The Ultimate Motor Cycle Stand

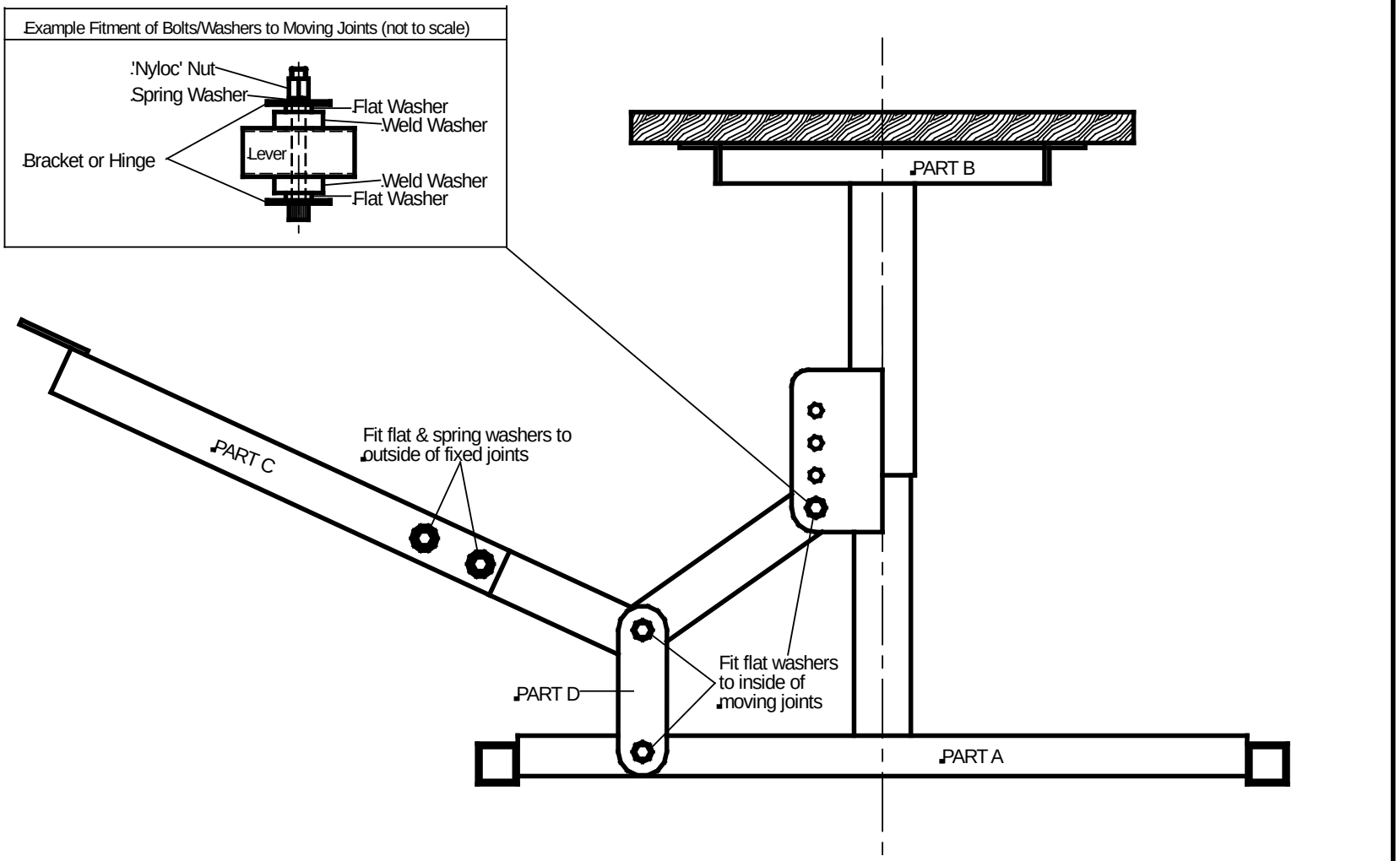
2009

A class booklet outlining the manufacture of the Singleton High School design adaptation of "The O'Neal Motor Cycle Stand"

The Original "O'Neal Motor Cycle Stand"

SINGLETON ADAPTATION OF THE ULTIMATE MOTOR CYCLE STAND - PARTS LIST				
PART	DESCRIPTION	MATERIAL	LENGTH (mm)	QTY
A	BASE ASSEMBLY	ASSEMBLY UNIT	MCS001	1
A1	MAJOR RAIL	50 x 25 RHS MILD STEEL	356	1
A2	SUPPORT LEG	25 x 25 RHS MILD STEEL	300	2
A3	SHAFT INNER	35 SHS MILD STEEL	221	1
JIG	WELDING JIG	ASSEMBLY UNIT	WJMCS002	1
B	UPPER ASSEMBLY	ASSEMBLY UNIT	MCS002	1
B1	SHAFT UPPER	40 SHS MILD STEEL	205	1
B2	SUPPORT RAIL (lg)	25 x 25 RAS MILD STEEL	200	2
B3	SUPPORT RAIL (sh)	25 x 25 RAS MILD STEEL	170	2
B4	TOP	210 x 19 RADIATA PINE	310	1
B5	WELD BRACKET (MCS003)	100 x 2 FLAT MILD STEEL BAR	56	2
JIG	WELDING JIG	ASSEMBLY UNIT	WJMCS001	1
C	LEVER ASSEMBLY	ASSEMBLY UNIT	MCS004	1
C1	LEVER UPPER	30 SHS MILD STEEL TUBE	298	1
C2	LEVER LOWER	30 SHS MILD STEEL TUBE	100	1
C3	LEVER EXTENSION	30 SHS MILD STEEL TUBE	160	1
C4	SOLID JOINER (MCS003)	25 SQ MILD STEEL BAR	169	1
C5	LEVER PLATE	45 x 2 FLAT MILD STEEL BAR	110	1
C6	WELD WASHER	30 dia MILD STEEL ROUND BAR	**4**	2
C7	WELD WASHER	30 dia MILD STEEL ROUND BAR	**10**	2
D	HINGE (MCS003)	30 x 2 FLAT MILD STEEL BAR	105	2
E	8mm SET BOLT	High Tensile Steel Internal Hex	70	2
F	8mm SET BOLT	High Tensile Steel Internal Hex	60	3
G	FLAT WASHER	8mm ID Mild Steel	1	10
H	SPLIT WASHER	8mm ID SPRING STEEL	Std	5
I	8mm NUT	Mild Steel with Nyloc Insert	Std	5
J	1/8" Wood Screw	Mild Steel	12	10

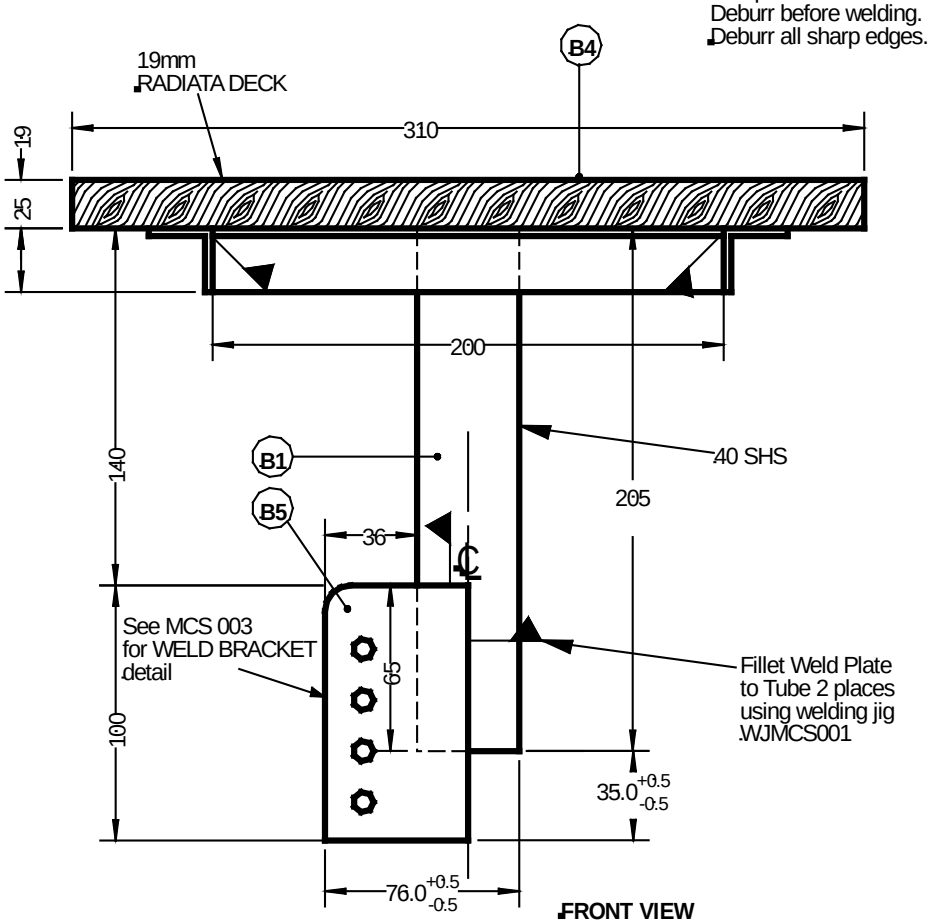
SINGLEON ADAPATION OF THE ULTIMATE MOTOR CYCLE STAND	DRAWING 5 OF 5	ISSUE A	12/12/08
FINAL ASSEMBLY MOTOR CYCLE STAND	DRAWING 1 OF 1	ISSUE A	12/12/08



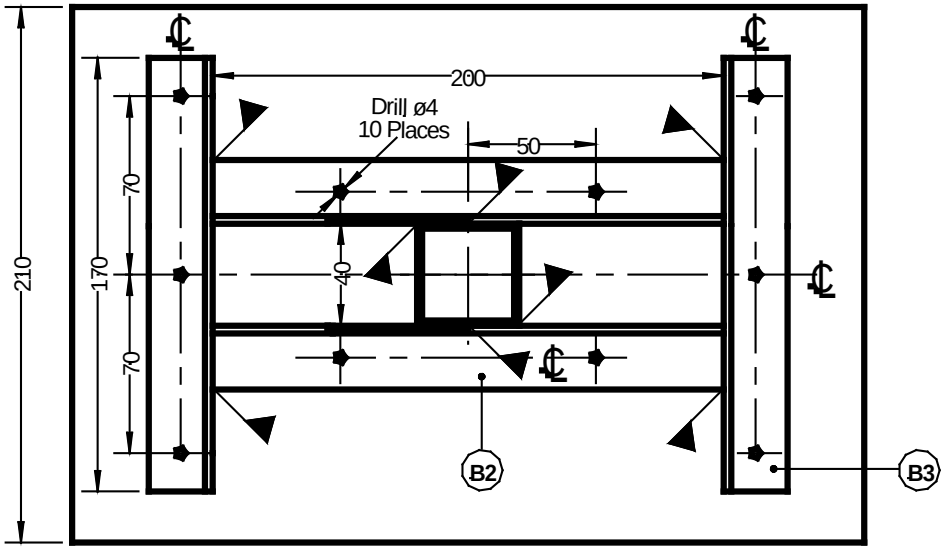
DRAWING NUMBER - MCS005 Drawn by J Shewan

SINGLEON ADAPATION OF THE ULTIMATE MOTOR CYCLE STAND	DRAWING 2 OF 5	ISSUE A	12/12/08
PART B - UPPER ASSEMBLY UNIT	DRAWING 1 OF 1	ISSUE A	12/12/08

All Dimensions in mm.
3rd Angle Projection.
Tolerances Plus/Minus 1.0mm
except where shown.
Deburr before welding.
Deburr all sharp edges.



FRONT VIEW

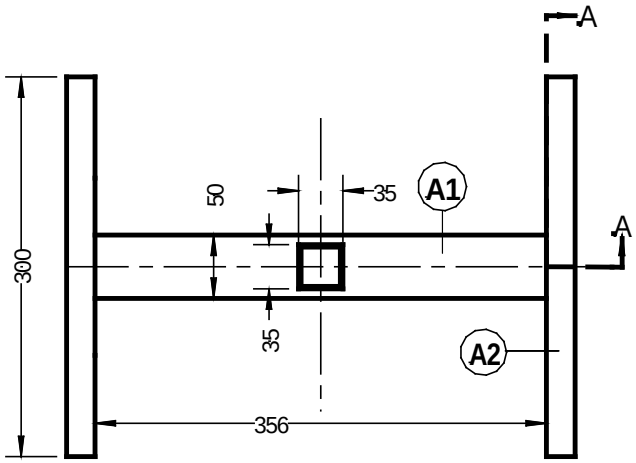


BOTTOM VIEW

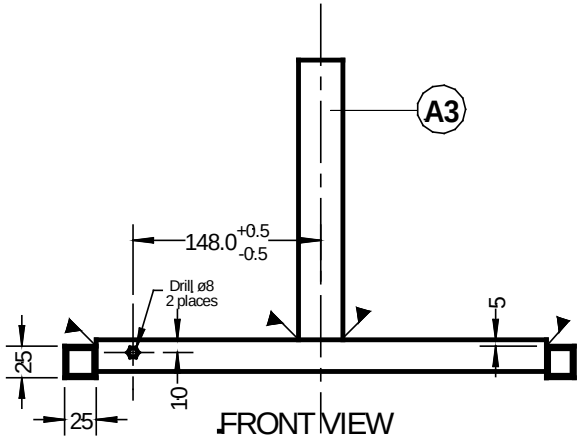
DRAWING NUMBER - MCS 002	Drawn by J Shewan

SINGLEON ADAPATION OF THE ULTIMATE MOTOR CYCLE STAND	DRAWING 1 OF 5	ISSUE A	12/12/08
PART A - BASE ASSEMBLY UNIT	DRAWING 1 OF 1	ISSUE A	12/12/08

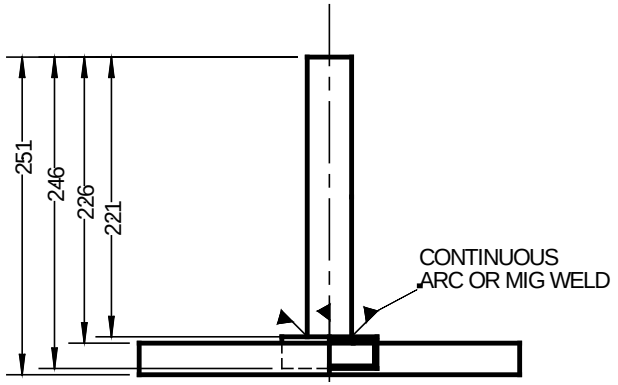
All Dimensions in mm
3rd Angle Projection
Linear Tolerances Plus/Minus 1mm
Angular Tolerances Plus/Minus 1 degree
Deburr before welding
Deburr all sharp edges



TOP VIEW



FRONT VIEW

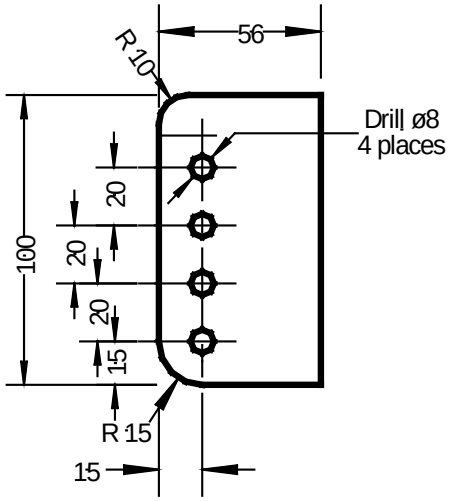


SECTION A-A

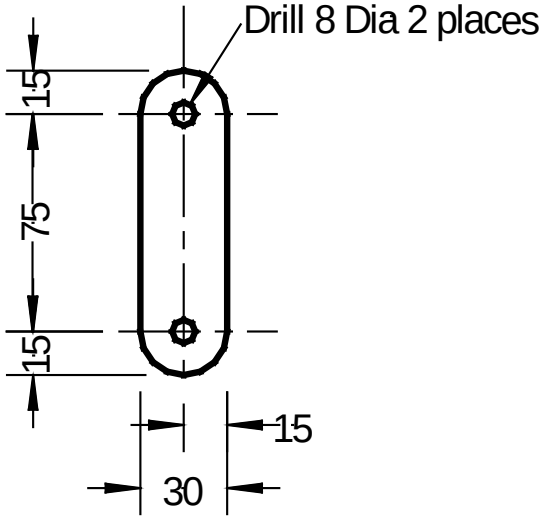
DRAWING NUMBER - MCS 001	Drawn by J Shewan

SINGLEON ADAPATION OF THE ULTIMATE MOTOR CYCLE STAND	DRAWING 3 OF 5	ISSUE A	12/12/08
MOTOR CYCLE STAND - SMALL COMPONENTS	DRAWING 1 OF 1	ISSUE A	12/12/08

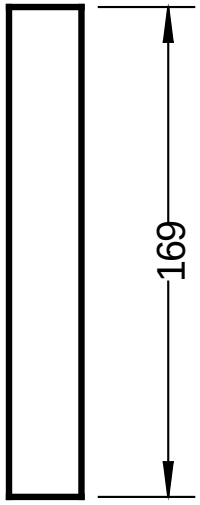
All Dimensions in mm.
3rd Angle Projection.
Tolerances Plus/Minus 1.0mm except where shown.
Deburr before welding.
Deburr all sharp edges.



B5 WELD BRACKET (2 off)
(2mm FLAT BAR MILD STEEL)
Radii 4mm unless shown



D HINGE (2 off)
(2mm FLAT BAR MILD STEEL)
Radii 4mm unless shown

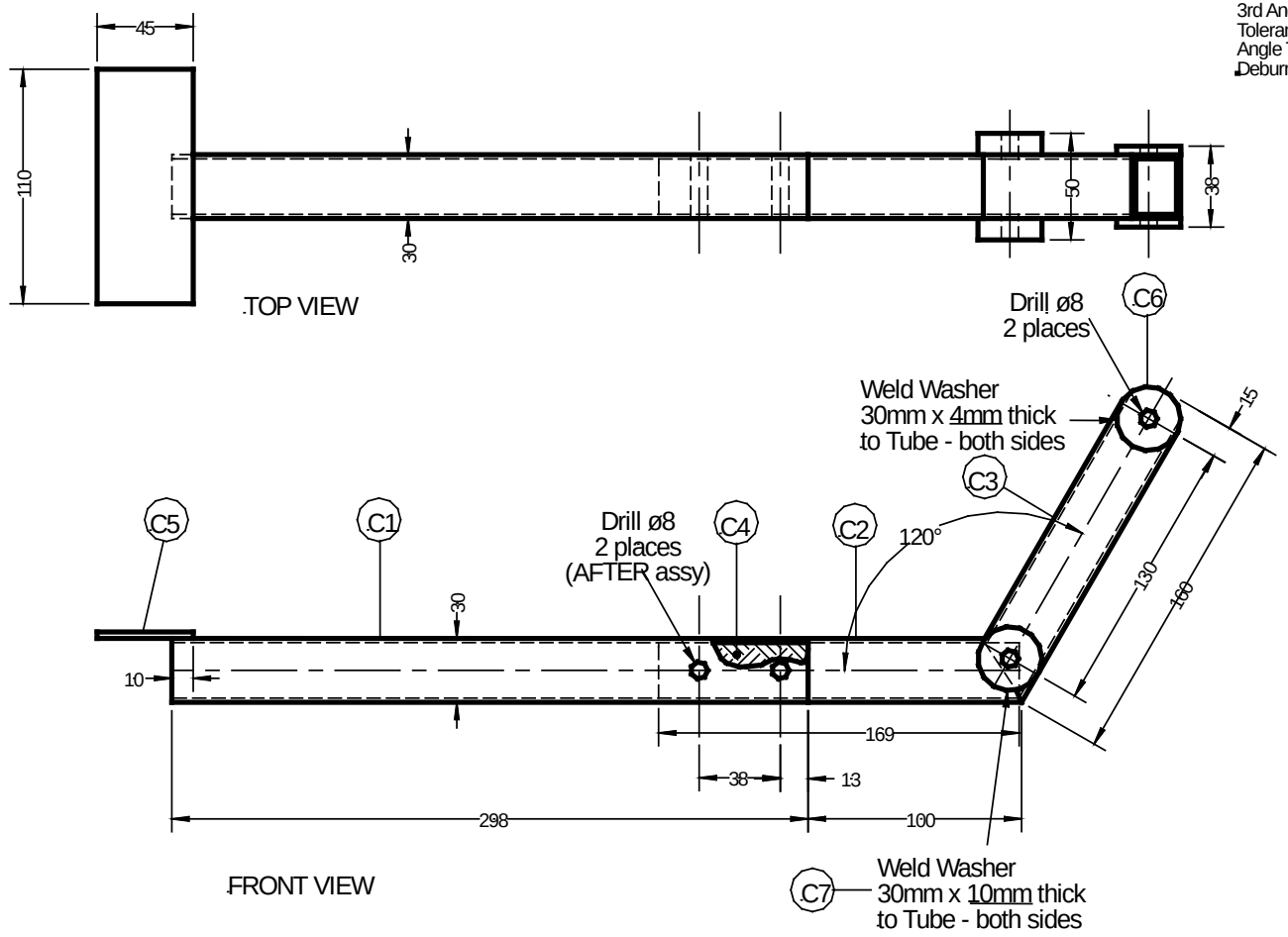


C4 SOLID JOINER - HANDLE
(25mm SQ BAR MILD STEEL)
Radii 1mm unless shown

DRAWING NUMBER - MCS003	Drawn by J Shewan

SINGLEON ADAPATION OF THE ULTIMATE MOTOR CYCLE STAND	DRAWING 4 OF 5	ISSUE A	12/12/08
PART C - LEVER ASSEMBLY UNIT	DRAWING 1 OF 1	ISSUE A	12/12/08

All Dimensions in mm
3rd Angle Projection
Tolerances Plus/Minus 1.0mm
Angle Tolerance Plus/Minus 1°
Deburr all sharp edges

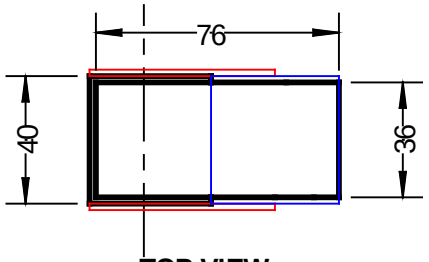


DRAWING NUMBER - MCS004	Drawn by J Shewan

MOTOR CYCLE STAND - WELDING JIG 001

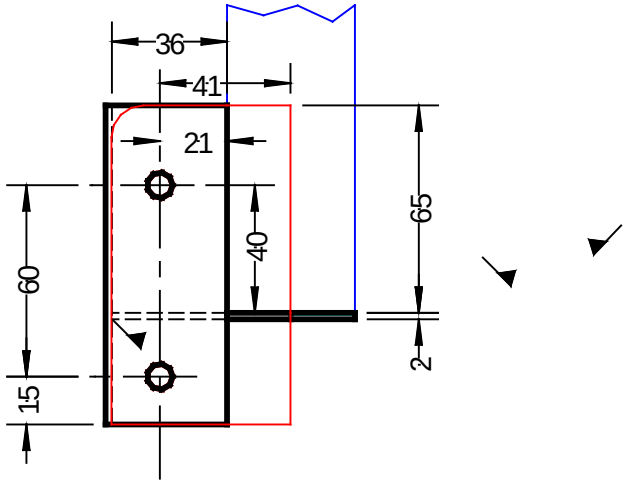
DRAWING 1 OF 1 ISSUE B 27/07/09

All Dimensions in mm.
3rd Angle Projection.
Tolerances Plus/Minus 0.5mm

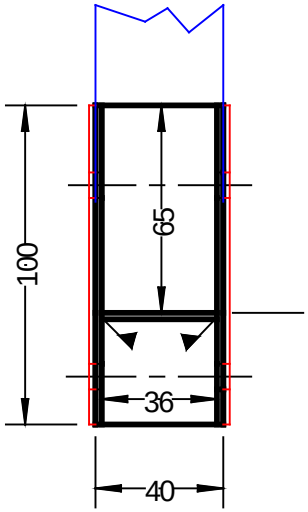


TOP VIEW

To use jig:
Bolt both brackets firmly to jig using final assembly bolts.
Fit jig onto Upper Shaft. Ensure tongue of jig is firmly against bottom of Upper Shaft and there are no gaps.
Weld brackets to Upper Shaft. Remove Jig.



SIDE VIEW



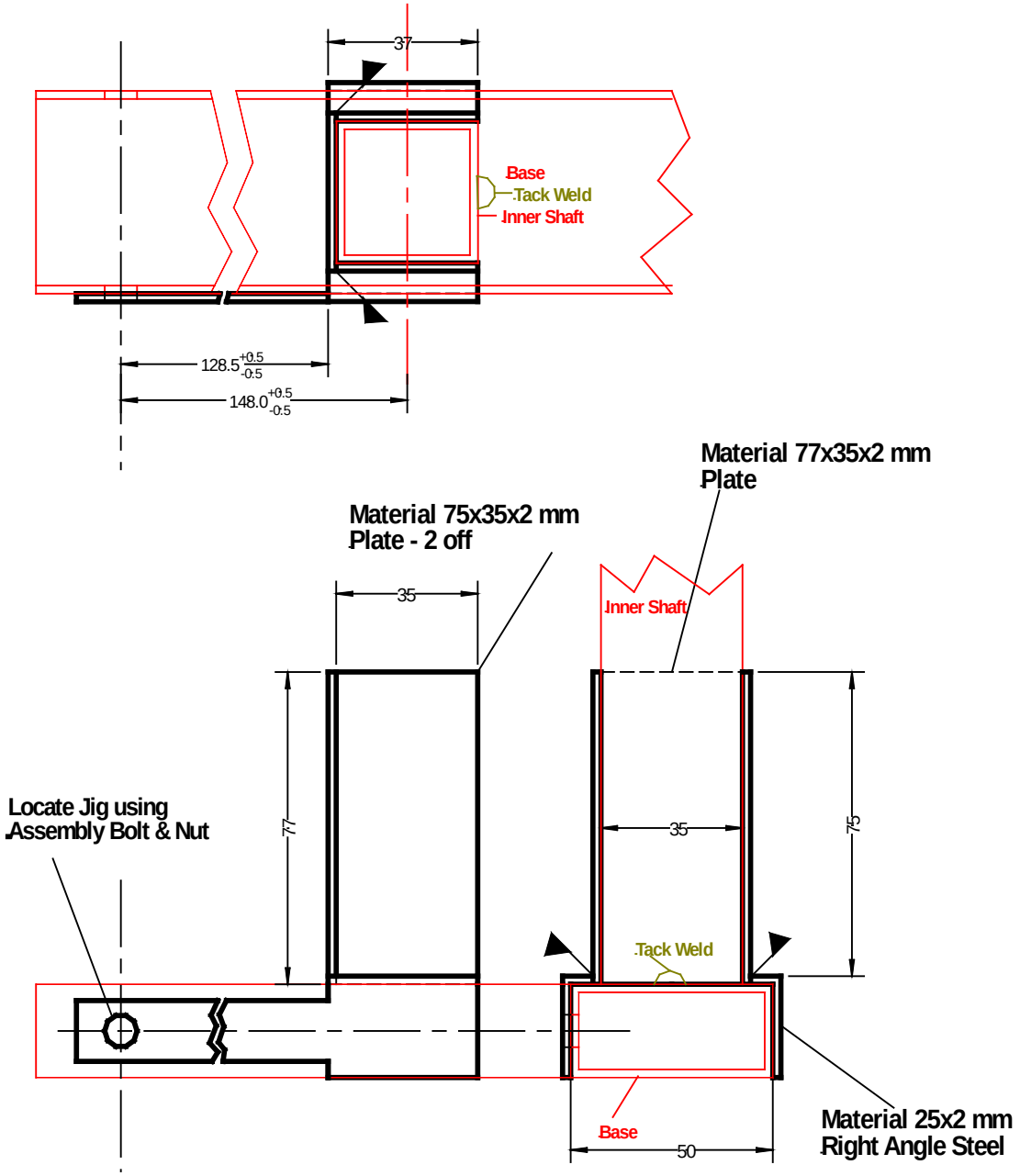
BACK VIEW

DRAWING NUMBER - WJMCS001 **NB Jig is made of modified 40 SHS and 2mm plate**

Drawn by J Shewan

BASE TO INNER SHAFT WELDING POSITION JIG WJMCS002

All Dimensions in mm
3rd Angle Projection
Linear Tolerances Plus/Minus 1mm
Angular Tolerances Plus/Minus 1 degree
Deburr before welding
Deburr all sharp edges



Base Cutting Sizes

(Minimum Material Requirements each unit incl cutting allowance not incl jigs)

Manufactured Items

Part	Material Unit	Material Size	Total Length
A1	Major Rail	50x25 RHS	356 mm
A2	Support Legs	25x25 RHS	610 mm
A3	Shaft Inner	35 SHS	221 mm
B1	Shaft Upper	40 SHS (2mm wall thickness)	205 mm
B2, B3	Support Rails	25x25 RAS	760 mm
B4	Top	Radiata Pine 19x210mm	320 mm
B5	Weld Bracket	100x2 Plate or Flat MS Bar	120 mm
C1, C2, C3	Lever Sections	30 SHS	570 mm
C4	Lever Joiner	25 Square Solid Bar	169 mm
C5	Lever Plate	45x2 Plate or Flat MS Bar	110 mm
C6 & C7	Weld Washer	30 dia MS Bar	50 mm
D	Hinge	30x2 Plate or Flat MS Bar	220 mm

Manufacturing and Assembly Instructions

B5 Weld Brackets

1 Cut 2 Brackets (100x2 Plate) 56mm long using Brobo Saw or hacksaw
2 Stamp Name on brackets
3 Mark Out radii and hole positions using try square, scriber & 300mm rule
4 Check centre punched hole positions using dial vernier caliper
5 Remark and over punch hole positions if necessary
6 Centre punch holes and periphery of radii
7 Angle Grind and file radii to size
8 Drill holes using Pedestal drill
9 Deburr holes
10 Store in secure place for later assembly

D Hinges

1 Cut 2 Hinges (30x2 Plate or Flat) 105mm long using Brobo Saw or hacksaw
2 Stamp Name on hinges
3 Mark Out radii and hole positions using try square, scriber & 300mm rule
4 Centre punch hole s and radii
5 Angle Grind and file radii to size
6 Drill holes using Pedestal drill
7 Deburr holes
8 Store in secure place for later assembly

C4 Lever Joiner

1 Cut Joiner (25 square bar) 169mm long using Brobo Saw or hacksaw
2 Stamp Name on Joiner
3 Overfile stamped area to remove distortion from stamping
4 Store in secure place for later assembly

C5 Lever Plate

1 Cut Lever (45x2 Plate or Flat) to 110mm long using Brobo Saw or hacksaw
2 Stamp Name on Lever Plate
3 Store in secure place for later assembly

C1 Lever Upper

1 Cut Lever Upper (30 SQ SHS) to 298mm long using Brobo Saw or hacksaw
2 Stamp Name on Lever Upper (put C4 Lever Joiner inside Lever Upper for support when stamping)
3 On a Flat welding surface:
4 Position and weld Lever Plate to Lever Upper
5 Spray paint weld areas using metal primer
6 Store in secure place for later assembly

C6 & C7 Weld Washer

1 Cut 2 C6 weld washers (30 dia MS Bar) 4mm long using Brobo Saw
2 Cut 2 C7 weld washers (30 dia MS Bar) 10mm long using Brobo Saw
3 Store in secure place for later assembly

C3 Lever Extension

1 Cut Lever (30 SQ SHS) to 160mm long using Brobo Saw or hacksaw
2 Stamp Name on Lever Extension (put C4 Lever Joiner inside extension for support when stamping)
3 Mark out position of radii, 30 degree angle and 8mm dia holes in Lever Extension using 300mm rule, try square & scriber
4 Centre punch hole positions and periphery of angle and radii.
5 Check centre punched hole positions using dial vernier caliper
6 Remark and over punch hole positions if necessary.
7 Drill 8mm dia holes in Lever Extension using Pedestal Drill
8 Cut 30 degree angle using Brobo Saw
9 Angle Grind and file radii to size
10 Braze C7 & C6 weld washers into position on Lever Extension (Use Bolt & nut to hold washers in place for brazing)
11 Store Lever Extension Sub-Assembly in secure place for later assembly

C2 Lever Lower

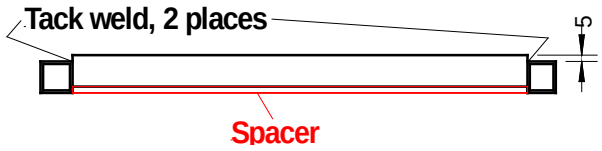
1 Cut Lever (30 SQ SHS) to 100mm long using Brobo Saw or hacksaw
2 Stamp Name on Lever Lower (put C4 Lever Joiner inside Lever Lower for support when stamping)
3 Use C3 Lever Extension Sub-Assembly as jig to drill 8mm dia holes in Lever Lower using Pedestal Drill
4 Disassemble & deburr drilled holes internally and externally
5 Assemble C3 Lever Extension to C2 Lever Lower with bolts, washers, spring washers and nuts.
6 Store in secure place for later assembly

C Lever Assembly

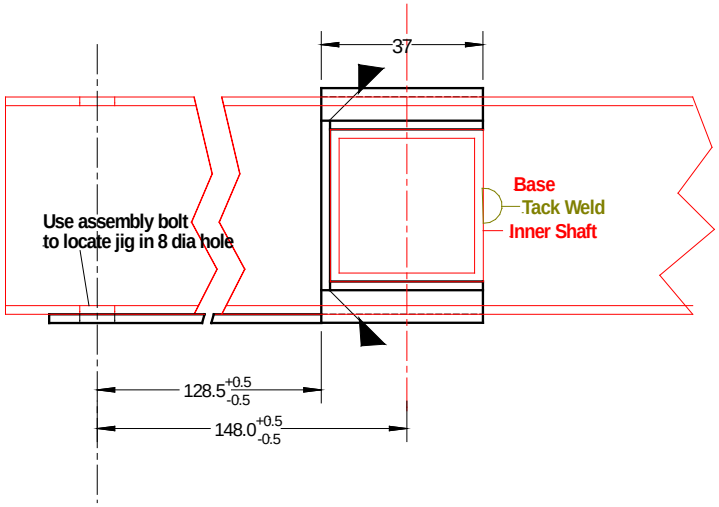
1Force C4 Joiner into C2 & C3 sub-assembly to depth of joining bolt using lubricant and 8lb hammer
2 Remove any distortion from joiner using file and reduce joiner so that C1 Lever Upper slides onto joiner with slightly less than an interference fit.
3 Place C1 Lever Upper sub-assembly onto joiner to abut C2 & C3 Sub Asssembly
4 Mark out hole positions onto C1 Lever using try square, scriber and 300mm rule
5 Centre punch hole positions
6 Drill 8mm dia holes using Pedestal Drill
7 Deburr
8 Fit Bolts, washers, split washers and nuts to assembly unit.
9 Spray paint Lever unit assembly using metal primer and a single undercoat
10 Store in secure place for later assembly

A Stand Base Sub-Assembly (MIG [preferred] or Arc)

1 Cut A1 Major Rail (50x25 RHS MS) to 356mm long using Brobo Saw or hacksaw
2 Cut 2 A2 Support Legs (25x25 RHS MS) to 300mm long each using Brobo Saw or hacksaw
3 Cut A3 Inner Shaft (35 SHS) to 221mm long using Brobo Saw or hacksaw
4 Stamp Name on all parts
5 Mark position of Inner Shaft onto Major Rail using scriber, try square and 600mm steel rule
6 Mark out position of 8mm dia holes in Major Rail using 300mm rule, try square & scriber
7 Centre punch hole positions.
8 Check centre punched hole positions using dial vernier caliper
9 Remark and over punch hole positions if necessary.
10 Drill two 8mm dia holes in Major Rail
11 Mark out position of Main Rail onto Support Legs, all around, using 300mm rule & scriber
On a FLAT welding surface:
12 Place 5mm spacer under Main Rail
13 Align Support Leg with Main Rail
14 Tack weld Support Leg to Main Rail in 1 place
15 Check alignment of Support Leg to Main Rail (Top surfaces should be parallel with even 5mm gap)



16 Tack weld Support Leg to Main Rail in 2nd place
17 Fillet weld Support Leg to Main Rail, all around.
18 Repeat for second Support Leg.
19 Spray paint weld areas using metal primer.
On a FLAT welding surface:
20 Fit welding jig WJMCS002 to Main Rail to hold Inner Shaft in position to tack weld
(use final assembly bolt to locate jig in 8mm dia drilled hole.)



21 Position Inner Shaft into jig on Major Rail.
22 Tack weld Inner Shaft to Major Rail.
23 Remove welding jig.
24 Check squareness and positioning of Inner Shaft on Major Rail.
25 Angle grind weld, disassemble parts and re-tack if necessary.
26 Fillet weld Inner Shaft to Major Rail all around.
27 Lightly remove weld splatter from Inner Shaft using angle grinder.
28 Spray paint Base Assembly using metal primer.

B Stand Upper Sub-Assembly (MIG [preferred] or Arc)

1 Cut 2 B2 Support Rails (long) (50x25 RHS MS) to 200mm long each using Brobo Saw or hacksaw
2 Cut 2 B3 Support Rails (short) (25x25 RHS MS) to 170mm long each using Brobo Saw or hacksaw
3 Cut B1 Shaft Upper (40 SHS) to 205mm long using Brobo Saw or hacksaw
4 Mark Out Shaft Upper position on Support Rails (long) using try square, scriber and 300mm rule, (Mark Shaft Upper position on Support Rails (long) all around)
5 Mark Out hole positions in Support Rails using scriber and 300mm rule
6 Mark Out Support Rail (long) position onto Support Rails (short) using try square, scriber and 300mm rule
(Mark Support Rail (long) positions on Support Rails (short) all around)
7 Drill holes in Support Rails using Pedestal Drill
8 Deburr all holes
On a FLAT welding surface:
9 Align Shaft Upper with marking out on Support Rail (long)
10 Tack weld Support Rail (long) to Shaft Upper in one place
11 Check squareness and positioning of Shaft Upper to Support Rail (long) tack weld
12 Adjust or grind and re-tack Support rail (long) if necessary
13 Fillet weld Support Rail (long) to Shaft Upper all around
14 Repeat for second Support Rail (long)
(ensure Support Rails (long) are parallel to each other and perpendicular to Shaft Upper, adjust or grind and re-weld Support rails (long) if necessary)
15 Spray all welds with metal primer
On a FLAT welding surface:
16 Align Shaft Upper and Support Rail (long) Sub-Assembly with Support Rail (short)
17 Tack weld Support Rail (short) to Shaft Upper and Support Rail (long) Sub-Assembly
18 Check Support Rails are parallel to each other, adjust or grind and re-weld Support rails if necessary
19 Repeat for second Support Rail (short).
20 Weld B5 Bracket to Shaft Upper using Bracket to Shaft Welding Jig WJMCS001
21 Spray paint Stand Upper Sub-Assembly using metal primer.
22 Store in secure place for later assembly

B4 Top

1 Cut B4 210x19mm Radiata Pine to 310mm long using tenon saw
(alternative:
a1 Cut 140x19mm Radiata Pine to 310mm long using tenon saw
a2 Cut 70x19mm Radiata Pine to 310mm long using tenon saw
a3 Cut biscuit joints in Radiata Pine
2 Write Name on end grain of Radiata Pine
3 Biscuit Join, Glue and clamp Radiata Pine pieces
4 Sand Radiata Pine
5 Lacquer Radiata Pine.
6 Store in secure place for later assembly

Final Assembly

1 Ensure all manufactured metal components as spray painted as follows:
2 One coat metal primer, allow to dry, light sand,
3 One coat undercoat, allow to dry, light sand,
4 One coat finished coat, allow to dry.
5 Reassemble all components. Check finish and operation. Adjust and touch up if necessary

INDUSTRIAL TECHNOLOGY STAGE 5 (YEAR 10) ULTIMATE MOTOR CYCLE STAND

STUDENT NAME: _____ TEACHER _____ 2009

Part	Material Unit	Material Size	Total Length	Quantity	Cost / metre, unit or can	Calculation	Cost per Material Type
A1	Major Rail	50x25 RHS	356 mm	1	$		$
A2	Support Legs	25x25 RHS	610 mm	1	$		$
A3	Shaft Inner	35 SHS	221 mm	1	$		$
B1	Shaft Upper	40 SHS	205 mm	1	$		$
B2, B3	Support Rails	25x25 RAS	760 mm	1	$		$
B4	Top	310 x 210 Radiata Pine	310	1	$		$
B5	Weld Bracket	100x2 Plate or Flat MS Bar	120 mm	1	$		$
C1, C2, C3	Lever Sections	30 SHS	570 mm	1	$		$
C4	Lever Joiner	25 Square Solid Bar	169 mm	1	$		$
C5	Lever Plate	45x2 Plate or Flat MS Bar	110 mm	1	$		$
C6 & C7	Weld Washer	30 dia MS Bar	50 mm	1	$		$
D	Hinge	30x2 Plate or Flat MS Bar	220 mm	1	$		$
E	8mm Set Bolt	High Tensile Steel Internal Hex	70 mm	2	$		$
F	8mm Set Bolt	High Tensile Steel Internal Hex	60 mm	3	$		$
G	Flat Washer	8mm Id Mild Steel		10	$		$
H	Split Washer	8mm Id Spring Steel		5	$		$
I	8mm Nut	Mild Steel With Nylex Insert		5	$		$
J	1/8" Wood Screw	Mild Steel	12 mm	10	$		$
	Spray Paint	Metal Primer		1/3 can	$		$
	Spray Paint	Undercoat		1/3 can	$		$
	Spray Paint	Finish Coat		1/3 can	$		$
						Total Material Cost	$

STUDENT RESEARCH

1/ To join pieces of square mild steel tube with 2mm wall thickness the _____ welding process and a voltage of _____ amps is used. The _____ welding process may also be used.

2/ To join solid steel washers of 5mm and 10mm thick to mild steel tube with 2mm wall thickness the _____ process is used. Alternately the _____ welding or _____ welding process may be used.

3/ List the Personal Protection Equipment needed when welding or brazing and the tools used _____

_____

4/ Draw & Label the "voltage adjustment" on the arc welder.

4/ Draw & Label the "acetylene" and "oxygen" flow adjustment s "A" and "O".

WORD	MEANING
support	
shaft	
upper	
rail	
top	
bracket	
lever	
joiner	
plate	
weld	
hinge	
set	
bolt	
flat washer	
split washer	
'nyloc' nut	
wood screw	
spray paint	
section	
paint	
measure	
scriber	
centre punch	
	join with silver solder
	tighten, make safe,
	protect the eyes from flying debris
	making an item
	contains instructions on doing an action or making an item
	measures angles

Solve the following

1/ 25cm equals _____ mm

2/ 1.3 metres equals _____ mm

3/ A saw cut takes 3mm of metal. I need 2 pieces of metal each 300mm long. What is the shortest single piece of metal I need to start with? (I am only allowed one piece and have to cut the two pieces from it. Show working.

_____

4/ 90 degrees is also called a _____ angle.

5/ 300mm + 1.3 metres + 400mm equals _____mm which also equals _____ metres.

6/ A hole has 10mm diameter. What is the radius of the hole? _____ mm

7/ If drilling a hole greater than 8mm in diameter it is best to first use a drill whose diameter is at least 1mm greater than the land of the hole size drill. Use the table below to answer the following questions.

Hole size	Drill Size	Land of Drill
12mm	12mm	1.5mm
15mm	15mm	2mm

For a 12 mm diameter hole pre-drill using a _____ mm drill

For a 15mm diameter hole pre-drill using a _____ mm drill

8/ A bolt and nut set costs 65 cents.

How much will it cost for 2 sets? $_____.___c

How much change is there from $2.

If washers are 10 cents each how many washers can I buy with the change? _____

How much change is left if I need to buy six washers? $_____.___c

9/ A motor cycle stand retails at $155. Using the costing on page 15 how much money have I saved by manufacturing the motor cycle stand myself? $_____.___c

What could explain the difference between my manufacturing cost and the retail cost of a similar motor cycle stand? _____

_____

_____

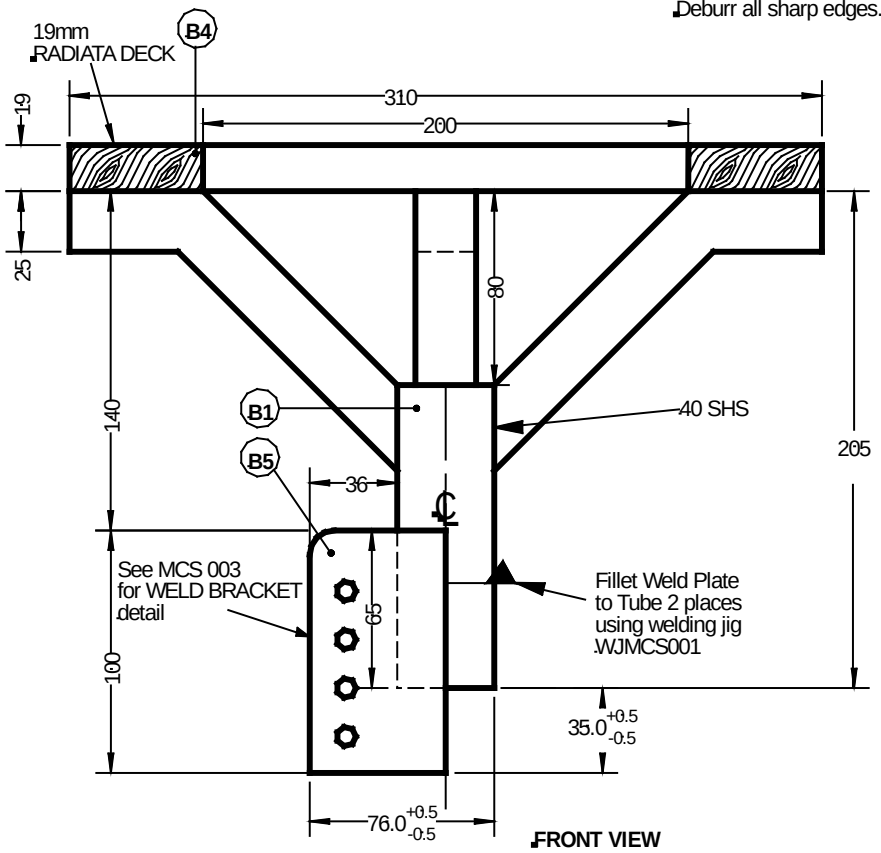
_____

_____

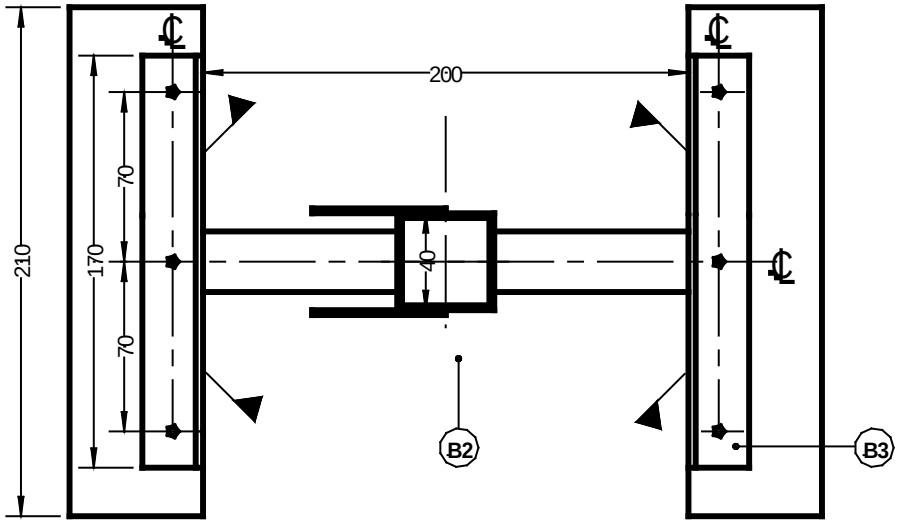
OPTIONAL - OIL CHANGE ACCESS AND DRIP TRAY

SINGLEON ADAPATION OF THE ULTIMATE MOTOR CYCLE STAND	DRAWING 2 OF 5	ISSUE A	12/12/08
PART B - UPPER ASSEMBLY UNIT	DRAWING 1 OF 1	ISSUE A	12/12/08

All Dimensions in mm.
3rd Angle Projection.
Tolerances Plus/Minus 1.0mm
except where shown.
Deburr before welding.
Deburr all sharp edges.



FRONT VIEW



BOTTOM VIEW

DRAWING NUMBER - MCS 002	Drawn by J Shewan