



Bespoke iPhone 5 Dock

Design for Manufacture

PRODUCT TECHNOLOGY 2

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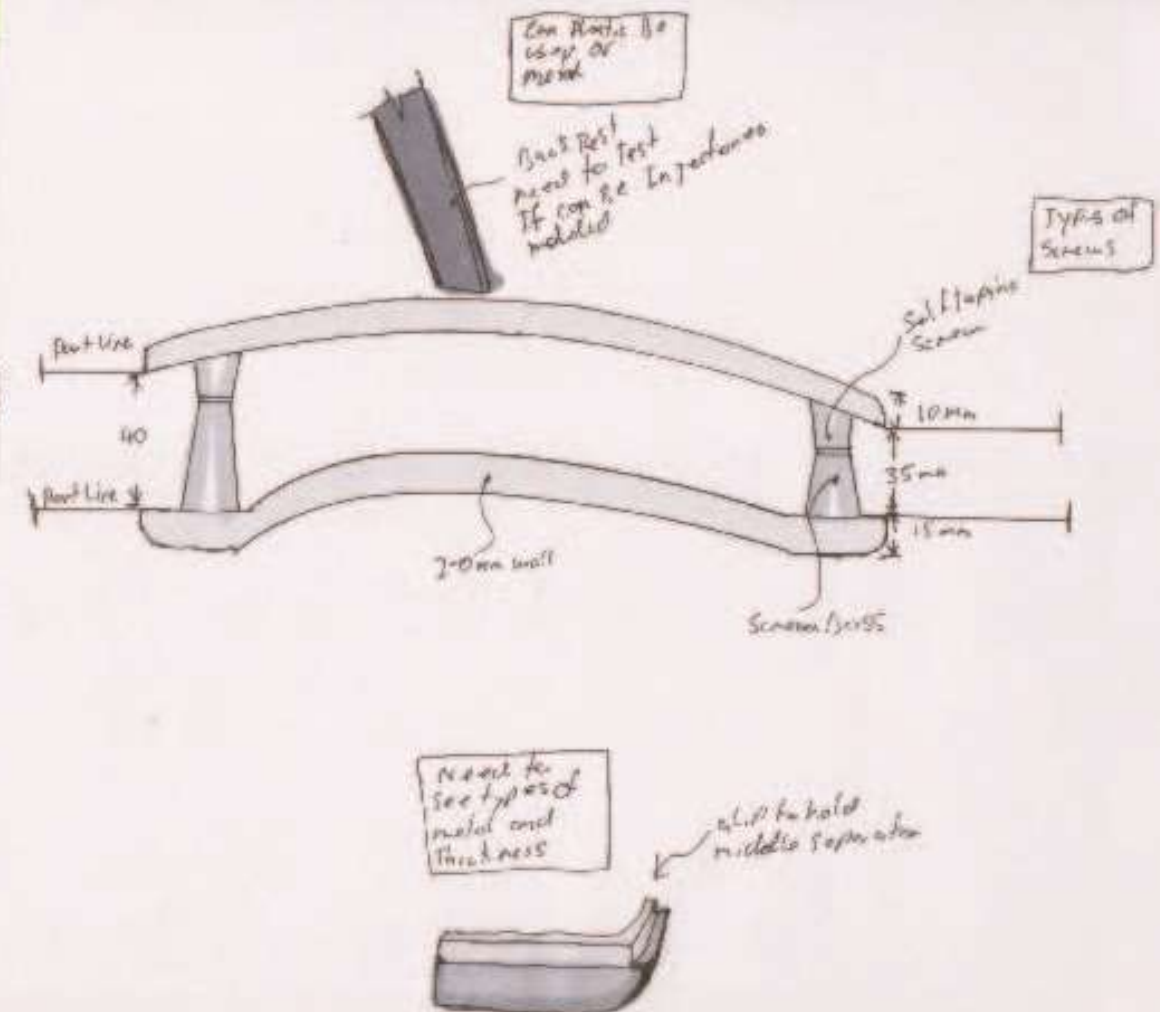
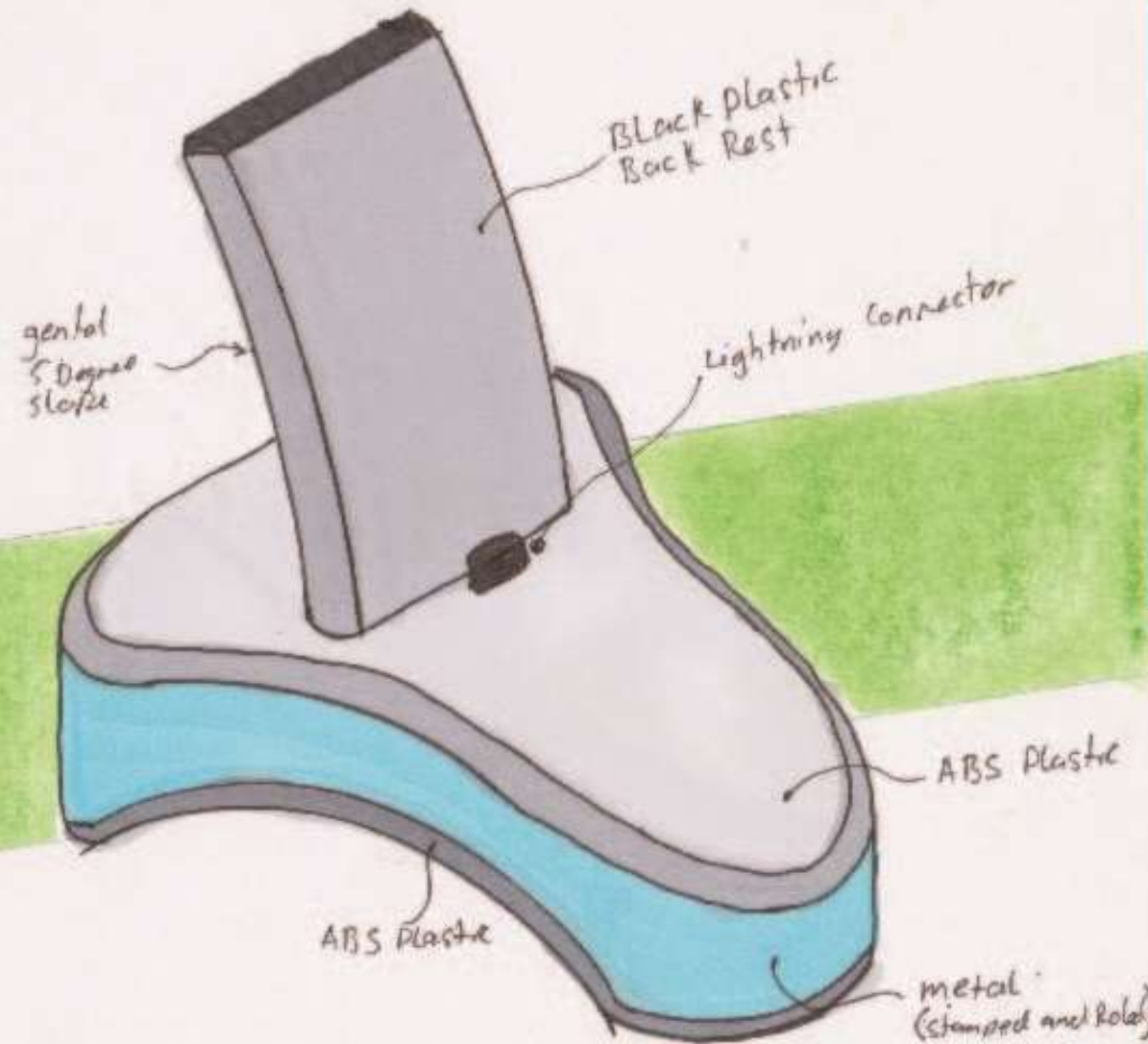
Concept Bomb:

Bespoke iPhone 5 Dock

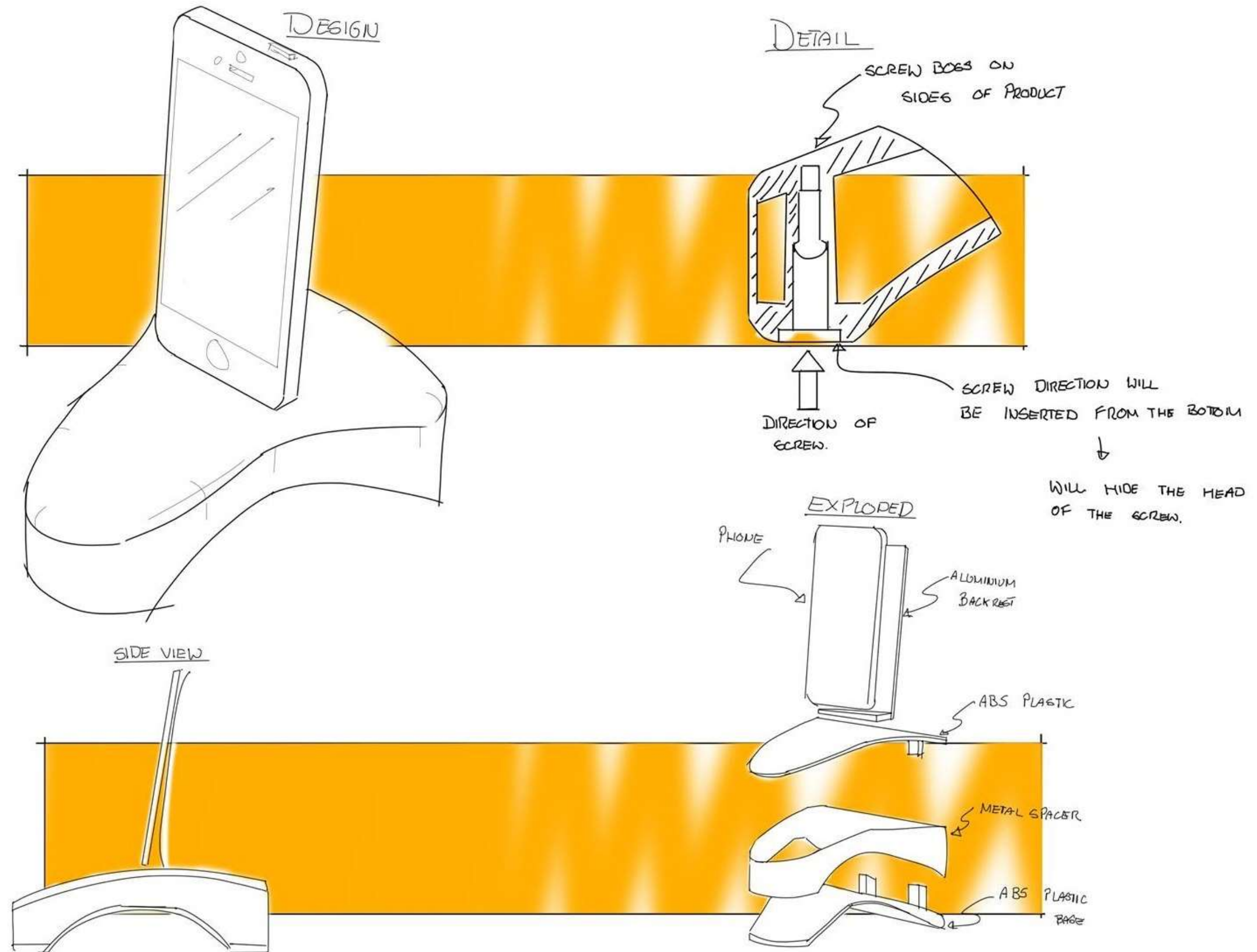
A stylish phone dock that removes the need for excess cables on the desk.

Keeps the iPhone upright so make seeing the screen easy

Charge and Dock with computer



Initial Concept Drawings:



Major Components:

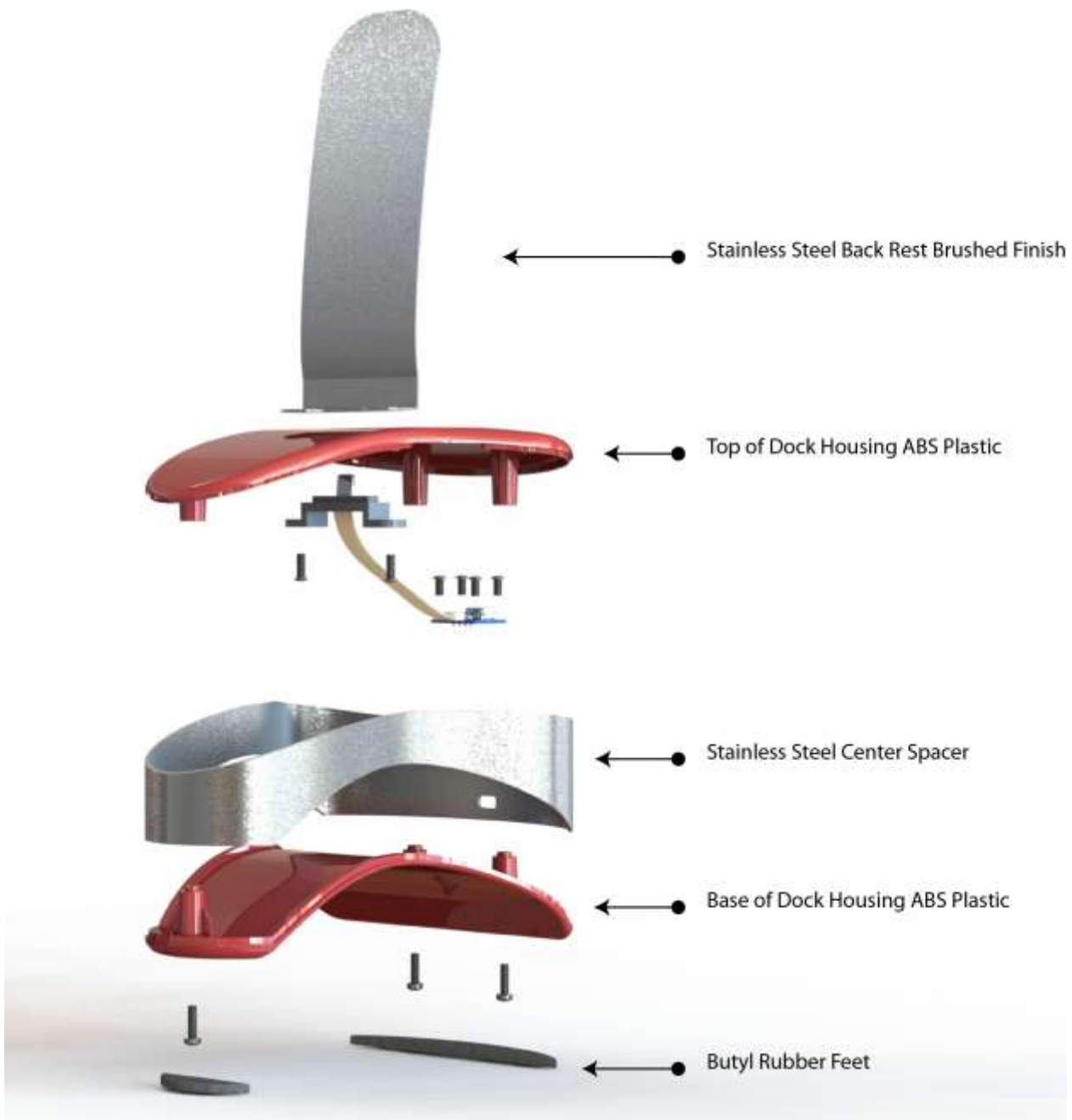


Figure 1: The Exploded View of the Housing

Minor Components:

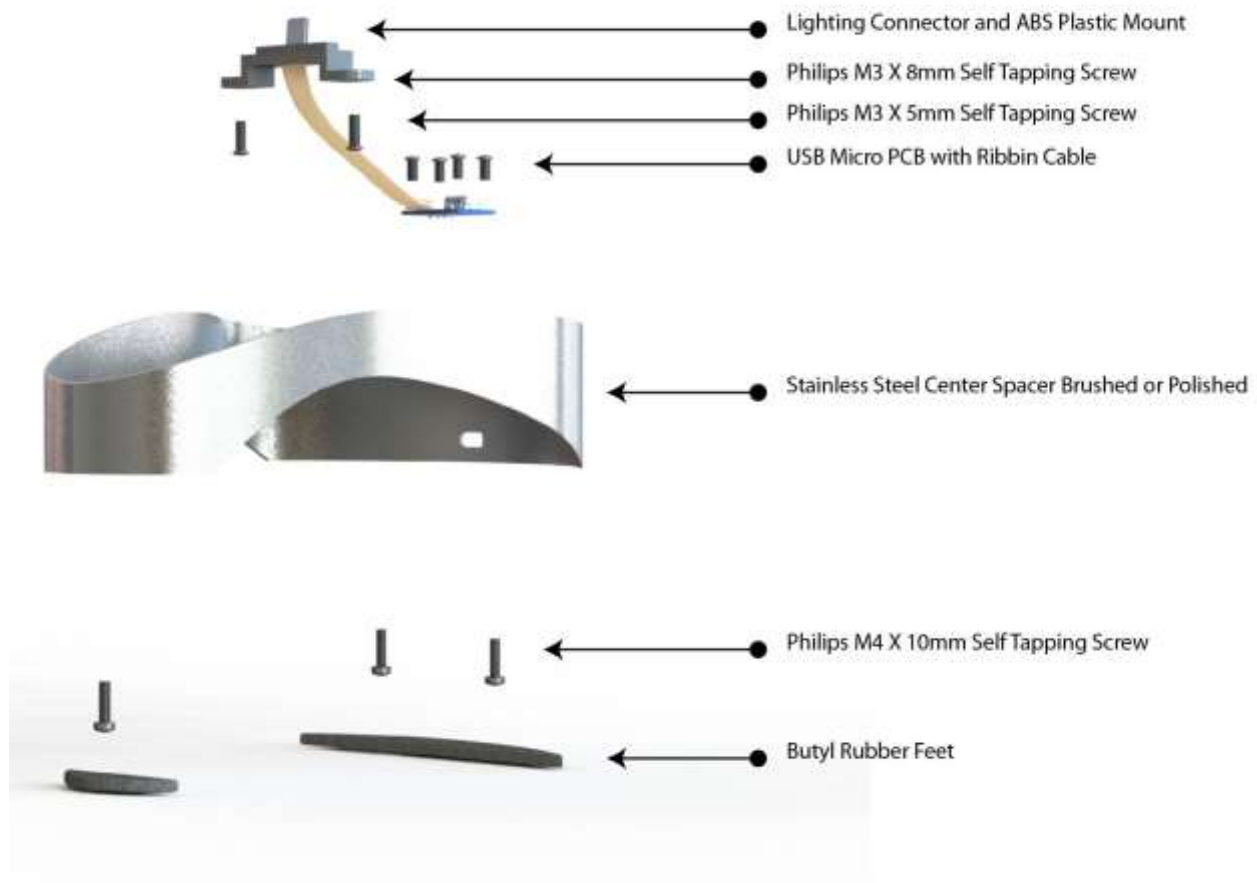


Figure 2: Exploded View of the Internal Parts

Materials:

The two-main plastic part, the top and the base of the dock are made from ABS (Acrylonitrile butadiene styrene) it is a thermoplastic and amorphous polymer made up of different plastics giving it both strength and impact resistance. It is the flexible properties of ABS that makes it the preferred material to manufacture small plastics parts[1].

The middle and back rest of the dock are stamped metal parts as this is easy to produce and adds a stylish look to the aesthetics of the dock.

Assembly:

The dock is designed to be assembled with the top and base holding the middle divider in place. This is done by use of a lip on the two plastic parts to stop any movement of the metal divider. As well the top and base are compressed on to the middle with 3 self-tapping screws. The back-rest assembly holds the lightning connector and metal back rest in place with 2 self-tapping screws. This is feed through the top of the dock housing giving it support and strength. The electronics are held in place by 4 self-tapping screws to the rear of the base. The electronics consist of a PCB board and a micro USB port mounted on it. The micro USB port has a hole punched through the metal middle divider and is mounted flush with the outer wall.

Surface Finishes:

The dock consists of two metal parts and two plastic parts. The plastic part is injection moulded with a gloss finish which is detailed at SPI A-2, this requires a 1 degree draft for the best results[2]. This finish will be applied to the display face, with the inner faces produced with a PM-F0 non cosmetic finish. The plastic parts will be offered in a Pantone 179C high gloss red colour to suit the desired aesthetics of the final dock. The metal parts are offered as a brushed stainless steel finished, which is detailed as a Ra 25 – 320 grit application[3].

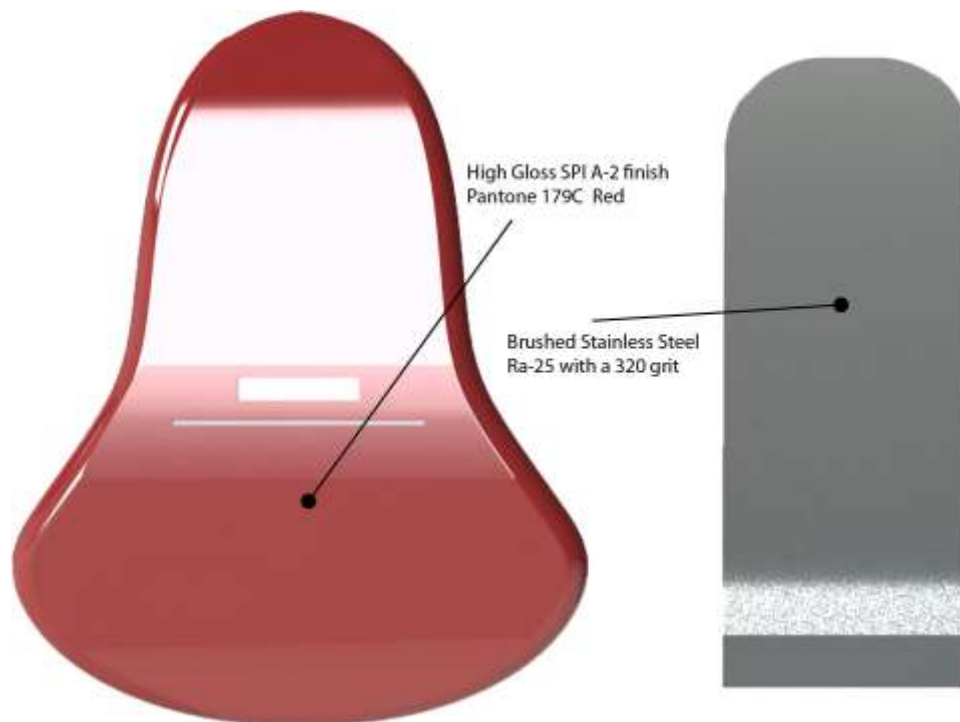


Figure 3: Surface Finish

Design:



Figure 4: Dock Display

Designed to be a bright addition to any office desk, it will provide a simple way to dock an iPhone 5. Standing the phone upright gives the user a view of the phones screen to see is notification with ease. The dock removes the need for cables on the desk and provides the user with a central point of functionality. Giving quick and easy way to access their phones data, while charging the phone throughout the day.

Fixtures and Screw:

This dock was designed to have a high aesthetic appearance, with this in mind the dock needed for all fixtures and screws to be minimal and hidden. The top and bottom housing are designed to support the middle surround on a ledge and compress together holding the middle surround in place. This is done with three M4 10mm thread cutting self-tapping screws. This is then covered by butyl rubber feet to hide the screw openings.

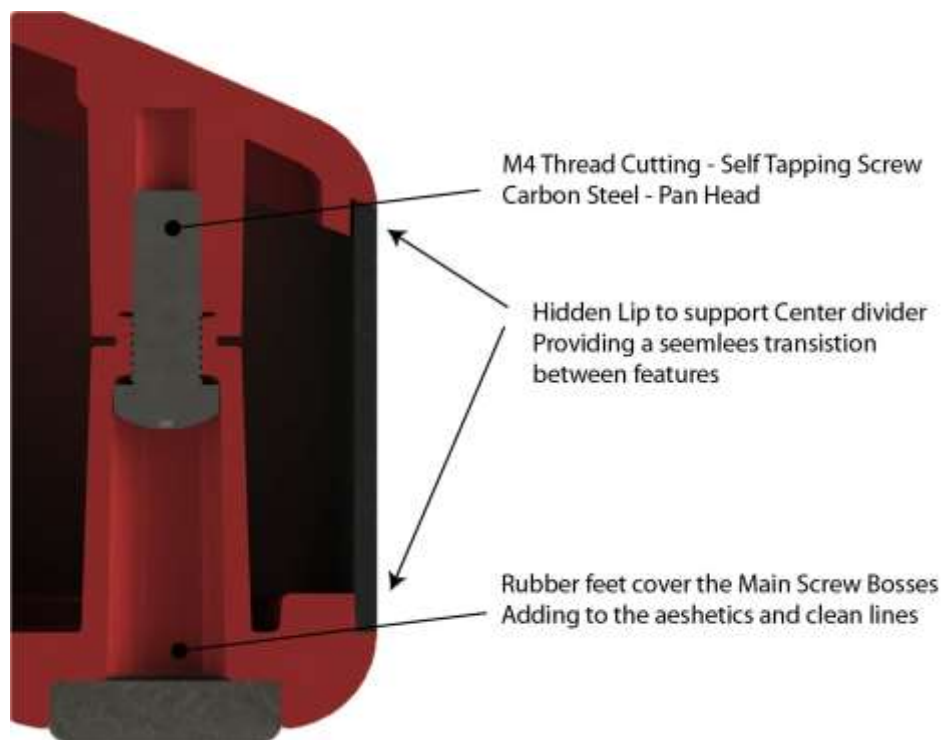


Figure 5: Section View of Main Screw

The metal back rest and lightning connector are held in place with two M3 8mm thread forming self-tapping screws, with the back rest passing through the top of the dock for extra support.

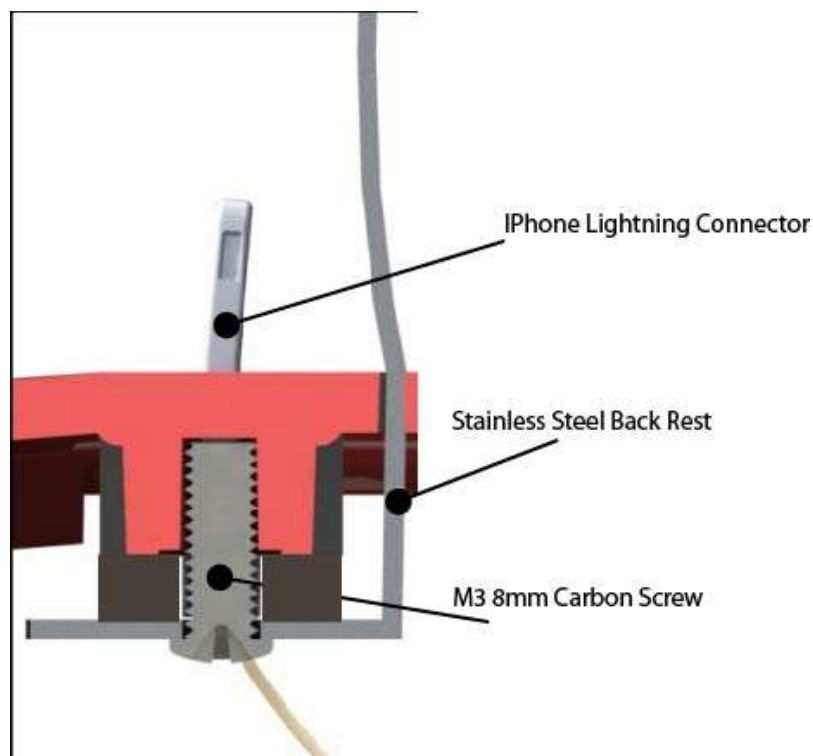


Figure 6 - Back Rest Section View

Functionality:

The dock was designed to make life easy for the office worker. The dock will sit on a desk and allow for connection to a computer which will enable the iPhone to charge and transfer data to the computer used. It does away with specialty cable and wall charges that can clutter up a desk, by use of a single Micro USB connector on the back. The stylish design hold the iPhone upright and allows the person using the dock to see incoming alerts, removing the need to find or pick the phone up.

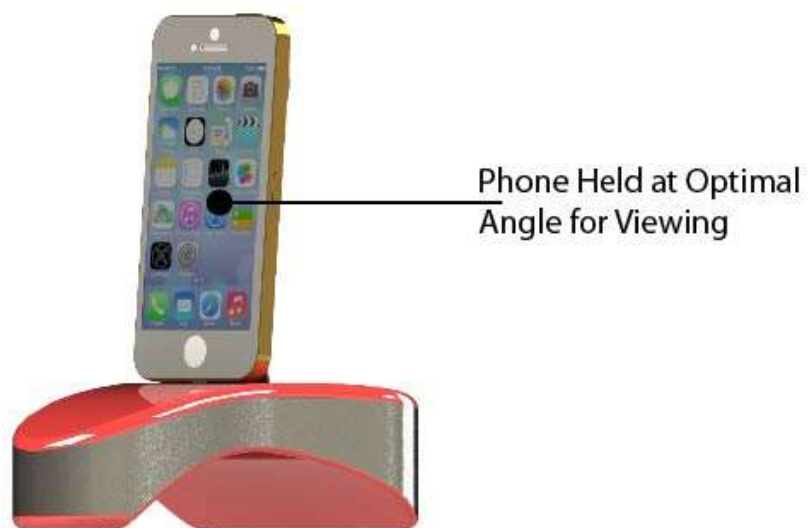
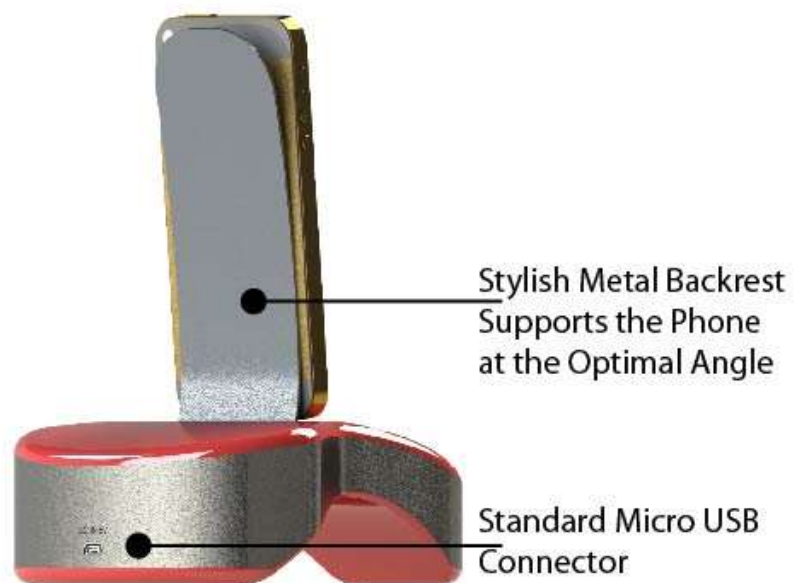


Figure 7: Dock Functionality

Component Analysis

The dock was analyzed to make sure it was able to be produced, with plastic parts undergoing draft analysis and injection flow testing. The metal parts tested for ease of manufacture.

Dock Top:

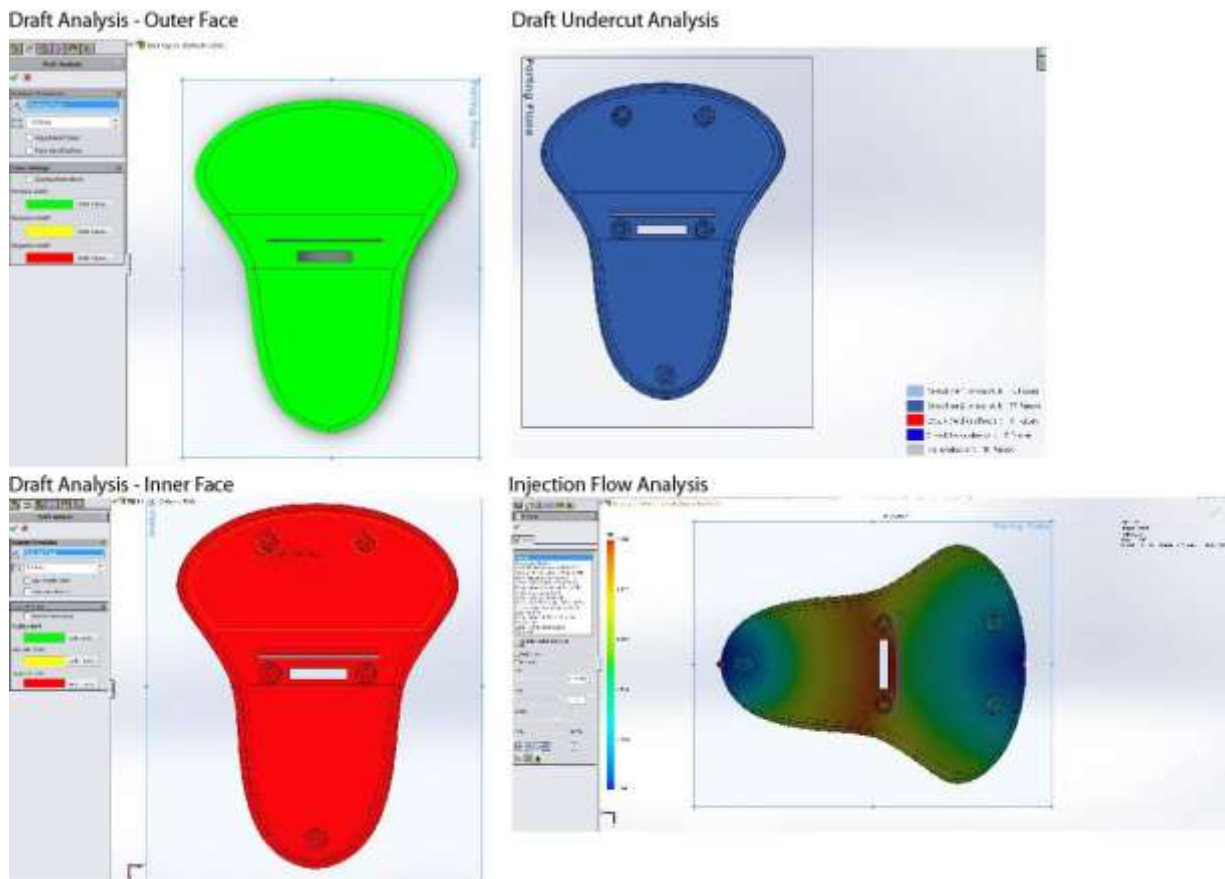


Figure 8: Top of Dock Analysis

DESIGN:

The dock's plastic top is designed to hold the back rest and Lightning connector in place with added support for the back rest as it feeds through the top. Additional support was added by using a lip along the lower edge which supports the metal middle of the dock without the use of extra fixture. This reduces the expense and complexity of the dock design. The 3 screw bosses are placed to meet the screw hole on the base housing, giving the top and bottom housing parts inter connecting points.

INJECTION MOULDING PROCESS:

The injection moulding process was used to manufacture this part. It was designed to best suit the parameters of this manufacturing system. Two injection gates are places on the edges of the dock housing where the lip face meets the parting line. This hides the split line marks and any injection mould marks. The injection moulding process will take 2.3 second and 66% of the maximum pressure allowed. The draft was set to 1 degree as this was the requirement for the SPI A-2 mould finish chosen. The screw bosses are long but this is taken in to account and the screw boss wall thickness was kept to 60% of the surface wall thickness. A larger 4M screw was chosen to make this possible as it gave a larger possible draft angle. To keep the parts sharp and clean aesthetic the edges do not have a fillet on the top housing, while this does increase the chance of fouling in the injection process. The polished mould will reduce the change of this happening.

Dock Base:

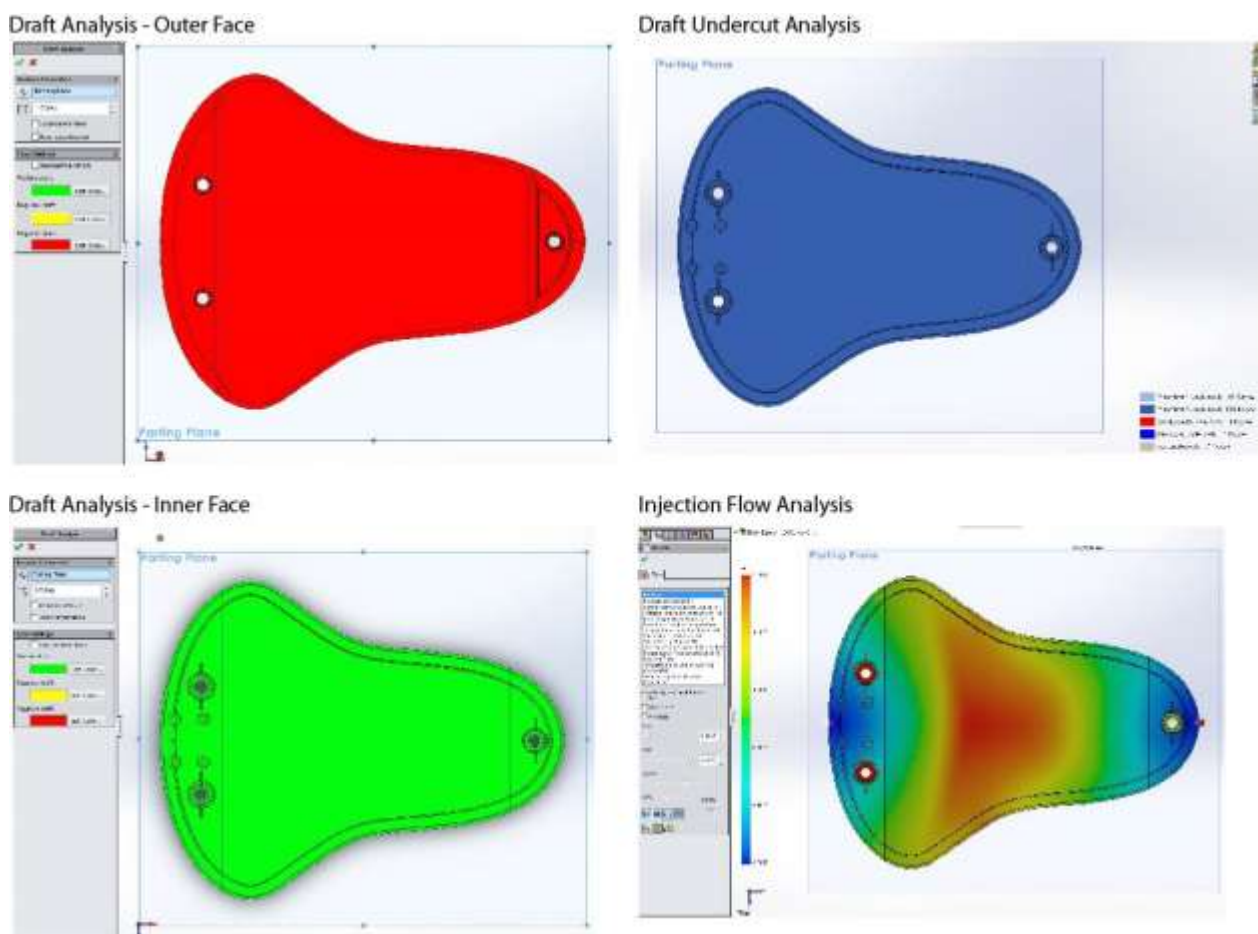


Figure 9: Base of Dock Analysis

DESIGN:

The plastic base housing of the dock was designed to hold the Micro USB and electronic board in place while supporting the metal middle separator. It has 3 screw boss holes that connect with the screw bosses of the top housing. A lip along the edge was designed to add strength and an edge to hold the metal middle in place. In order to join the two halves of the dock the screw boss hole were designed to be long and in turn hide the screws.

By use of rubber feet the hole are covered and this also adds grip to the dock to minimise the chance of it moving around on the desk. The base include the rubber feet which are butyl, these will be adhered in place with double sided contact tape. The feet are simple custom parts that can be stamped as purchased as needed. These feet are by double sided contact tape, make removal easy is the dock needs repair.

INJECTION MOULDING PROCESS:

The injection moulding process required 4 injection gates along the sides of the lip. This kept the injection pressure at 66% and the duration to 2.1 seconds. By placing the injection gate along the lip edge the pressure could be set to over pressurize to minimise shrinkage of the mould while cooling reducing the possibility of fouling. To maintain the aesthetics of the dock, the part will be ejected from the mould by the inner face. The draft was set to 1 degree as this was the requirement for the SPI A-2 finish chosen. The screw hole bosses are long but this is taken in to account and the wall thickness was kept to 60% of the surface wall thickness.

Metal Separator and Backrest:



Figure 10: Metal Parts

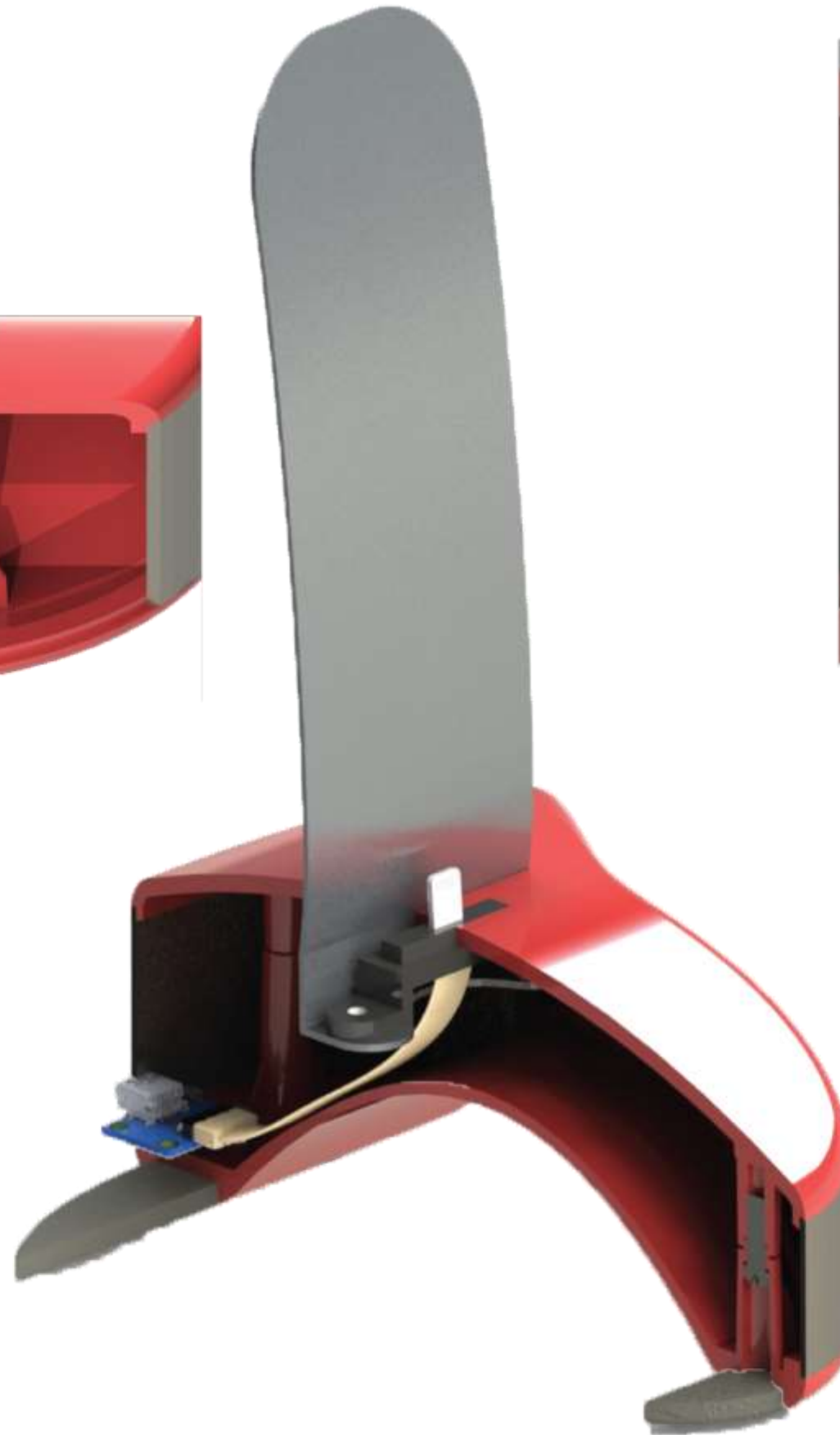
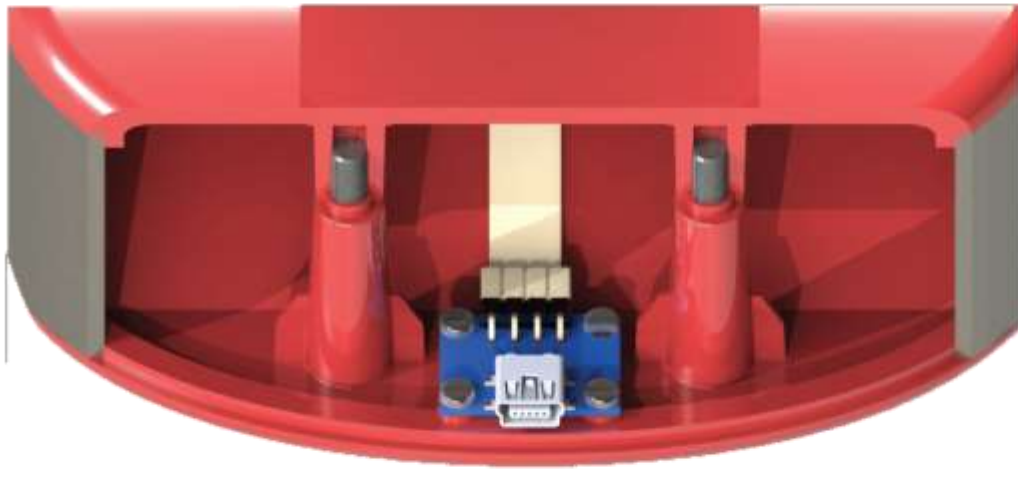
DESIGN:

The dock design needed a ridges and stylish way to support the iPhone in the upright position. This was difficult with plastic as it was difficult to achieve the aesthetics wanted. Brushed 316 stainless steel can achieve this aesthetic and strength requirements needed. The middle of the dock is for aesthetic purposes only and designed to complement the back rest stylings. This is achieved by a matching Ra 25 – 320 grit brushed finish,

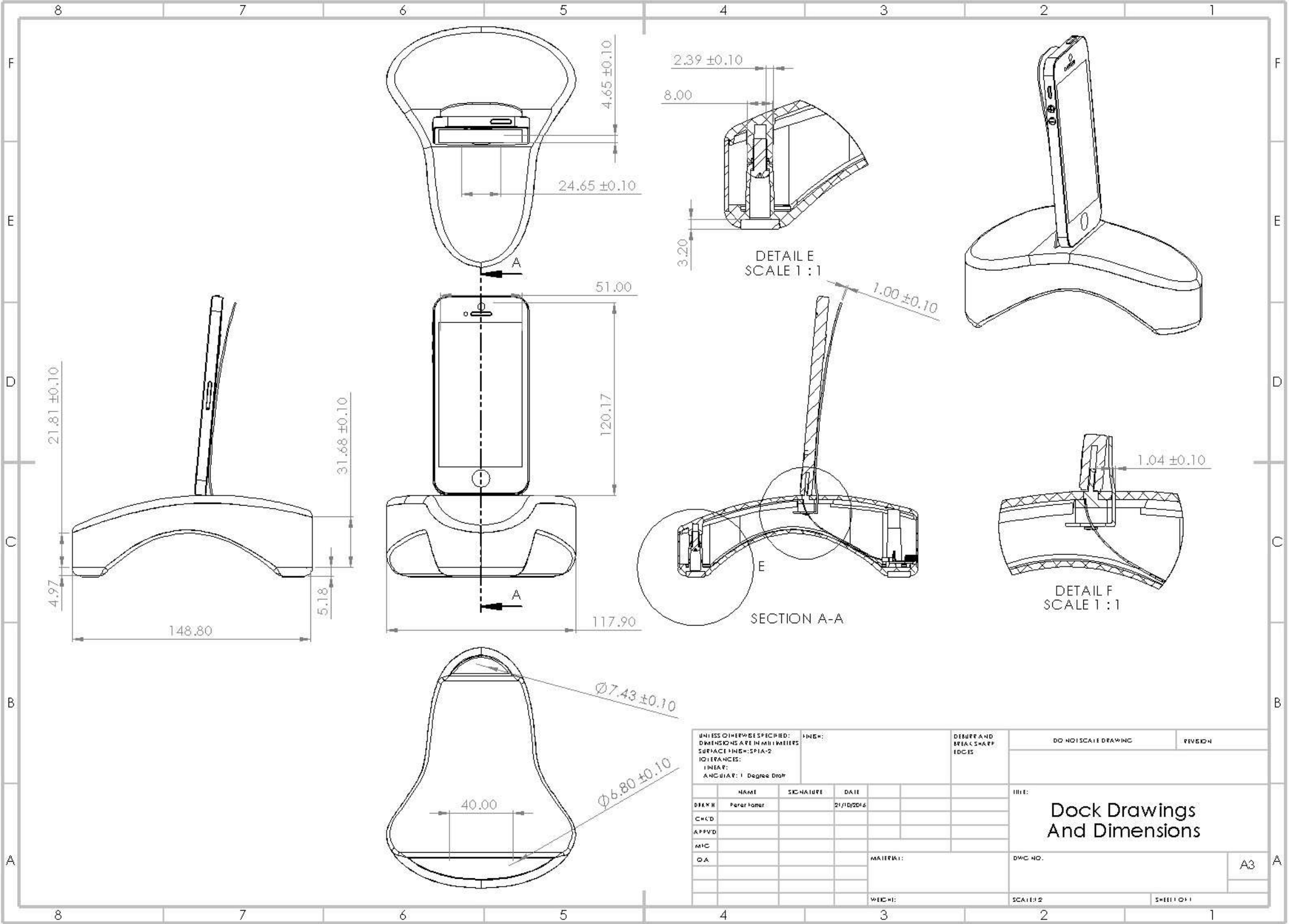
METAL FABRICATION:

The two metal parts are both made from 1mm 316 stainless steel sheet stock. The desired shape is stamped from the metal sheet and the sharp edges of the metal parts are dulled by stone tumbling. These parts are then bent and rolled in to the desired shape, with the middle being seam welded and ground flush to giving the final aesthetics of the dock a seamless look. The final finish is Ra 25 – 320 grit brushed in a single direction. This is performed at the end of the manufacturing process. The hole in the back rest are drilled to 3.2mm diameter, with the Micro USB hole punched to reduce cost.

Drawings - Mechanical:



Drawings – 2D Engineering:



Concept: Bespoke iPhone 5 Dock



Reference:

- [1] E. Prairie, “ABS | Plastics International,” 2016. [Online]. Available: <http://www.plasticsintl.com/abs.htm>. [Accessed: 16-Oct-2016].
- [2] BalesUSA.com, “SPI Mold Finishing Guide - Easy Conversion Reference between SPI & RA,” 2016. [Online]. Available: <http://www.balesusa.com/mold-finishing-guide/>. [Accessed: 20-Oct-2016].
- [3] Ssina.com, “SSINA: Stainless Steel: Finishes,” 2015. [Online]. Available: <http://www.ssina.com/finishes/sheetsamples.html#image>. [Accessed: 20-Oct-2016].