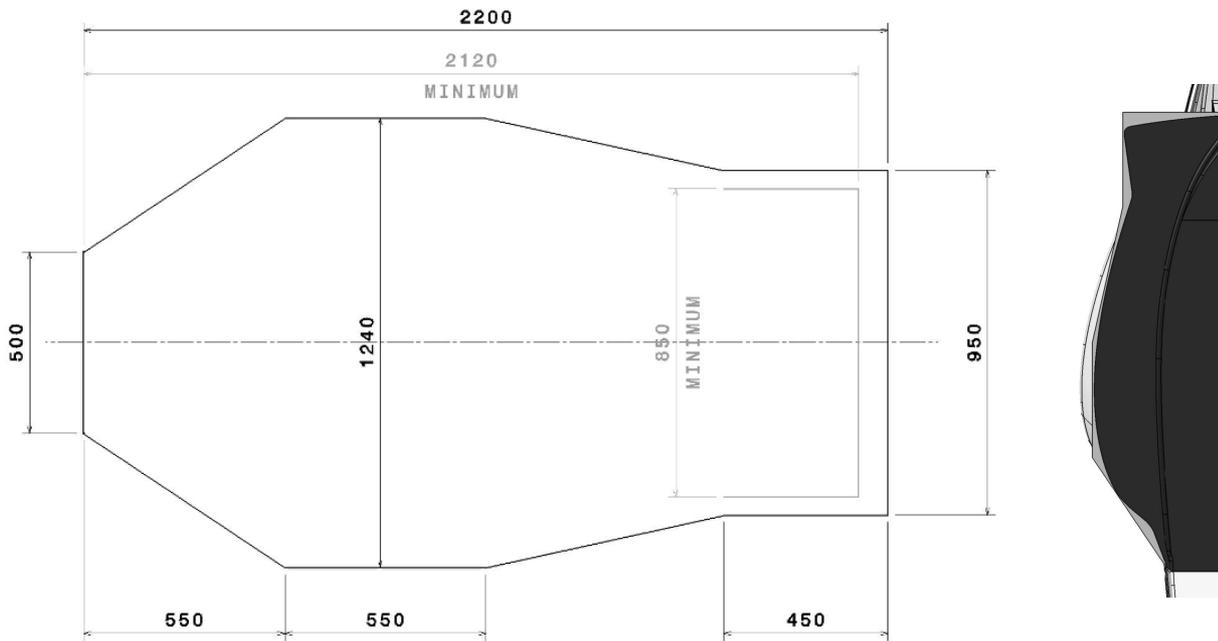
17.1.2) The use of carbon and/or Kevlar reinforcement is prohibited. (Unless expressly permitted).

17.1.3) The use of non-metallic materials for seals, bearing race cages and bearing liners i.e. rose joint bearings are permitted.

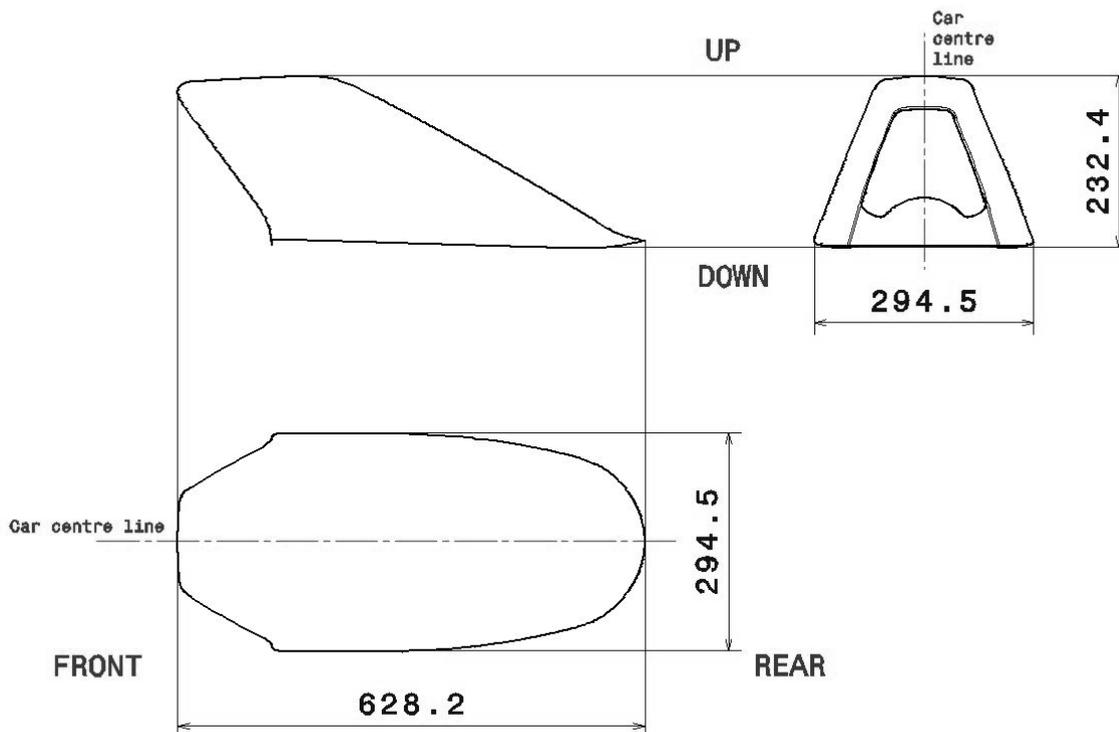
17.2 Verification:

Scrutineers are empowered to undertake any form of verification procedure necessary and may order the removal of parts from the car, incurred costs to be borne by the competitor. The right is reserved for a competitor's vehicle to be sealed for later inspection and to be removed to a Ford nominated location for examination. The competitor, or their agent, will be invited to witness this inspection and will be required to provide all the labour required to perform the vehicle or component strip. The scrutineers job is to observe and report; it is the entrant's responsibility to present any component requested by the scrutineer for inspection.

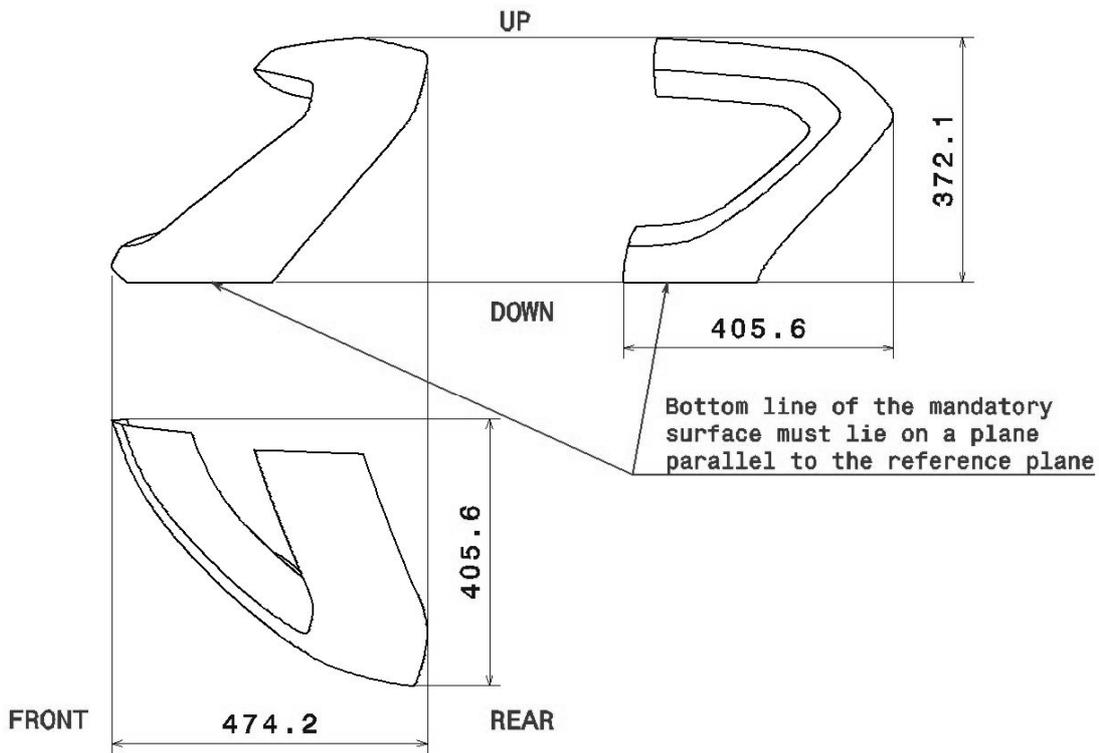
APPENDIX A DRAWING 1



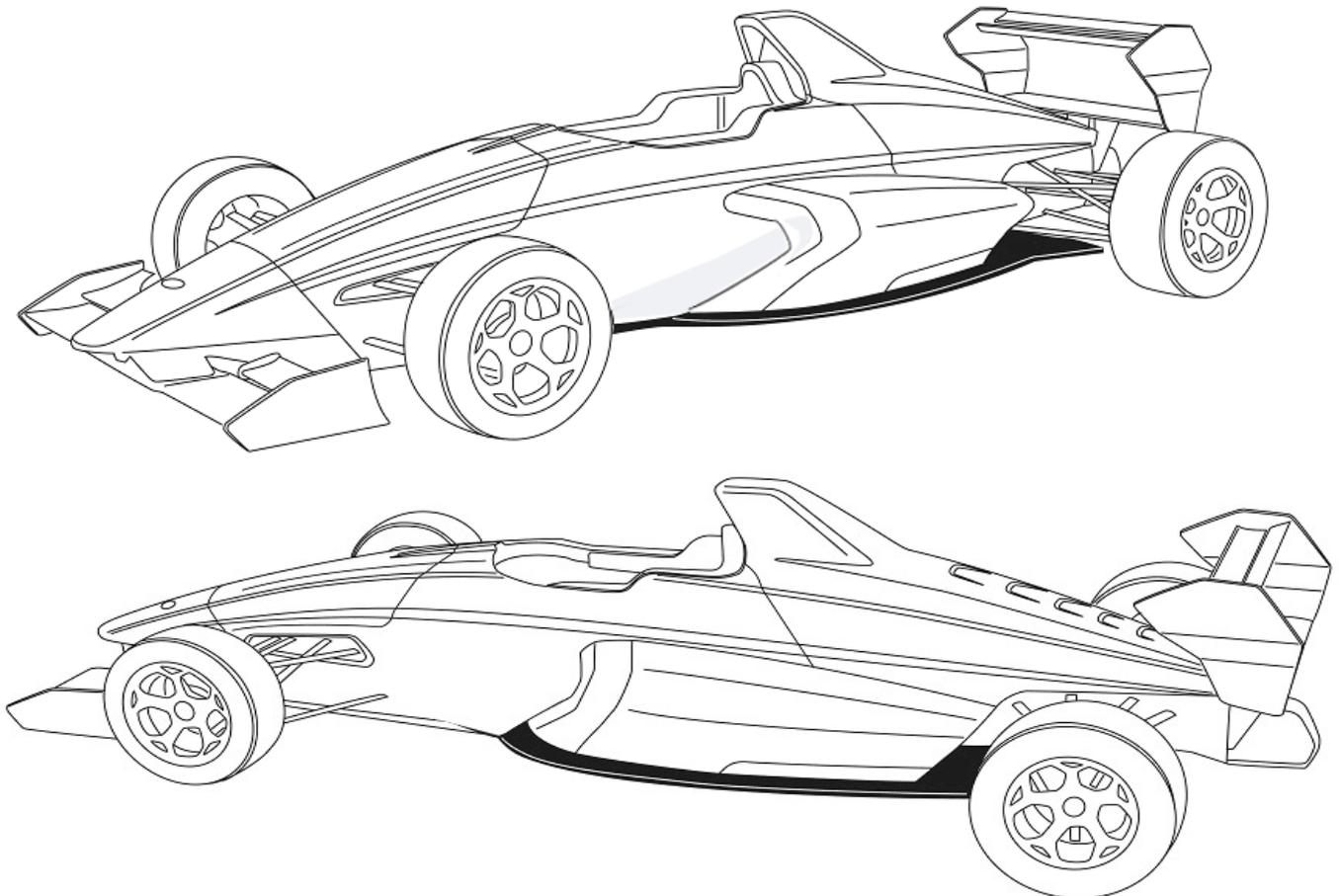
APPENDIX A DRAWING 2



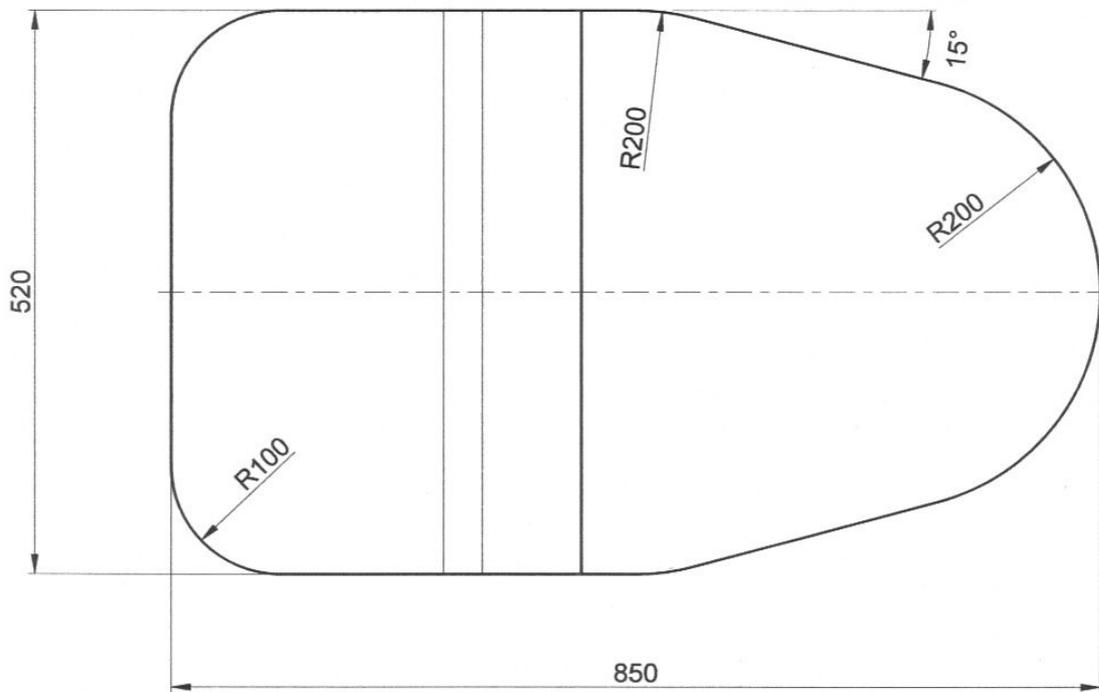
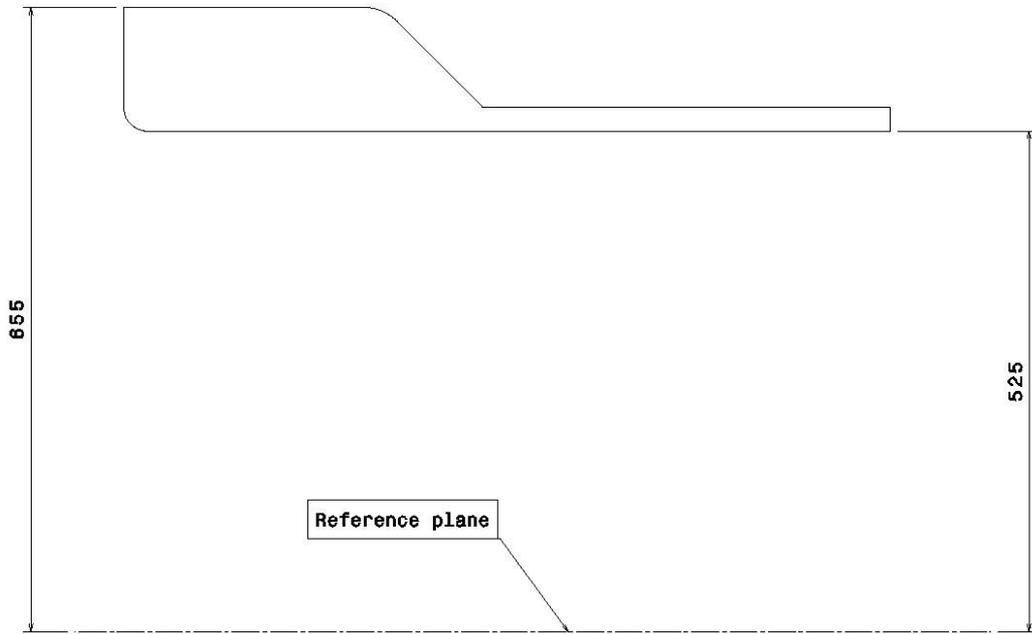
APPENDIX A DRAWING 3



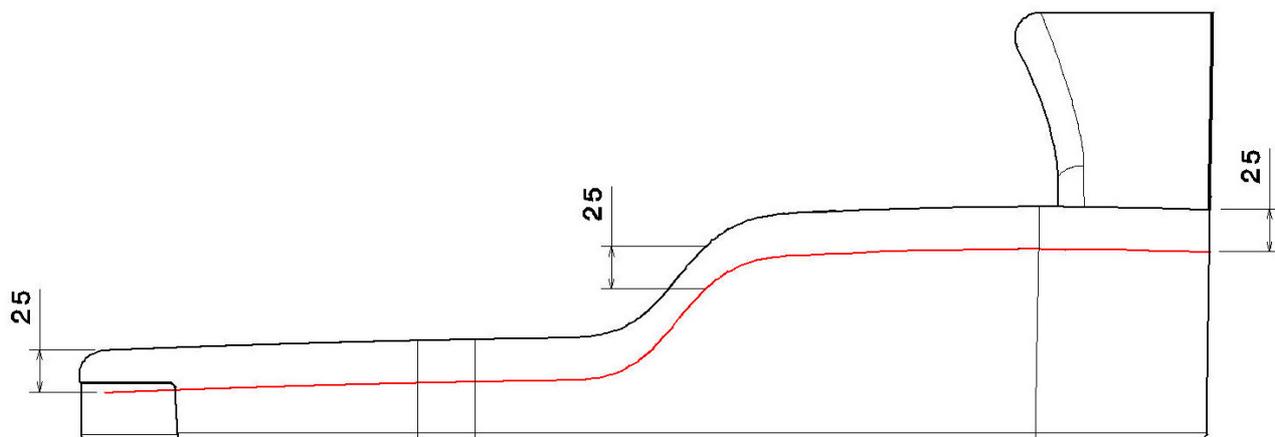
APPENDIX A DRAWING 4



APPENDIX A DRAWING 5



APPENDIX A DRAWING 6



Appendix B

TYRES

The only approved tyres for Formula Ford cars are Dunlop:

	Pattern	Size	Specification N°
Front Tyre	Slick	175/535R13	S04 662
Rear Tyre	Slick	205/570R13	S04W 226 CR900
Front Tyre	Wet	175/535R13	S04 662
Rear Tyre	Wet	205/57R13	S04W 226 CR9000

The specification number will be moulded on one sidewall of the tyre, as will a unique serial number for that tyre. No mechanical (other than rubber removal by normal wear), heat or chemical treatments are permitted to the "as sold" tyres.

Tyres Supplied by:

Dunlop Motorsport Europe

Fort Dunlop

Birmingham,

B24 9QT

England

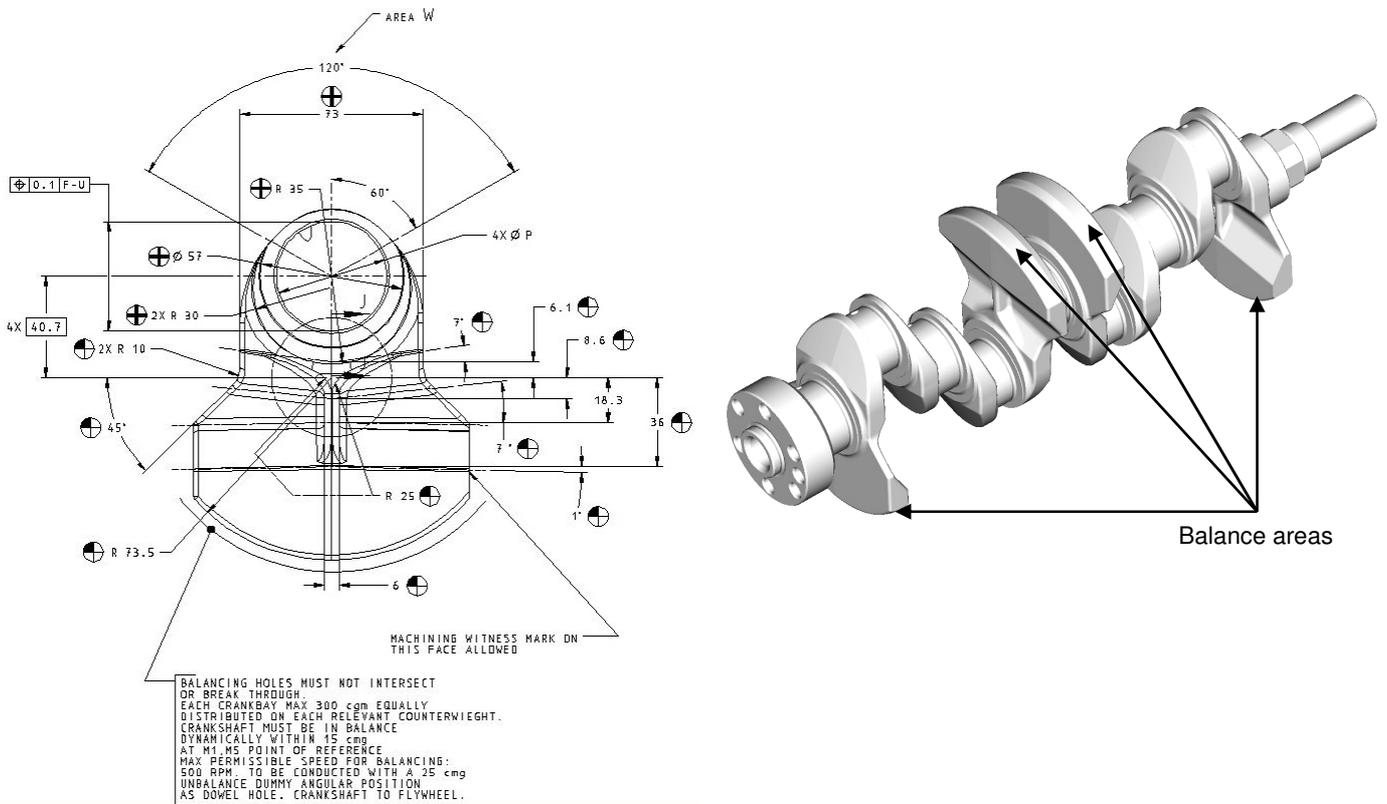
Tel: 0044 (0) 121 306 6000

Fax: 0044 (0) 121 306 7000

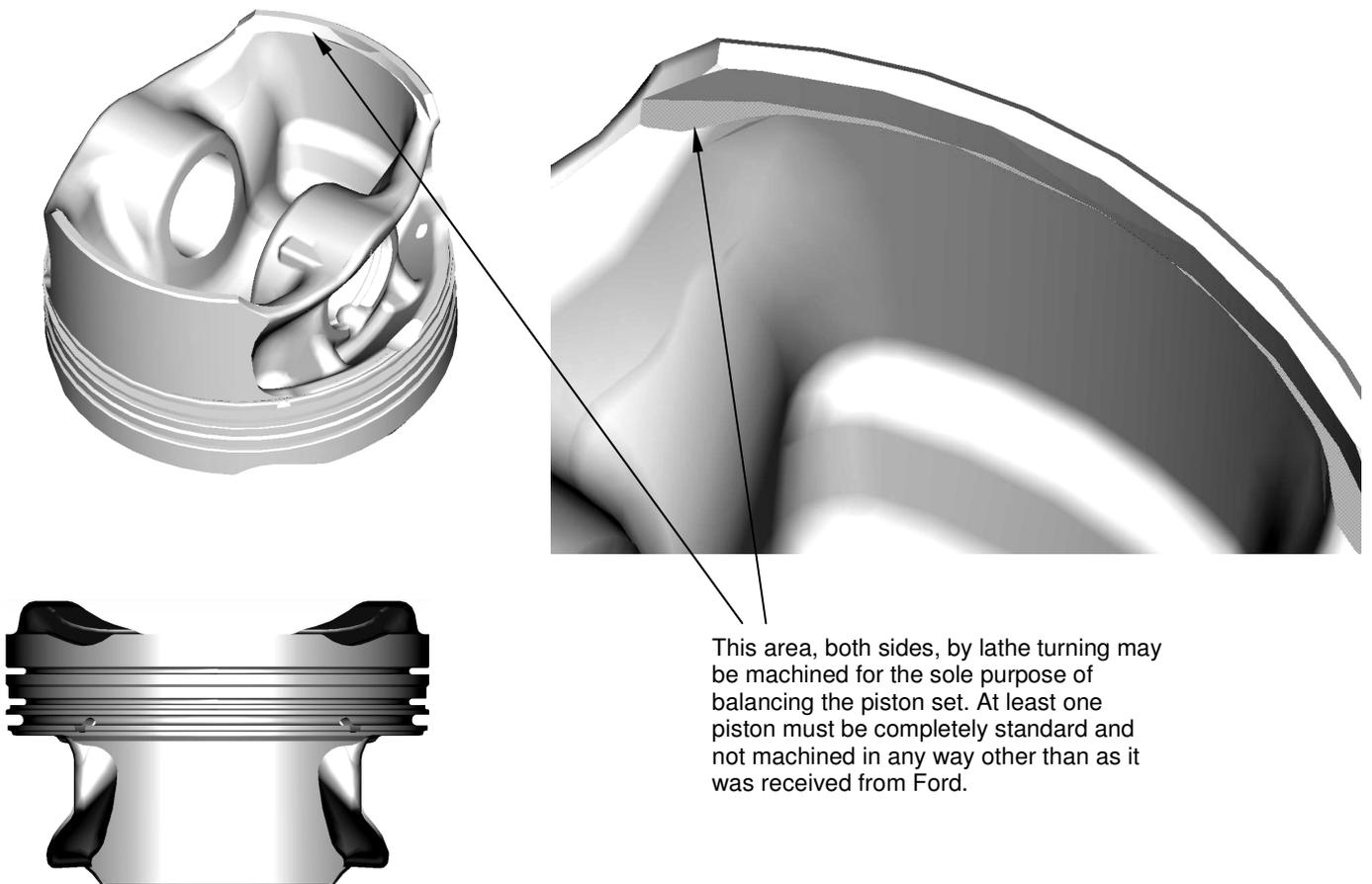
See [sporting regulations](#) for the number of tyres that can be used at any race meeting.

Appendix C

1. Crank Balance



2. Piston Balance



5. Timing Information

REPAIR AND PROTOTYPE ONLY

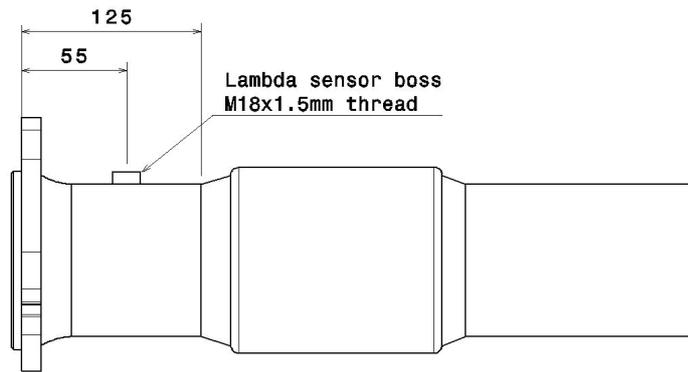
- 1 CAMSHAFTS SHOULD BE POSITIONED SUCH THAT THE SLOTS AT THE REAR ARE PARALLEL WITH THE CAM COVER SEALING FACE ON THE CYLINDER HEAD
- 2 INSERT LOCATION PLATE INTO THE SLOTS IN THE REAR OF CAMSHAFTS
- 3 FIT TIMING PIN IN THE SIDE OF THE CYLINDER BLOCK AND ROTATE THE CRANKSHAFT CLOCKWISE UNTIL IT CONTACTS THE TIMING PIN
- 4 ASSEMBLE VCT PHASER UNITS TO THE CAMSHAFTS WITH IDENT MARKS AT THE 12 O'CLOCK POSITION ALSO PAYING ATTENTION TO ASSEMBLING THE CORRECT PHASERS TO INTAKE AND EXHAUST - PHASER UNITS MUST BE FREE TO ROTATE
- 5 FIT THE PHASER LOCATOR OVER VCT PHASERS
- 6 STARTING AT THE CRANK SPROCKET ASSEMBLE THE TIMING BELT WORKING IN A CLOCKWISE DIRECTION OVER THE TENSIONER, EXHAUST & THEN INTAKE PHASOR
- 7 CHECK THAT THE PHASER IDENT MARKS ARE STILL AT THE 12 O'CLOCK POSITION
- 8 PULL THE GRENADE PIN ON THE TENSIONER TO APPLY TENSION TO THE TIMING BELT - NO OTHER SETTING IS REQUIRED FOR THE TENSIONER AS IT IS AUTOMATIC
- 9 WHILE PREVENTING THE CAMSHAFTS FROM MOVING BY LOCATING A SUITABLE TOOL ON THE CAST HEXAGON RUN DOWN PHASER BOLTS IN 2 STEPS
 - 10 1. TO SNUG TORQUE 25NM ± 3NM
 - 11 2. TURN ON 75° ± 5°
- 12 REMOVE PHASER LOCATOR
- 13 FIT CRANK DAMPER PULLEY AND RETAINING BOLT
- 14 PREVENT CRANKSHAFT FROM ROTATING BY LOCKING THE FLYWHEEL IN POSITION
- 15 RUN DOWN THE CRANK DAMPER RETAINING BOLT IN 2 STEPS AS SPECIFIED
- 16 REMOVE FLYWHEEL LOCKING TOOL
- 17 REMOVE TIMING PIN FROM SIDE OF CYLINDER BLOCK
- 18 FIT PLUG AND WASHER ASSY W700115 TO 20NM ± 2NM INTO TIMING PIN BORE

6. Tappet Grading

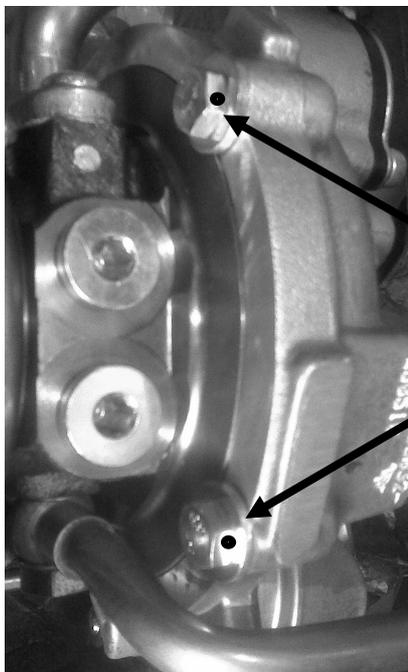
TAPPET GRADING TABLE			
GRADE (MM)	POLISHED		
2.7	BM5G	6500	DAAA
2.725	BM5G	6500	DABA
2.75	BM5G	6500	DACA
2.775	BM5G	6500	DADA
2.8	BM5G	6500	DAEA
2.825	BM5G	6500	DAFA
2.85	BM5G	6500	DAGA
2.875	BM5G	6500	DAHA
2.9	BM5G	6500	DAJA
2.925	BM5G	6500	DAKA
2.95	BM5G	6500	DALA
2.975	BM5G	6500	DAMA
3	BM5G	6500	DANA
3.025	BM5G	6500	DAPA
3.05	BM5G	6500	DAQA
3.075	BM5G	6500	DARA
3.1	BM5G	6500	DASA
3.125	BM5G	6500	DATA
3.15	BM5G	6500	DAUA
3.175	BM5G	6500	DAVA
3.2	BM5G	6500	DAWA
3.225	BM5G	6500	DAYA
3.25	BM5G	6500	DAZA
3.275	BM5G	6500	DBAA
3.3	BM5G	6500	DBBA
3.325	BM5G	6500	DBCA
3.35	BM5G	6500	DBDA
3.375	BM5G	6500	DBEA
3.4	BM5G	6500	DBFA
3.425	BM5G	6500	DBGA
3.45	BM5G	6500	DBHA
3.475	BM5G	6500	DBJA
3.5	BM5G	6500	DBKA
3.525	BM5G	6500	DBLA
3.55	BM5G	6500	DBMA
3.575	BM5G	6500	DBNA

7. Exhaust System Layout

General Dimension Tolerance ±10 mm



8. Turbocharger Sealing



To enable seals to be fitted please can you drill holes in the bolts highlighted to allow sealing wire to be passed through. The holes need to be minimum 1/16 or 1.5mm Diameter.

Bolts to be drilled

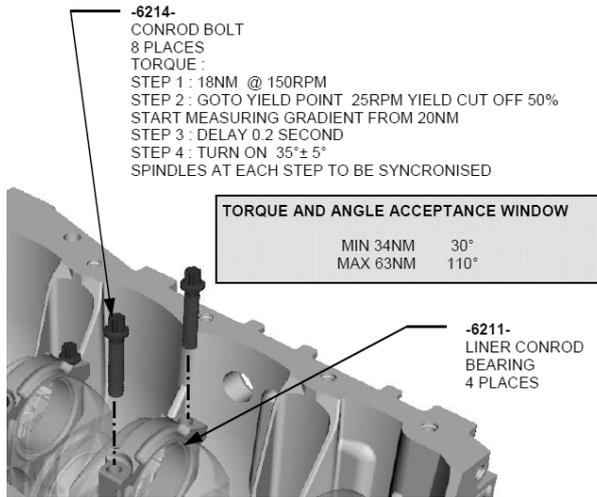
9. Chassis Connector Pin-Out

Pin numbers refer to engine loom side

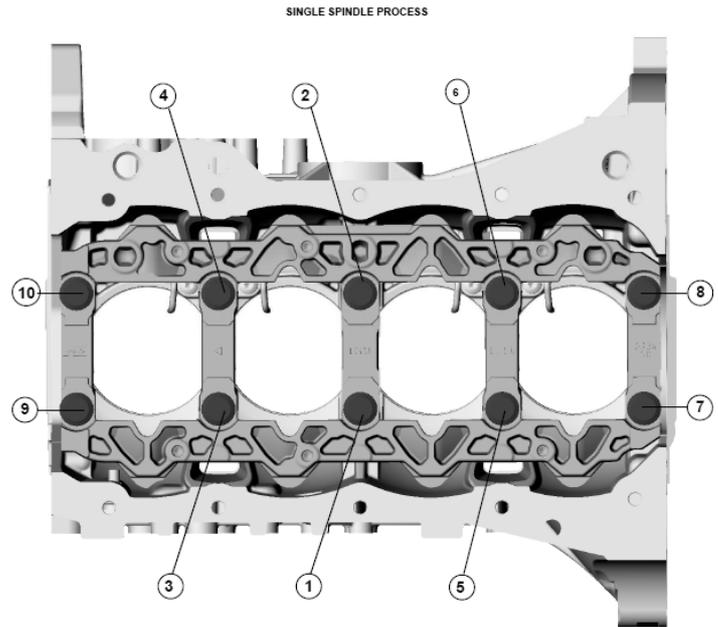
	DESCRIPTION	AUXILLIARY ANALOG INPUTS	
	LABEL	SPARE / INPUTS	
	PART NUMBER	DTM06-65	
	TERMINAL	DTM SKTS	
	BOOT	HTAT	
	NOTES:		
1	22 RED	30/ 19	SPARE +12V
2	22 RED YEL	1/ 64	SPARE +5V
3	22 BLK	1/ SP1	SPARE ANA GND
4	22 WHT	1/ 39	SPARE ANA #1 (configured for steering angle <i>swa</i>)
5	22 WHT	1/ 10	SPARE ANA #2 (configured for Front Brake Pressure <i>bpf</i>)
6	22 WHT	1/ 37	SPARE ANA #3 (configured for Rear Brake Pressure <i>bpr</i>)

Note: Pin numbering is looking into connector

10. Con rod bolt tightening information

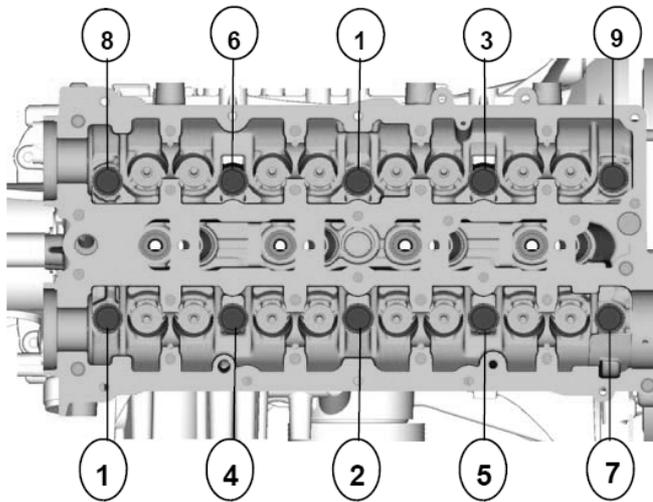


11. Ladder frame tightening information

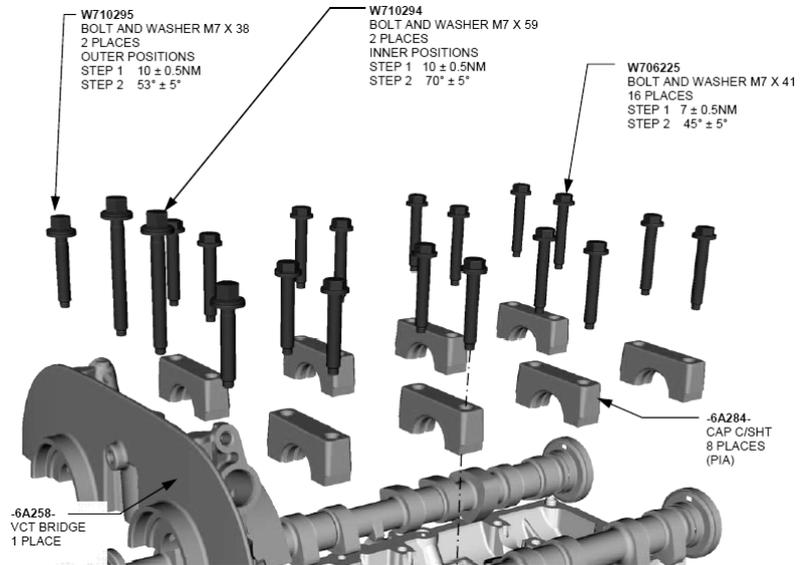


SINGLE SPINDLE / REPAIR PROCEDURE
STEP 1: ALL BOLTS TO SNUG 30 ± 1NM IN ORDER 1 TO 10
STEP 2: REPEAT TO 50NM ± 1NM
STEP 3: TIGHTENING ANGLE 45°±5°
STEP 4: TURN ON A FURTHER 45°±5°

12. Cylinder Head bolt tightening sequence



13. Cam cap installation



Appendix D

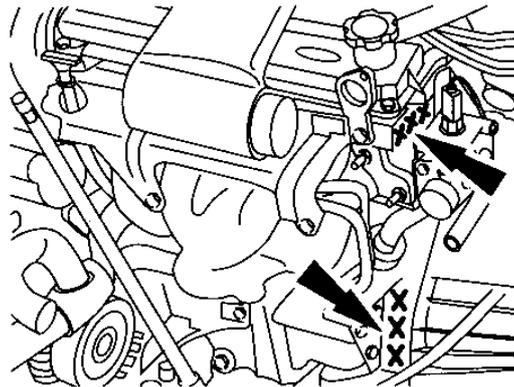
GENERAL ENGINE INFORMATION

This appendix is for **information only** and does not form part of the regulations. However, it is available to the scrutineer as guidance to normal dealer rework procedures.

General Engine Details (from standard production Focus, C-Max, Mondeo variants)

Engine – General	1.6 litre EcoBoost
Emission standard	Stage V
Identification code	JTDA / JTDB
Firing order	1-3-4-2
Bore	79.0mm
Stroke	81.4mm
Cubic capacity effective	1596cc
Compression ratio	11.0:1
Spark Plug	Production BM5G-12405-CA, CYFS12YRC Gap 0.80mm
Valve Clearance	Inlet 0.30mm, Exhaust 0.40mm
Max. engine speed	continuous 6150 rev/min intermittent 6375 rev/min
Power output (DIN)	132 kw 180(PS) at 5700 rev/min
Torque (DIN)	240Nm at 1600-5000rpm

Note: 1600cc EcoBoost engines have also been and are used in other Ford models. It is the responsibility of the competitor to ensure that their engine meets all of the regulations and parts numbers as described in these regulations.



TDB 44

Engine code/serial number, on inlet manifold side and rear of cylinder head near coil housing.

Crankshaft

Main bearing clearances	0.011 - 0.058mm
End float	0.090 - 0.260mm

Camshaft

Number of camshaft bearings	5
Drive	by means of toothed belt
Camshaft end float	0.080 - 0.220mm
Bearing clearances	0.020 - 0.070mm

Coolant

Type	Motorcraft Super Plus anti-freeze
Specification	WSS-M97B44-D

Engine Lubrication

Oil Type	FORD SAE 5W-30
Viscosity	from -20°C to +30°C SAE 10W-30 from -15°C to over +40°C SAE 15W-40 from -10°C to over +40°C SAE 20W-50

TIGHTENING TORQUES AND ENGINE BUILD INFORMATION

Item / Action	Torque Nm	Hardware No. & Qty	Notes
Crankshaft Dowel	na	W702247 1 place	Max allowed dowel protrusion from crankshaft face 5.5-6.5 mm
Oil gallery bung	29 ±2	W715533	
Connecting rod bolt	Step 1. Snug torque (18) Step 2. Tighten to yield Step 3. Turn on 35°±5° angle	xx-6214- 8-off	See Appendix C Drawing 10 for more details
Ladder frame bolt	Step 1. 30±1 Step 2. 50±1 Step 2. Tighten 45°±5° angle	xx-6345-xx 10-off	See Appendix C Drawing 11 for more details
Oil pump bolt	10±1.5	W500305 (M6x55) 2-off W500215 (M6x25) 3-off W500301 (M6x35) 3-off	
Rear oil seal carrier	9.5±1.5	W500213 6-off	
Oil filter adaptor	55±2.5	xx-6L626-	
Oil filter	14.5±2.5		
Sump	19.5±3.5	W500225 (M8x30) 13-off	
Flywheel	Step 1. 15 Step 2. 25 Step 3. 30 Step 4. 90°	4S7Q-6379 6-off	Do not re-use bolts
Cyl head dowel	na	W701182 2 places	
Cyl head bolt	Step 1. 5 Step 2. 15±2 Step 3. 35±3 Step 4. 90°± 5° angle	98MM-6065-A2B 10-off	See Appendix C Drawing 12 for tightening sequence
Water pump bolt	10±1	W713043 6-off	Do not reuse gasket
Cam caps – front only, outer	Step 1. 10±0.5 Step 2. 53°± 5° angle	W710295 (M7x38) 2-off	See Appendix C Drawing 13 for more details
Cam caps – front only, inner	Step 1. 10±0.5 Step 2. 70°± 1° angle	W710294 (M7x59) 2-off	See Appendix C Drawing 13 for more details
Cam caps – remainder	Step 1. 7±0.5 Step 2. 45°± 5° angle	W706225 (M7x41) 16-off	See Appendix C Drawing 13 for more details and tightening sequence
Cam belt tensioner	25±2	BM5G-6K254- 1-off	
Cam sprocket	Refer to timing procedure sheet	xx-6M282-xx 2-off	See Appendix C Section 5
Timing belt cover	9.5±1.5 9.5±1.5	W500303 6-off W711261 1-off	
Front Pulley	Step 1. 100±4 Step 2. 90°± 4° angle Step 3. 15°± 2° angle	xx-6K340-xx	Do not reuse front pulley bolt
Cam cover	Step 1. 5±1 Step 2. 9±1 Step 3. 10±1	13-off	
Timing belt cover	9.5±1.5 9.5±1.5	W500303 (M6x45) 1-off W500215 (M6x25) 6-off	
Water pump pulley	24±3	W702426 (M8x13 slf lk) 4-off	
Crankcase vent blanking plate	9.5±1.5	M6 X 25 8-off	
Inlet manifold	17±1 9.5±1.5	W500319 (M8x80) 2-off W500102 (M6x40) 4-off	
Fuel rail	22.5±3.5	W500117 4-off	
Exhaust manifold studs	10±3	W715309 9-off	
Cam position sensor	9±1.5	W702251	
Spark plug	15±2	xx-12405-xx 4-off	
Water outlet	19±3.5	W500225 3-off W500315 (M8x60) 1-off	
ECT sensor	18±2	xx-12A648-xx	Do not re-use
Throttle body	11.5±1	W708972 (M6x55)	
Clutch cover	29±4	W702426 6-off	

Cylinder Clearance Limits Specification

Bore cleaning and honing is permissible during engine rebuild.

Maximum permissible bore size is 79.1mm giving maximum swept volume of 400cm³ per cylinder.

Note to Scrutineers

For all components that have a minimum weight specified:

The minimum weights quoted are to ensure that only the correct level Ford parts are used. It is possible that over time re-specification of Ford components for production or the repair market will introduce changes that would have no detrimental affect for the repair trade, yet would put the component outside the Formula Ford intent. Components that weigh in excess of the minimum are expected to remain as delivered, with only minor re-balancing allowed.

It is not permissible to reduce the weight of a component close to the minimum and then re-balance.

Note to competitor / engine builder

Any underweight / undersized standard Ford production part obtained from the dealer network should be notified to the Formula Ford Technical scrutineer for checking and possible correction to the technical regulations. This is to be done BEFORE fitting to the race car.

FORMULA FORD PARTS LISTING

Parts with a Finis number starting with 909xxxx are available from Formula Ford International (SkyFord Hemel Hempstead)

44(0)1442 220344 or ~~07887984066~~ att; ~~Paul Revel~~ **Sam Dimmock**

The remaining parts can also be obtained by Formula Ford International or by any Ford Dealer

1600cc EcoBoost – Unique (Mandatory) Formula Ford Parts

Description	QTY	Part Number	Finis Code
Engine	1	MS12FF-6007-AA	9098001
Intercooler	1	8V61-9L440-CD	9098476
Turbo inlet duct	1	BV61-9C623-DC	9098878
Air filter	1	MS06FF-9601-AA	9099010
Starter motor – EcoBoost/Duratec	1	AV6N-11000-CA / 8V21-11000-BE	9098834 / 9098686
Flywheel	1	MS11FF-6375-AA	9099510
Clutch cover	1	MS11FF-7563-AA	9099515
Clutch plate	1	MS12FF-7550-AA	9099517
Sump kit	1		
<i>Sump pan</i>	1	MS12FF-6675-AA	9098181
<i>Oil pump</i>	1	MS12FF-6600-AA	9098182
<i>Oil pump body</i>	1	MS12FF-6603-AA	9098093
<i>Pulley gear</i>	1	MS12FF-6306-AA	9098183
Cat	1	MS06FF-5E211-AA	9099150
ECU	1	MS12FF-12A650-AA	9098070
Loom engine	1	MS12FF-14K011-AA	9098073
Loom chassis	1	MS12FF-1440-AA	9098074
GPS box	1	MS12FF-10E898-AA	9098078
FEAD belt	1	1C1Q-6D314-AB	9099133
FEAD idler pulley	1	4R8Q-19A216-AA	9099134
FEAD idler pulley bracket	1	MS06FF-8510-AA	9099135
Cover plate breather	1	MS06FF-6A785-AA	9099310
Turbo inlet restrictor	1	MS12FF-9C623-AA	9098611
Turbo exit exhaust flange	1	MS12FF-9C624-AA	9098612
Air charge temp sensor	1	MS12FF-67020-AA	9098094
Engine oil temp sensor	1	MS06FF-6C624-AA	9099093
Fuel pressure sensor	1	8W83-9F972-AA	9098875
Oil pressure sensor	1	8W83-9F972-AA	9098875
Dashboard	1	MS12FF-10849-AA	9098401
Throttle pedal position sensor	1	MS12FF-9F836-AA	9098402
Speed Sensor (one mandatory, 2 nd optional)	1 (2)	MS12FF-2B372-AA	9098403
Beacon receiver	1	MS12-19C175-AA	9098404
Rain light	1	MS12FF-13A602-AA	9098405
Gear position sensor	1	MS12FF-7A247-AA	9098406
Gear shift load cell	1	MS12FF-7F293-AA	9098407
Lambda sensor	1	MS12FF-9D375-AA	9098301
Battery master switch	1	MS12FF-11572-AA	9098210
Switch kit inc.	1	MS12FF-1A111-AA	9098201
<i>Starter button</i>	1	MS12FF-11572-AA	9098211
<i>Enable switch</i>	1	MS12FF-1C112-AA	9098212
<i>Rain light switch</i>	1	MS12FF-11654-AA	9098213
<i>Circuit breaker</i>	1	MS12FF-14A094-AA	9098214
<i>Fuel pump relay</i>	1	MS12FF-14N089-AA	9098215
Head rest	1	MS12FF-A611A08-AA	9098209
Front crash box	1	MS13FF-17K876-BH	9098500
Rear crash box	1	MS12FF-A17906-AA	9098230
Front wing main element	1	MS13-17F886-AA	9098110

Front wing flap left	1	MS13-17626-AB	9098112
Front wing flap right	1	MS13-17627-AB	9098113
Front wing flap mount LH	1	MS13-17626-BB	9098116
Front wing flap mount RH	1	MS13-17627-AB	9098117
Front flap plate	2	MS13-17628-AA	9098120
Front wing end plate left	1	MS13-10174-AA	9098115
Front wing end plate right	1	MS13-10175-AA	9098116
Rear wing upper element	1	MS13-17F884-AA	9098210
Rear wing lower element	1	MS13-17A894-AB	9098211
Rear wing mount	2	MS13-14536-DA	9098220
Rear wing end plate left	1	MS13-17A894-BB	9098222
Rear wing end plate right	1	MS13-17A895-BB	9098223

All items below come complete with 9098001 engine

Description	QTY	Part Number	Finis Code
Inlet camshaft	1	BM5G-6A270-AC	1692790
Exhaust camshaft	1	BM5G-6A272-AC	1699565
Exhaust valve	8	BM5G-6505-AB	1715442
Inlet valve	8	BM5-6507-AD	1715441
Valve spring	16	4M5G-6513-CA	1221323
Valve spring retainer	16	BM5G-6A536-AB	1685836
Valve collets	32	BM5G-6518-AB	1685837
Valve stem seal	16	BM5G-6571-BA	1685838
Cylinder head water elbow	1	96MM-7610-CA	1351481
V.V.T Exhaust solenoid	1	4M5G-6L713-BE	1366329
V.V.T Inlet solenoid	1	4M5G-6L713-AE	1366327
Inlet manifold	1	BM5G-9424-DC	1685947
Exhaust manifold	1	BM5G-9431-AD	1738996
Exhaust manifold heat shield	1	BM5G-9N454-AB	1685611
Timing belt	1	BM5G-6K288-AA	1675963
Timing belt cover	1	BM5G-6P073-EB	1732369
Timing belt tensioner	1	BM5G-6K254-AE	1685747
Exhaust camshaft pulley	1	BM5G-6C524-YB	1685731
Inlet camshaft pulley	1	4M5G-6C524-CG	1700007
Camshaft pulley bolt	2	4M5G-6M282-YB	1331012
Camshaft pulley plug	2	W710954-S430	1345739
Crankshaft pulley	1	BM5G-6B319-CA	1723130
Crank gear (inc washers)	1	BM5G-6306-AB	1706168
Crankshaft pulley	1	BM5G-6B319-CA	1723130
Crankshaft pulley bolt	1	BM5G-6K340-AB	1677517
Oil filter	1	BM5G-6714-AA	1714387
Oil filler cap	1	YS4G-6766-CA	1674715
Turbo-exhaust manifold gasket	1	BM5G-9L461-AC	1692764
Oil pressure switch / sensor	1	3M51-9278-AB	1363512
Crankshaft position sensor	1	BM51-96C315-BA	1690470
Fuel Pressure Sensor	1	8W83-9F972-AA	4995875
VVT cam sensor	2	BM51-12K073-AA	1685719
Knock sensor	1	98MF-12A699-BA	1141998
Map sensor	1	AG91-9F479-AA	1682141
Engine coolant temperature sensor	1	7M51-12A648-BA	1702985
Fuel Pump	1	BM5G-9D376-BA	1690911
Fuel pump mounting bracket	1	BM5G-9346-CC	1712236
Fuel pump tappet	1	8W-6C287-AA	4974953
Fuel rail including injectors	1	BM5G-9H487-CA	1685608

Fuel pipe	1	BM5G-9A421-BB	1696432
Fuel pump bolt	2	BM5G-9C193-AA	1702005
Fuel rail pipe	1	BM5G-9D354-DB	1692732
Fuel injector wiring loom	1	BM5G-9F666-AB	1701835
Water pump pulley	1	BM5G-9F666-AB	5070484
Water pump	1	7S7G-8591-A2B	1688697
Spark plug	4	BM5G-12405-CA	1685720
Ignition coil	4	BM5G-12A366-CA	1700610
Ignition coil mounting bracket	1	BM5G-12257-EA	1699527
Turbo	1	BM5G-6K682-DC	1711333
Turbo oil return pipe	1	BM5G-6K677-CB	1745892
Turbo oil feed pipe	1	BM5G-6K679-DA	1713359
Turbo pipe	1	BM5G-9G738-EB	1738460
Throttle body	1	7S7G-9F991-BA	1486105
Head gasket	1	BM5G-6051-AC	1685734
Front crank oil seal	1	6M5G-6700-BA	1473807
Water pump gasket	1	7S7G-8507-AB	1472865
Camshaft oil seal	2	4M5G-6K292-CB	1319178
Rear main oil seal	1	BM5G-6K301-AA	1680874
Inlet manifold gasket	1	BM5G-9441-BA	1685610
T-Body gasket	1	2S6G-9P848-AA	1141994
Fuel injector seal kit	4	BM5G-9U509-AA	1731549
Exhaust manifold gasket	1	BM5G-9448-AE	1721157
Turbo return pipe gasket	1	4R8Q-6N652-AA	1331076
Thermostat seal	1	4M5G-9K462-AA	1707046
Thermostat housing seal	1	96MM-9K462-AD	1557898
Fuel pump seal	1	2S7G-9E583-AA	1226258

1600cc EcoBoost – Unique (Optional) Formula Ford Parts

Description	QTY	Part Number	Finis Code
Aux sensor loom	1	MS12FF-12A522-AA	9098701
Brake pressure sensor	2	MS12FF-2L410-AA	9098702
Steering wheel angle sensor	1	MS12FF-6475-AA	9098703
Bat to isolator cable	1	MS12FF-14A280-AA	9098704
Bat to starter cable	1	MS12FF-10C679-AA	9098705
Jump battery cable	1	MS12FF-2A012-AA	9098706
Starter to alternator cable	1	MS12FF-2A013-AA	9098707
Engine gnd cable	1	MS12FF-14324-AA	9098708

All standard Ford parts with the prefix (909) are available from SkyFord.