Range of Handles for Mortise Lock

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Aim and Scope of the Project

Objective : To design a range of mortise lock handles focusing on aesthetic appeal

The range should be wide enough to accommodate aesthetic preferences of a wide variety of users.

Data Collection

→ **Study of existing Range of Locks**

- Godrej Mortise locks
- Other Indian Manufacturers
- Export Markets

→Study of **Manufacturing Processes for existing locks**

→Study of **New Materials and Finishes for design**

→Visit to **shops and talking to dealers**

→**Qualitative interviews with probable users**

Type of Lock

Combi Pack

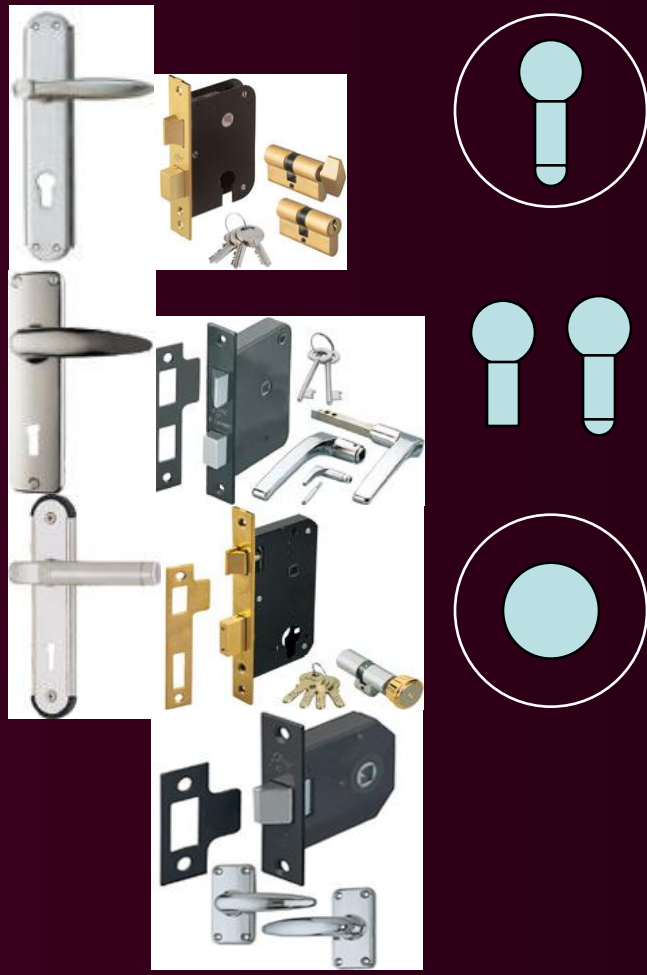
Rose Set

→Combi pack for **Euro Profile** Mortise Lock

→Combi pack for **Lever** Mortise Lock

→Combi pack for Ultra Mortise Lock

→Combi pack for Keyless Mortise Lock



Data Collection

Back Plate

→ Semi circular, straight
→ Embossing for **feature** lines
→ Engraving for **Richness**

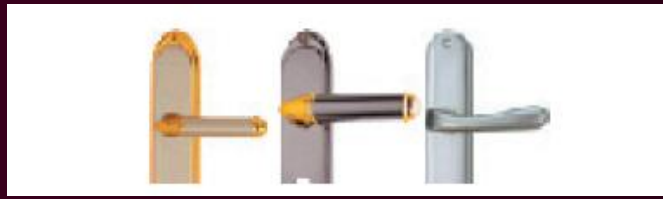
→Semi Circular
→Embossing

Handle

Straight Profile

Curved Profile

Details



→ Detailing at ends only
→ Rounded handle ends - **knobs**
→ Ends are bent **inwards** and **downwards**
→ Use of **Bi-metals**

Other Company Handles

Back Plate	Handle	Details

Straight Profile

→ Straight end plates
→ Patterns with punched holes

→Inclusion of other materials
→ Mostly no engravings to retain Elegance

Curved Profile

→ Curved ends plates
→ Designed profiles are used
→ Many types of curved handles

→Richness engraving is used
→Different Lock hole position

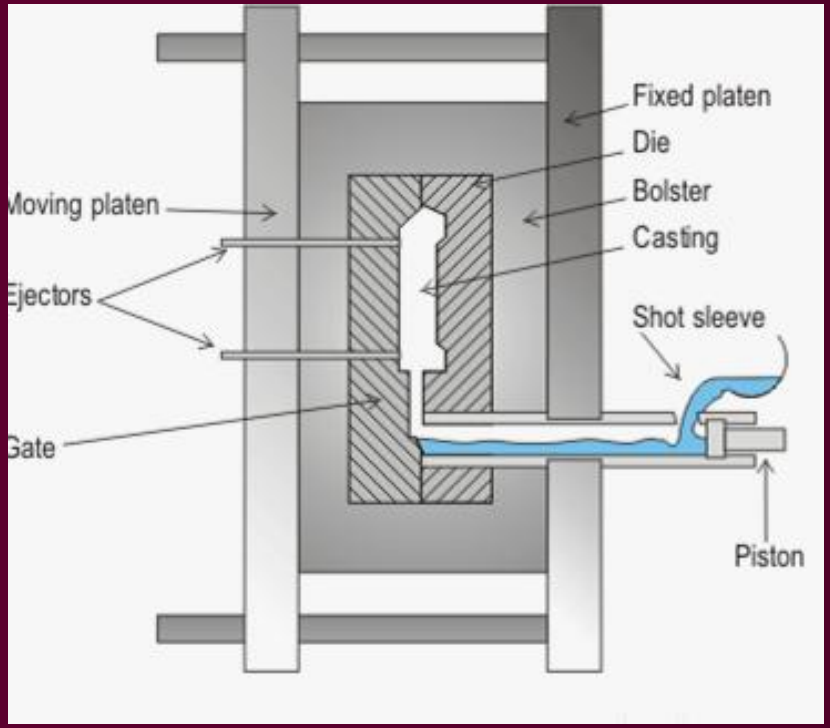
Data Collection

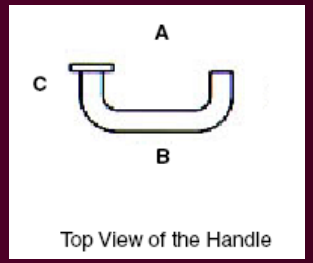
Manufacturing Details

Part	Material	Manufacturer	Process
Back Plate	MAZAK	In house Manufacturing	Die casting/Forged
	Brass	Vendor	Die casting/Forged
	Cast Iron	Vendor	Die casting/Forged
Handle	MAZAK	In house Manufacturing	Die casting/Forged
	Brass	Vendor	Die casting/Forged
	Cast Iron	Vendor	Die casting/Forged
Spring	Spring Steel	Available	Coiling
Stopper Plate	Hardened Steel	Vendor	Sheet metal Blanking
Circlip	Spring Steel	Available	

Manufacturing Details

Die Casting



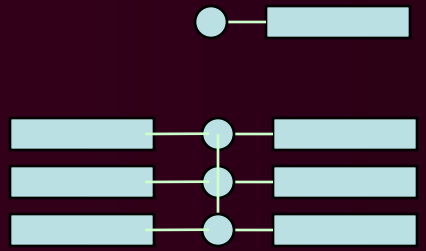


Top View of the Handle

A→ Difficult

B→ For single Cavity

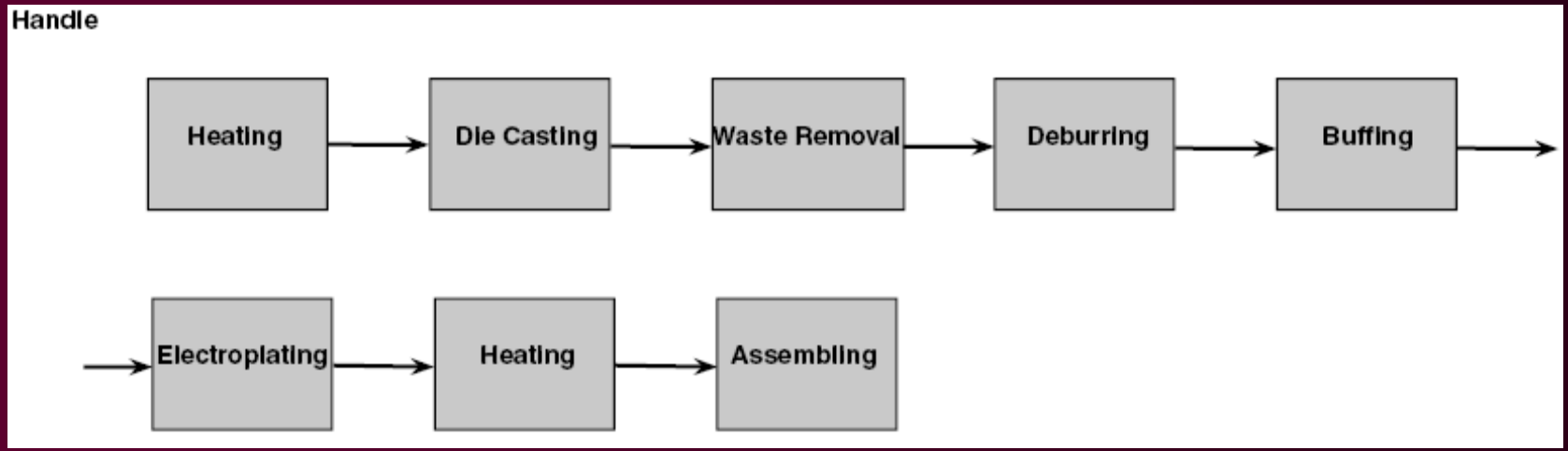
C→ Multiple Cavities

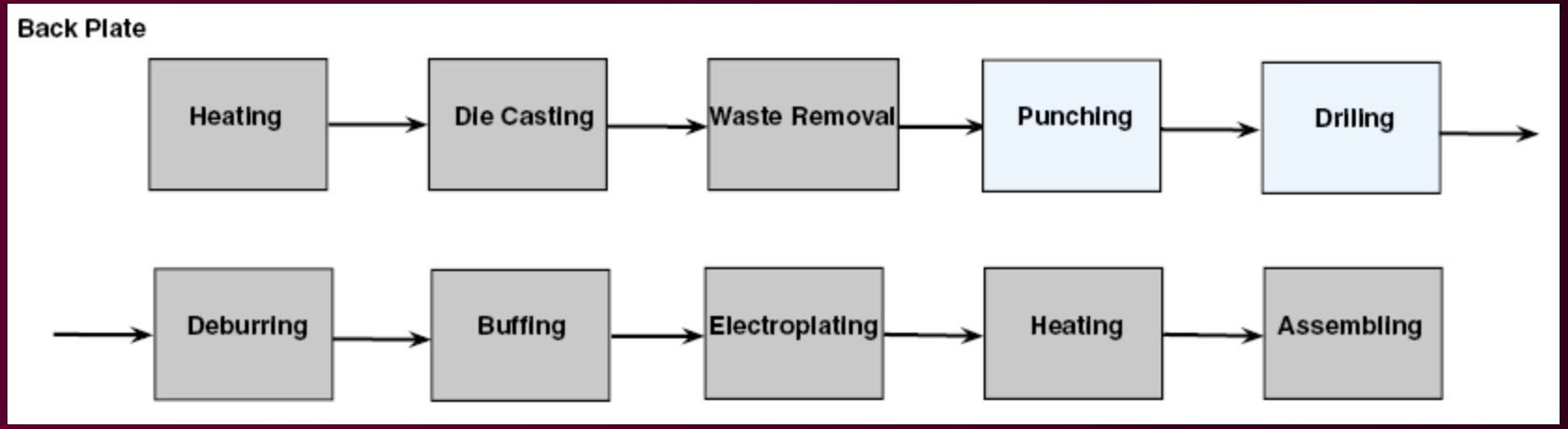


Dis. Adv.

- Voids & **Porosity** is Possible in Complex Shapes
- **Expensive** Machinery & Dies
- Limited to Metals With **Low** Melting Points (normally no higher than copper-based alloys)
- Hollow sections are complicated

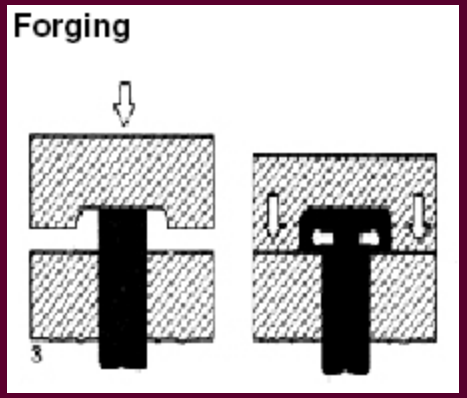
Manufacturing Details





Manufacturing Details

Forging



→ Improves properties and Required shape
→Tolerance – 0.5 to 1%
→ Reasonable complex structures

Dis. Adv.

- Expensive Dies
- Skilled Labour
- Rapid Oxidation

Using Forming Process for new design

- Cost effective
- Formal advantage of volume
- Versatile Shape
- Less material usage

- Roll Forming
- Stretch Forming
- Drawing
- Stamping
- Rubber Forming
- Spinning
- Super Plastic Forming
- Peen Forming
- Explosive Forming
- Magnetic Pulse Forming

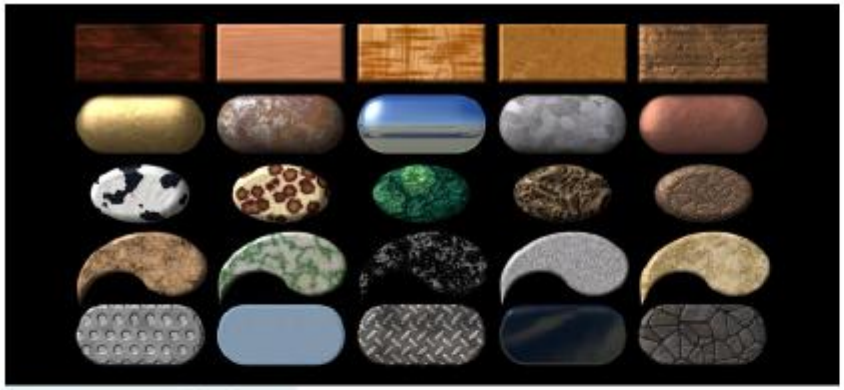
Finishes


Pure finishes
Matt Satin
Gold
Pearl Gold
Royal Gold
Chrome
Brass
Beige
Brown
Combination Finishes
Satin-Chrome
Polished Brass
Satin – Gold
Satin-Nickel
Satin-Brass
Polished Chrome
Brushed Nickel
Black – Gold
Antique Brass

Finishes

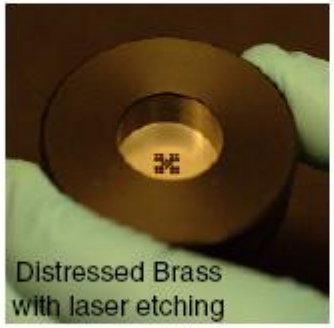

New Types of Finishes
Oil Rubbed Bronze
Chrome-White Enamel
Satin Black
Distressed Brass
Antique Nickel / Pewter
Venetian Bronze
Antique Copper
Distressed Oil rubbed Bronze
Antique Nickel

Finishes



Enamels

Stainless steel with Titanium coating



Distressed Brass with laser etching

Titanium Nitride Coating

Pg: 19

Finishes by Other Materials

GE Plastics

Lexan Resins

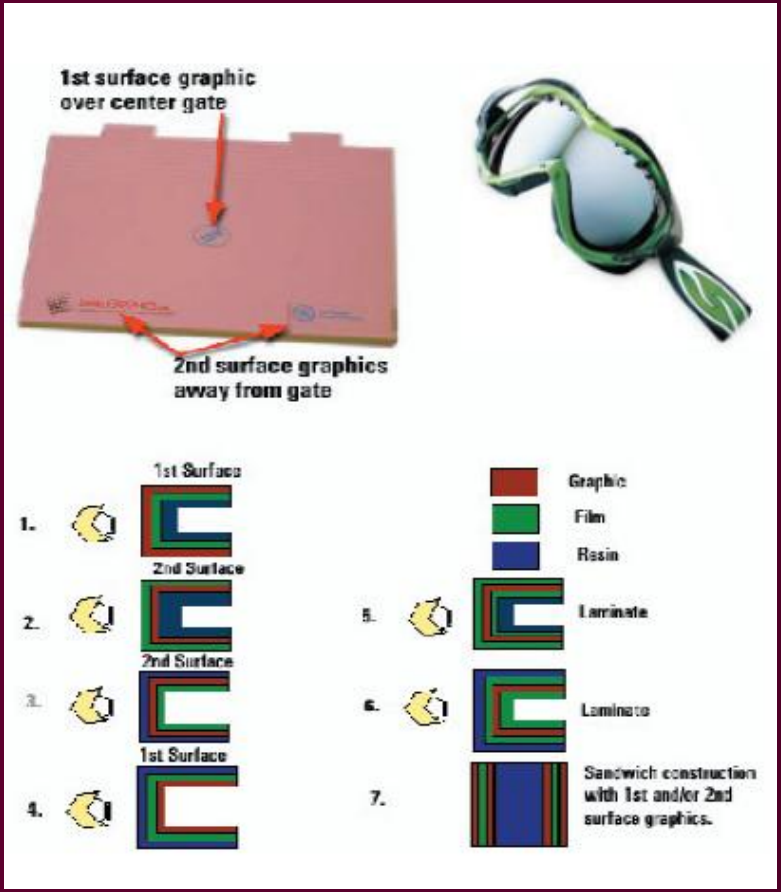
Lexan Polycarbonate -- ⇑ Impact Strength, Crystal Clear

PC ABS -- ⇑ Strength, Thin wall molding

Cycoloy Polycarbonate -- ⇑ Impact Resistant, heat resistant, Aesthetics

Finishes by Other Materials

GE Plastics



In-Mould Decoration

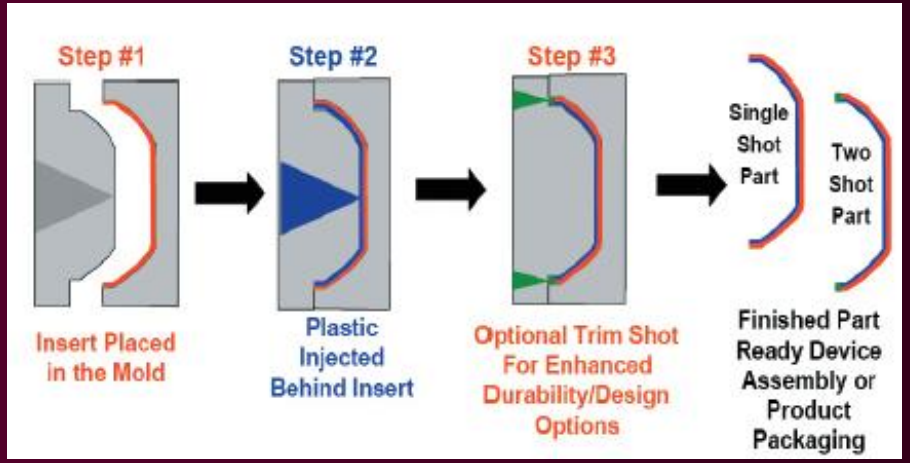
IMD -- ⇑ Design flexibility and productivity
- Multiple colors, effects, and textures
- Long - lasting graphics
- Systems cost reductions

Manufacturing gains --
- Reduced secondary operations
- Molds and decorates in one operation
- Reduce cost and process
- Lower system costs
- Reduced inventory

Finishes by Other Materials

INCLOSIA

The EXO Over molding process

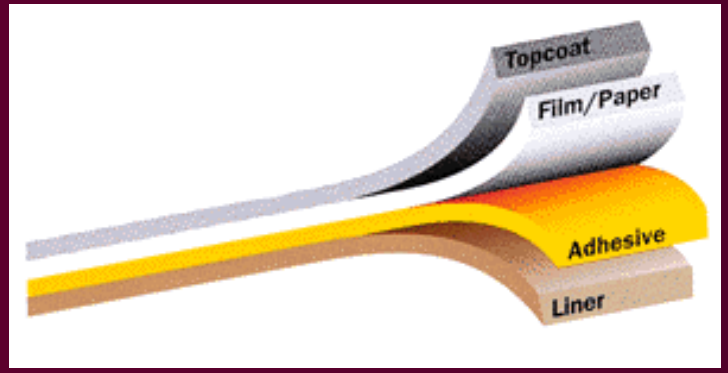


The design flexibility includes --

- Deep draw
- Holes and pockets
- 3-D shapes
- Logos and emblems
- Embossing and debossing
- Printing and laser etching
- Mixed materials
- Integrated fasteners

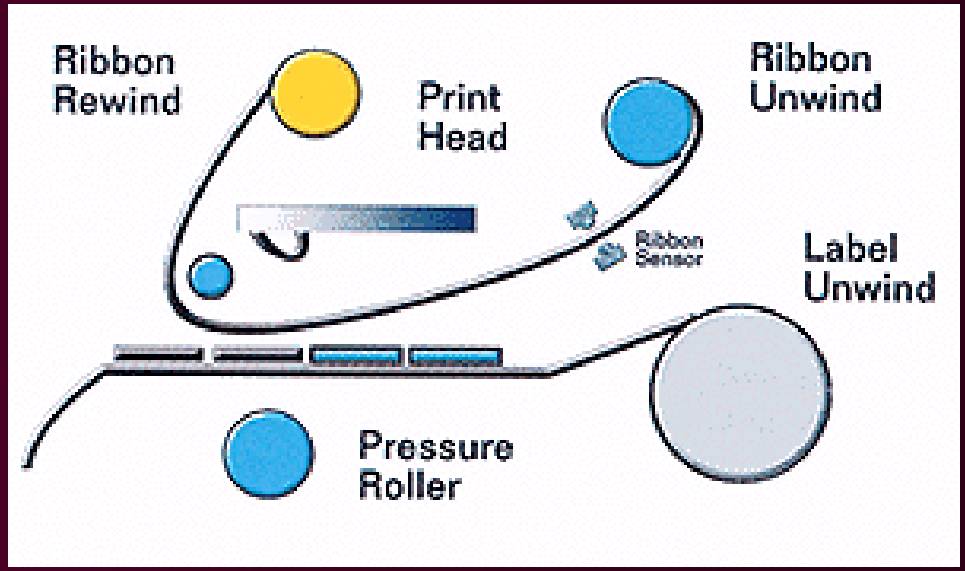
Finishes by Other Materials

Techno Prints, Mumbai



Heat Transfer Printing

Polyester or high-density tissue coated on one side with either a wax-base ink, resin-base ink or a combination of both.



Finishes by Other Materials

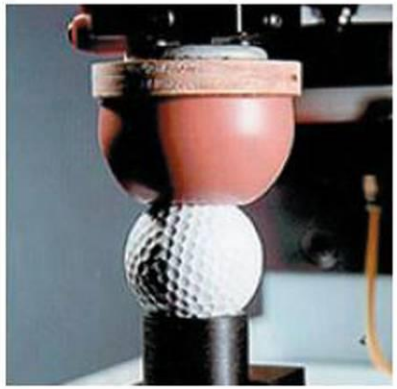
Techno Prints, Mumbai

Heat Transfer Printing

- Works on a heating concept
- Durable, high quality labels
- Used under a wide range of environments
- Wide range of color ribbons available
- Easy to use
- Multiple Colors

Finishes by Other Materials

Techno Prints, Mumbai



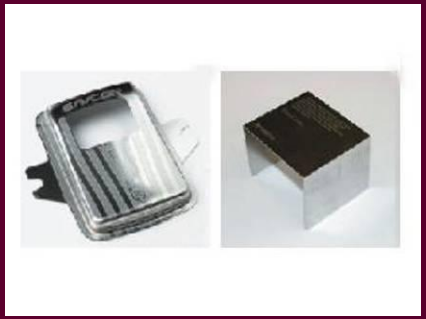
Pad Printing

- Applied on Round surfaces
- Only CMYK colors

- Extreme adaptability
- Can be used on objects of various material with its specific ink.
- Printing wet on wet

Finishes by Other Materials

Sharpline Converting Inc, Newyork, US

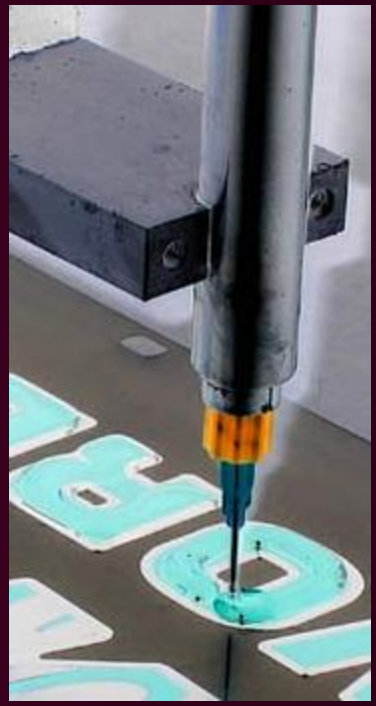


Etching

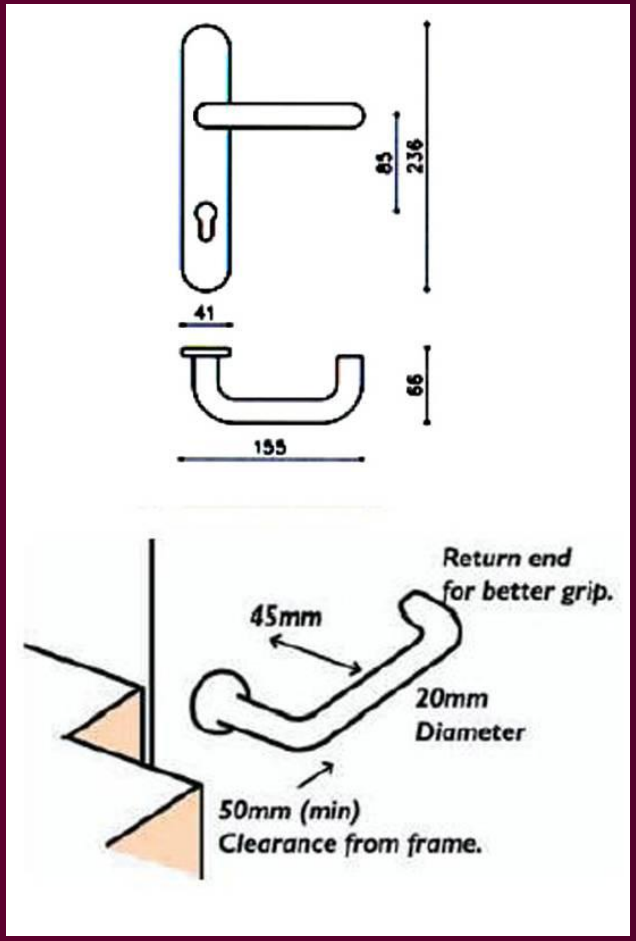
Crystal Clear

Process involves debossing relief patterns in the chrome base of the image, providing additional detail and complexity

Material : Urathene



Constraints



Dimensional Constraints

1. The center to center distance = 85mm
2. The center to center distance between the screws holes = 236mm

Human Factors Constraints

1. The force < 20N
2. Distinguishable colors with the door
3. The length of the handle >= 145mm
4. Griping dia = minimum 20mm and maximum 35mm
5. It is preferred if return end has a little bigger gripping dia

Handling of Handle

Thumb Position

Colored handles

Protrusion on one end

Avoids Slipping

Key hole Position

Inferences

Form

- Rose set forms developed than Combi Pack
- Back plate form is almost same in most of the handles
- Larger handle – More expressive
- Curved profiles are more Playful and Dynamic
- Straight profiles are Elegant and Modern
- Fitting Screws details are not worked out much
- Only Solid forms are used

Manufacturing

- Processes – Die Casting or Forging

Inferences

Finishes

- Contrast between materials is giving more Expressive
- No graphics – Engraving or Embossing
- Availability of More finishes

Materials and Expressions

- Polished brass, black and gold – Elegance, elightness
- Matte nickel and gold -- Richness
- Brass -- Pure
- Chrome / Nickel -- Moderns

Product Brief





To design a range of mortise lock handles focusing on aesthetic appeal which will satisfy the following

1. **Form and Aesthetics**

   Playful range - Youth
   Elegant -- Middle age population
   Postmodern -- Who wants to be different

2. **Manufacturing**

   Reduction in cost by tooling

3. **Cost**

   Common Dies
   Reflect Godrej's capability in precision die manufacturing

4. Common back plate → Economical and defines range

Playful - Mortise Lock Handles

Form







Material




Details





Low

High

Elegant – Mortise Lock Handles

Form

Material

Details

Low

High

PostmoderN – Mortise Lock Handles

Form

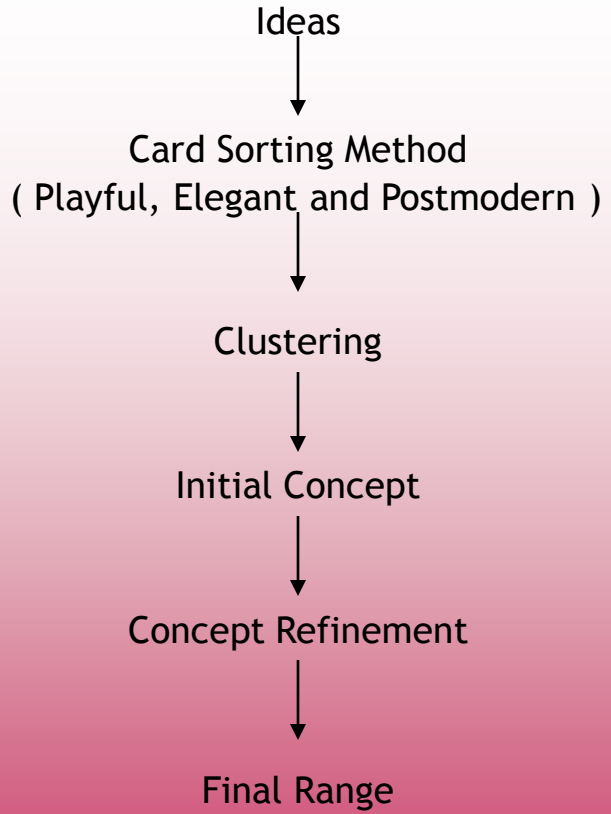
Material

Details

Low

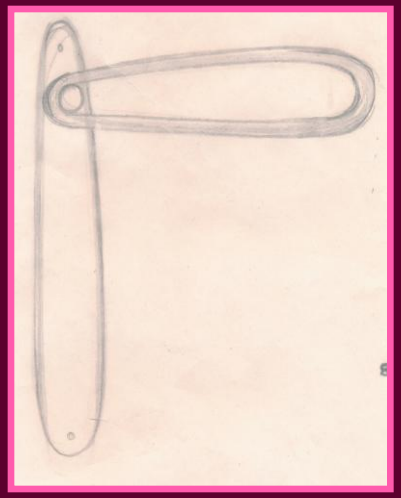
High

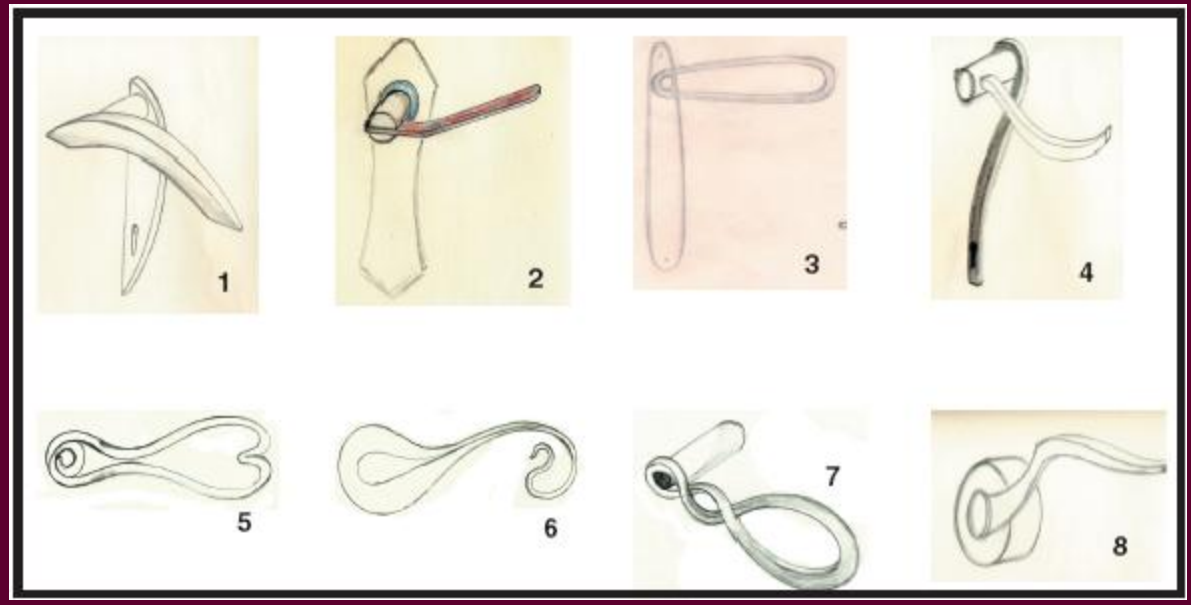
Idea Generation



Cluster 1: Rod Shape

Playful – Interplay between elements





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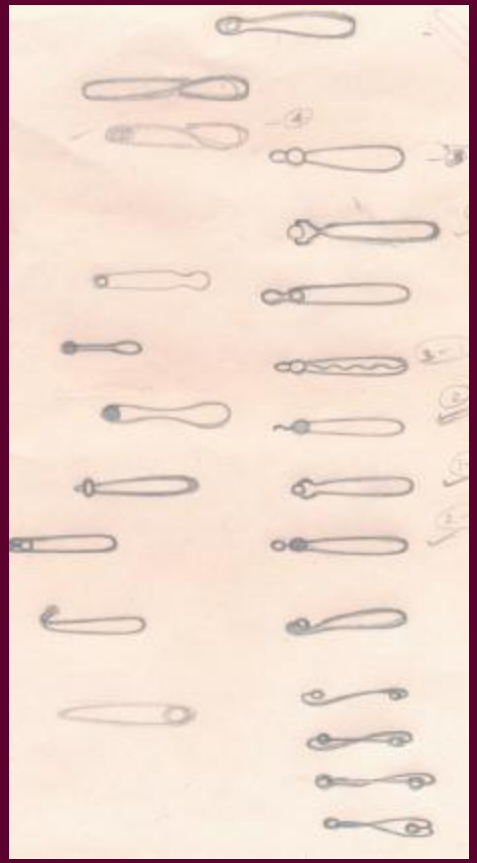
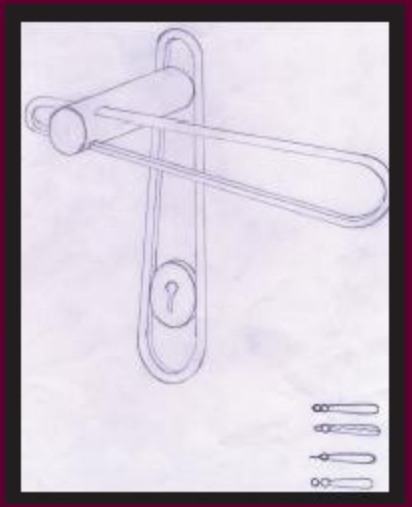
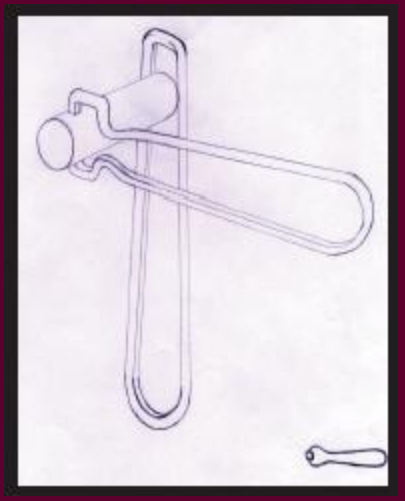
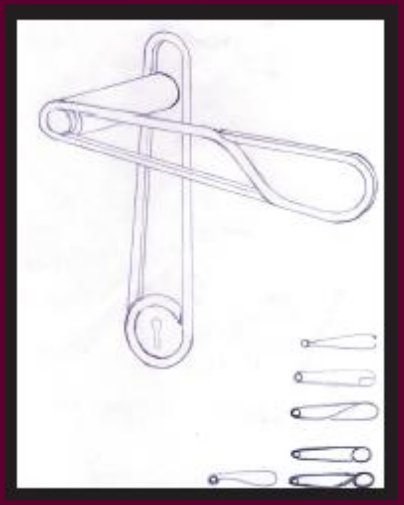


Playful – Foreground and background
-- Flow of lines
-- Intersecting lines

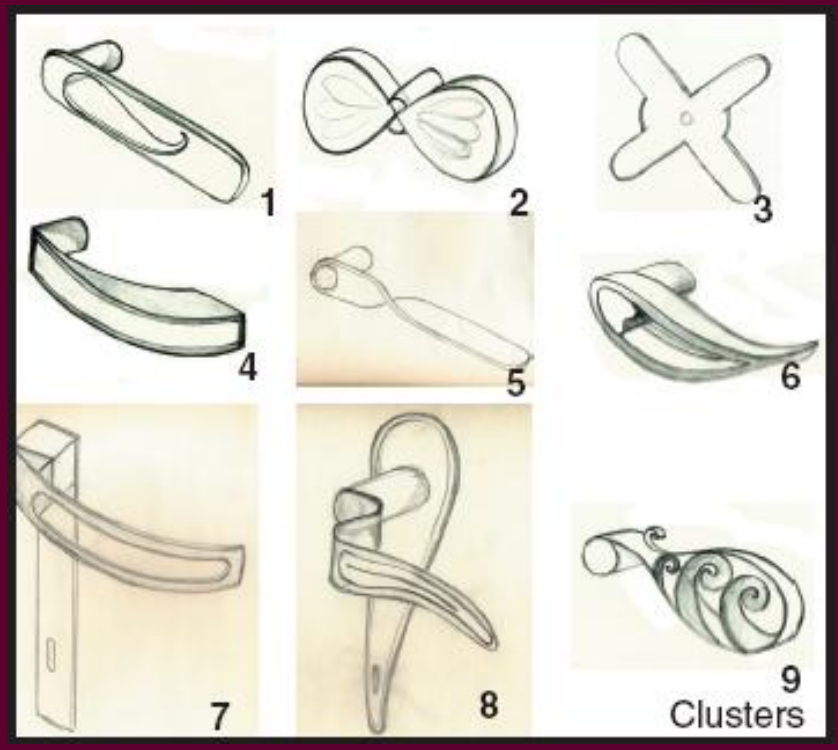






Cluster 2: Sheet Form

Playful - Bents
-- Flow of lines



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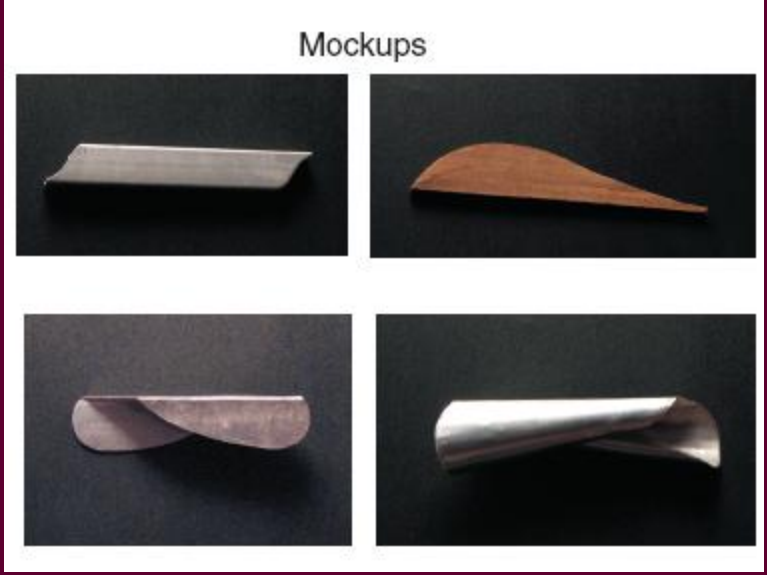
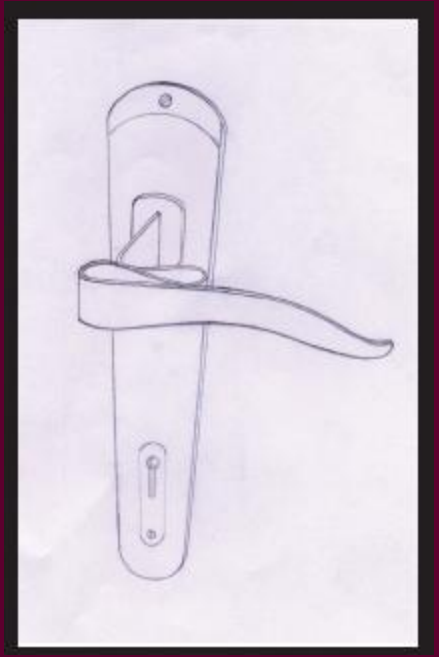
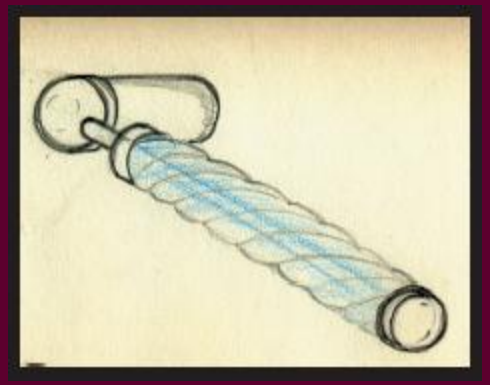
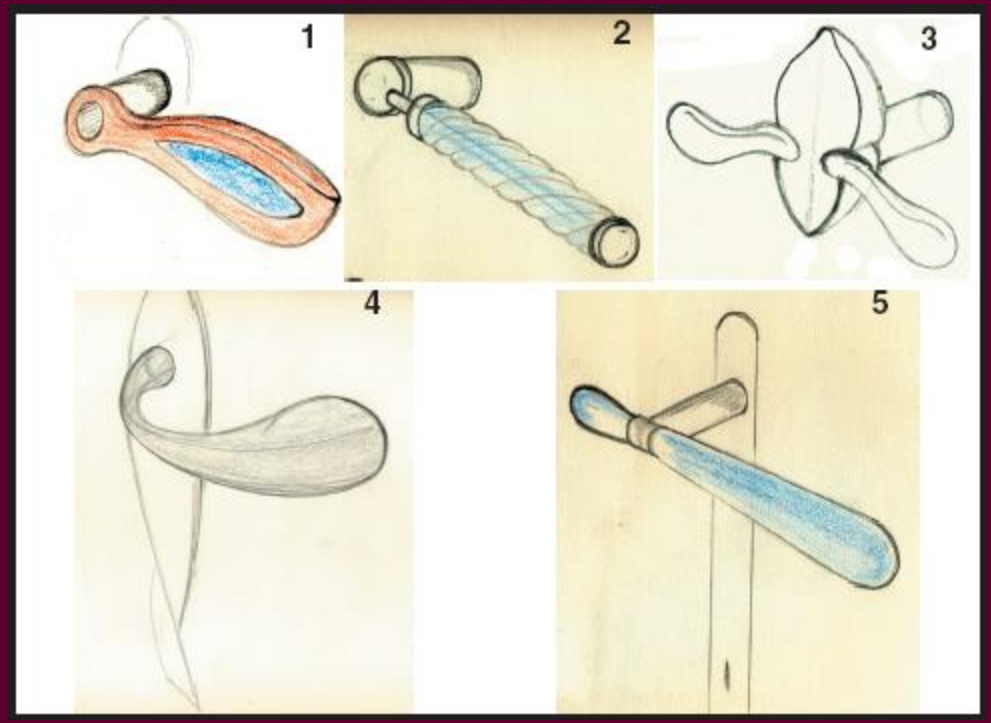




Cluster 3: Solid Form

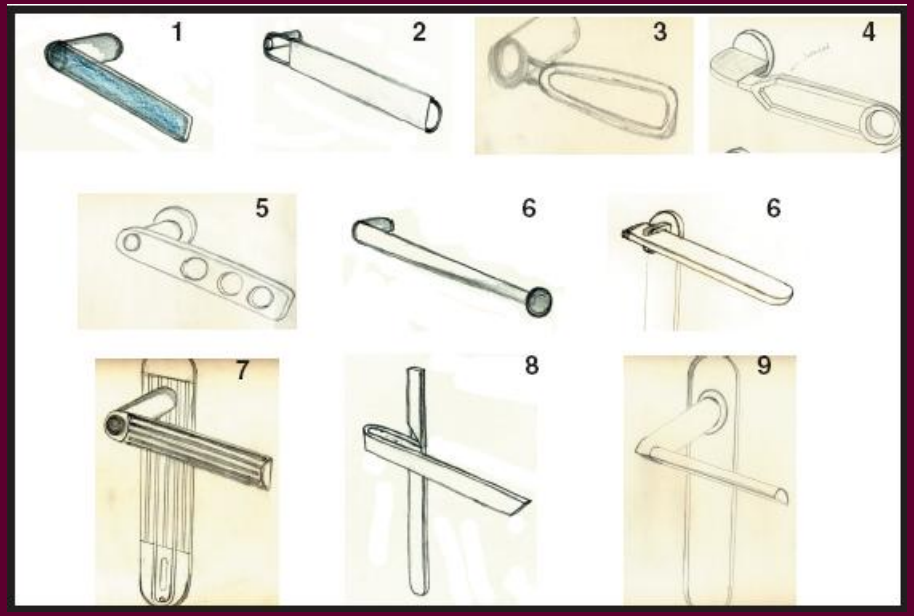


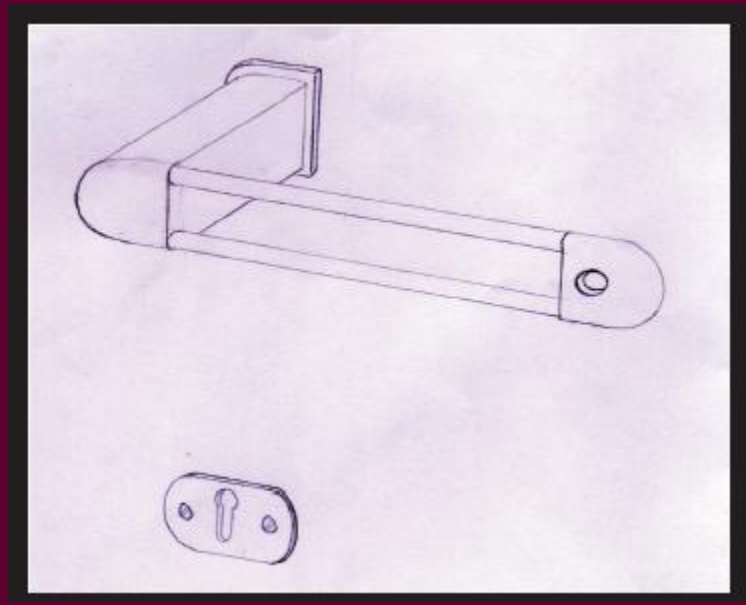
Playful – Interesting twists
-- Multiple lines / Curves



Cluster 4: Rod Shaped

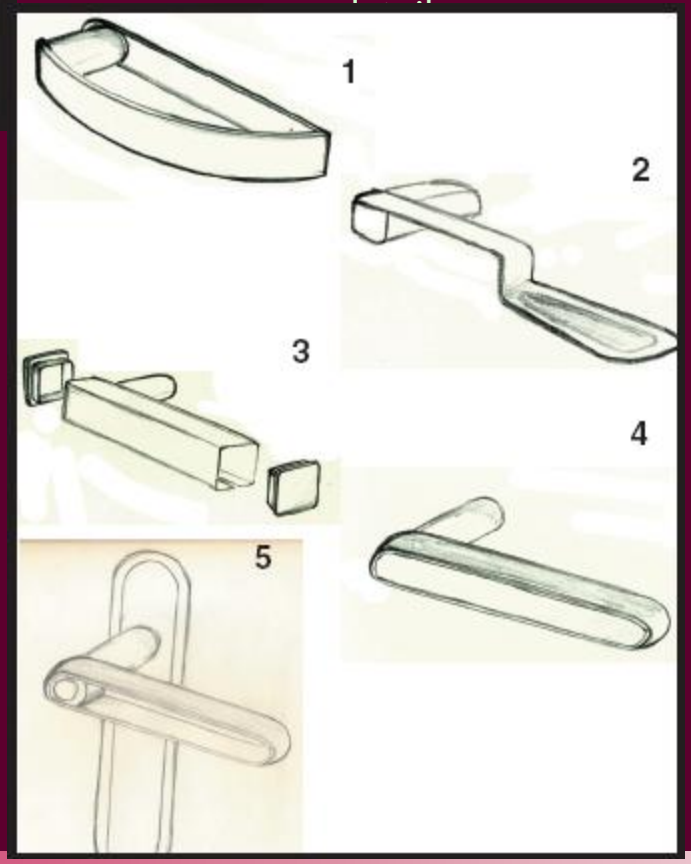
Elegant - Sleek lines
-- Small radii

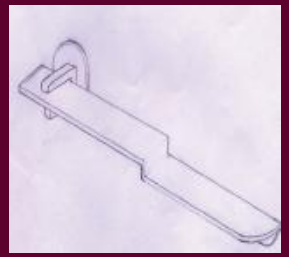


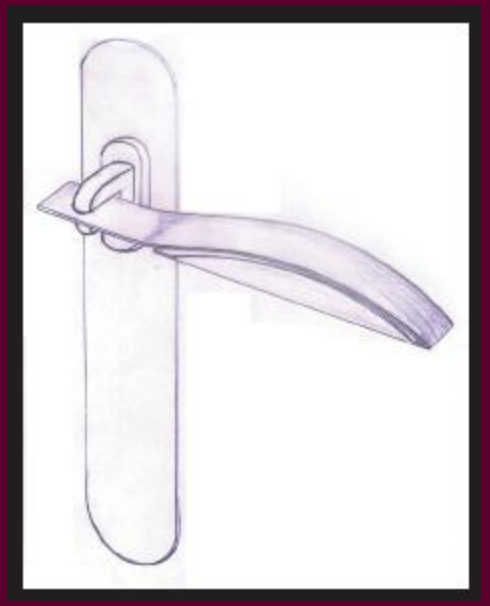


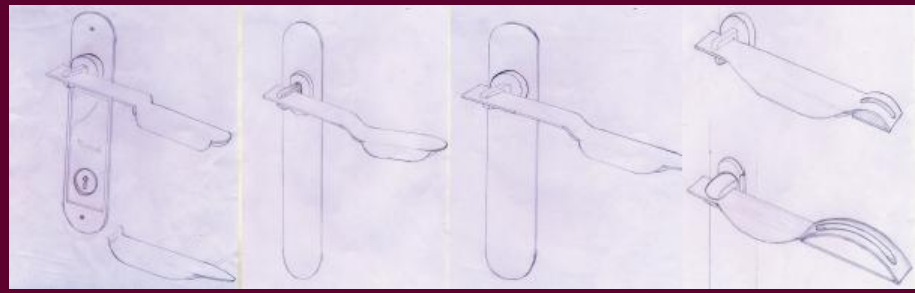
Cluster 5: Sheet Form

Elegant - Sleekness in the whole form
-- Narrow bents and Joining

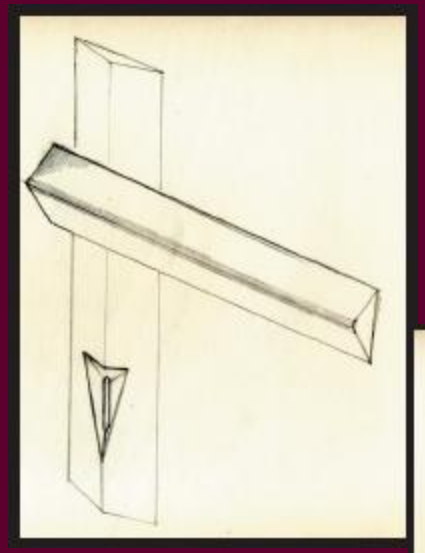




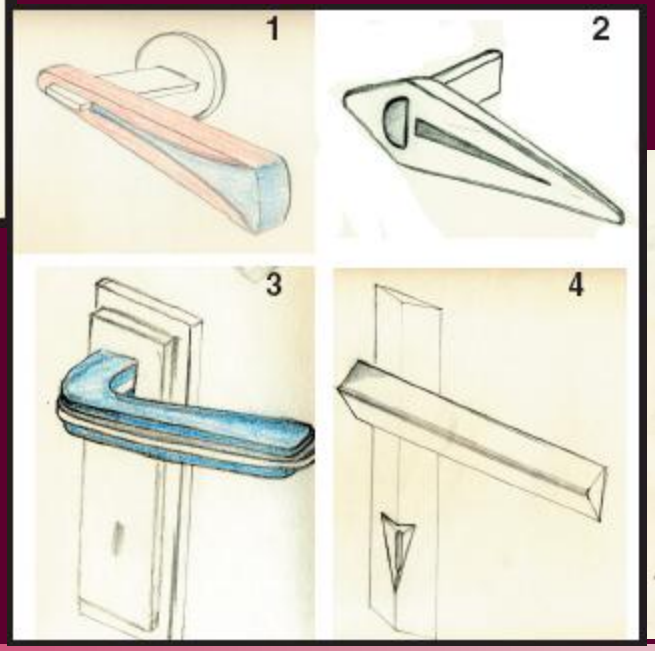


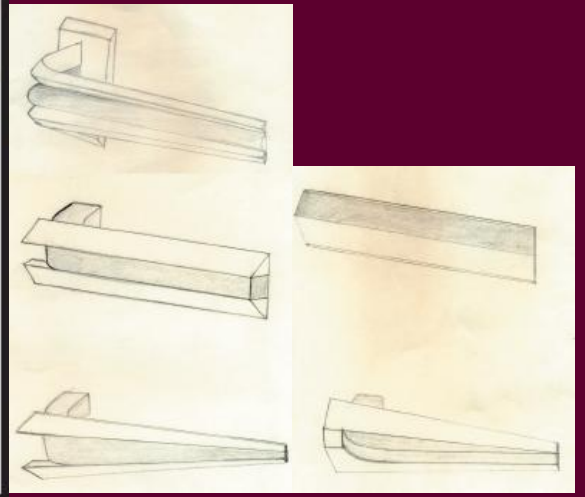


Cluster 6: Solid Form



Elegant - Straight and Sleek in whole form
-- Simple geometry





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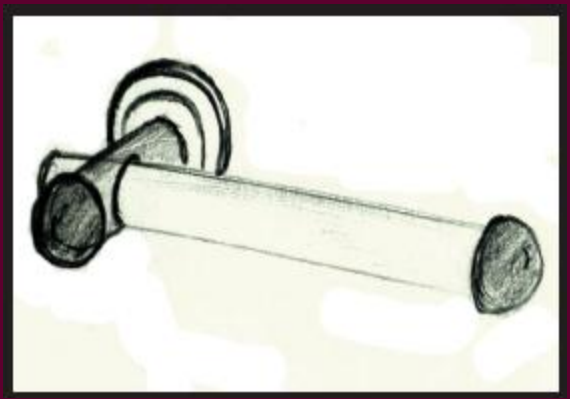
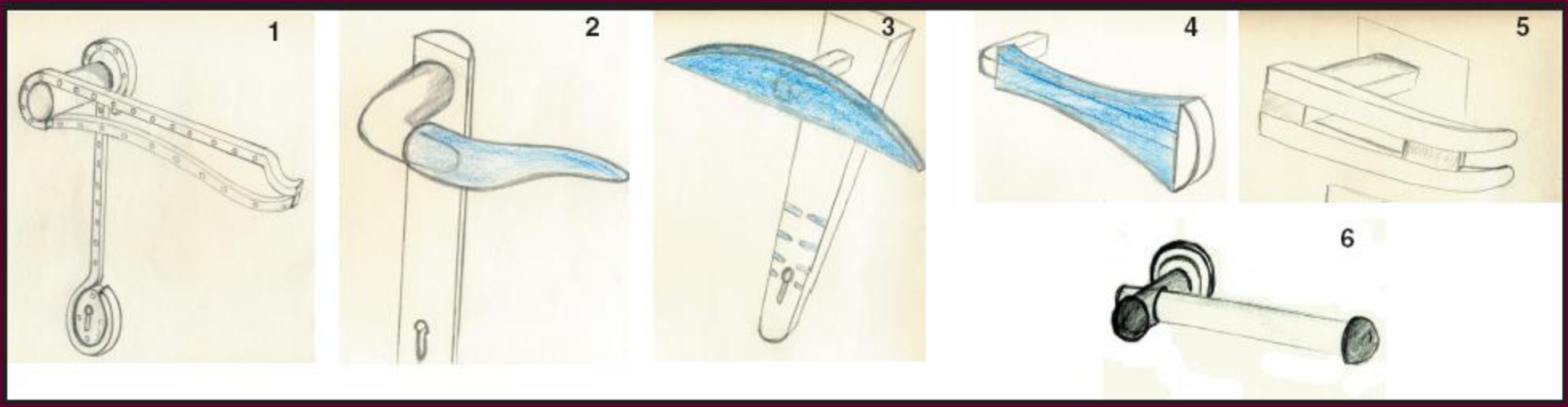
Cluster 7: Rod Shaped



Postmodern

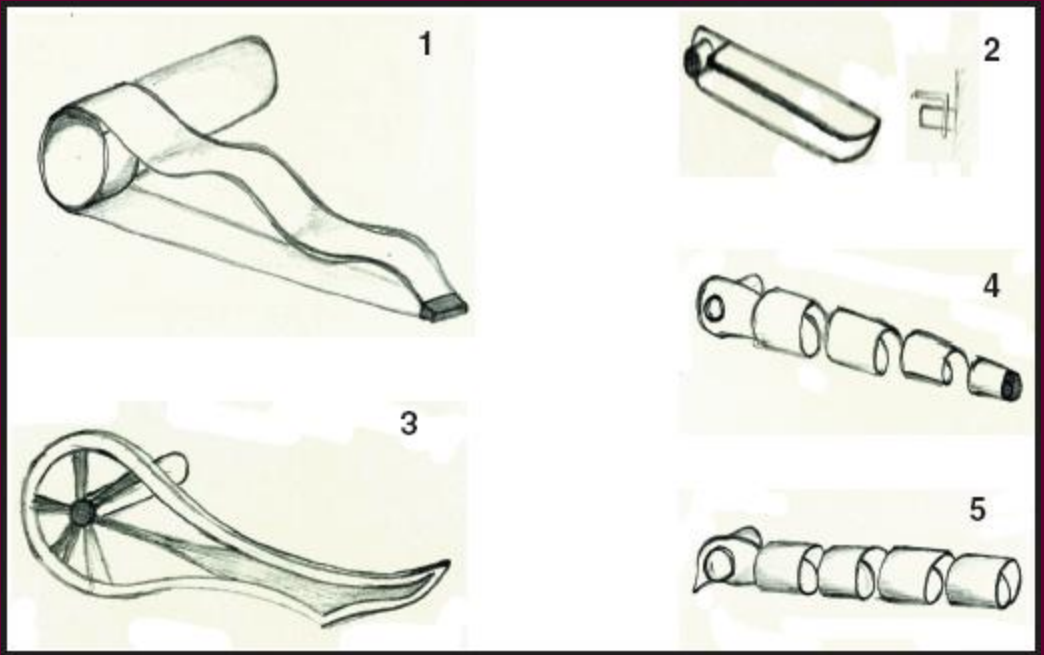
- Irregularity, new material
-- Narrow bents and Joining details



Cluster 8: Sheet Form

Postmodern

- Use of metaphor of Spring
-- Wavy patterns



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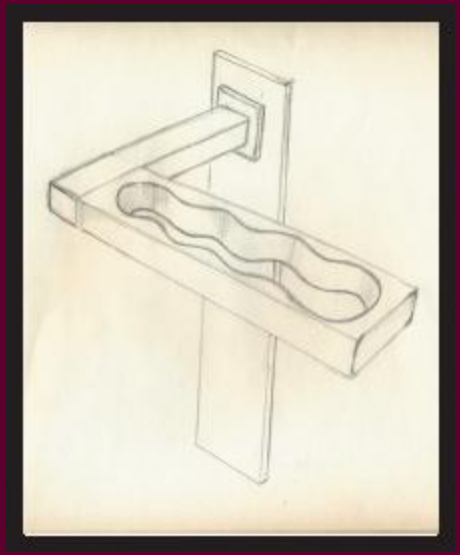
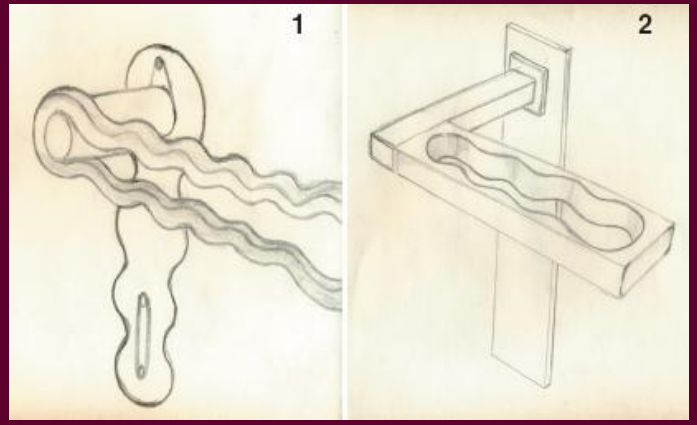
Cluster 9: Solid Form



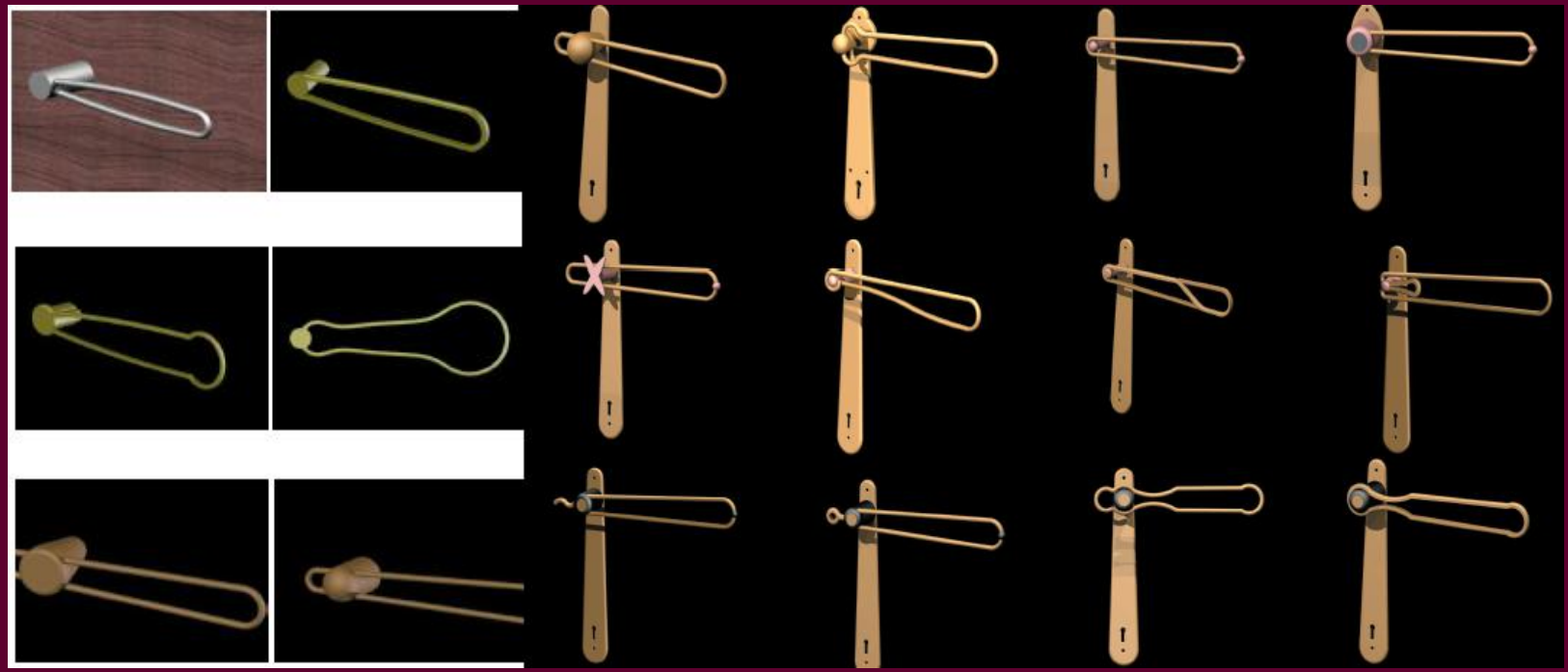
Postmodern

- Use of Profile of the hand
-- Sudden tilt at the joint



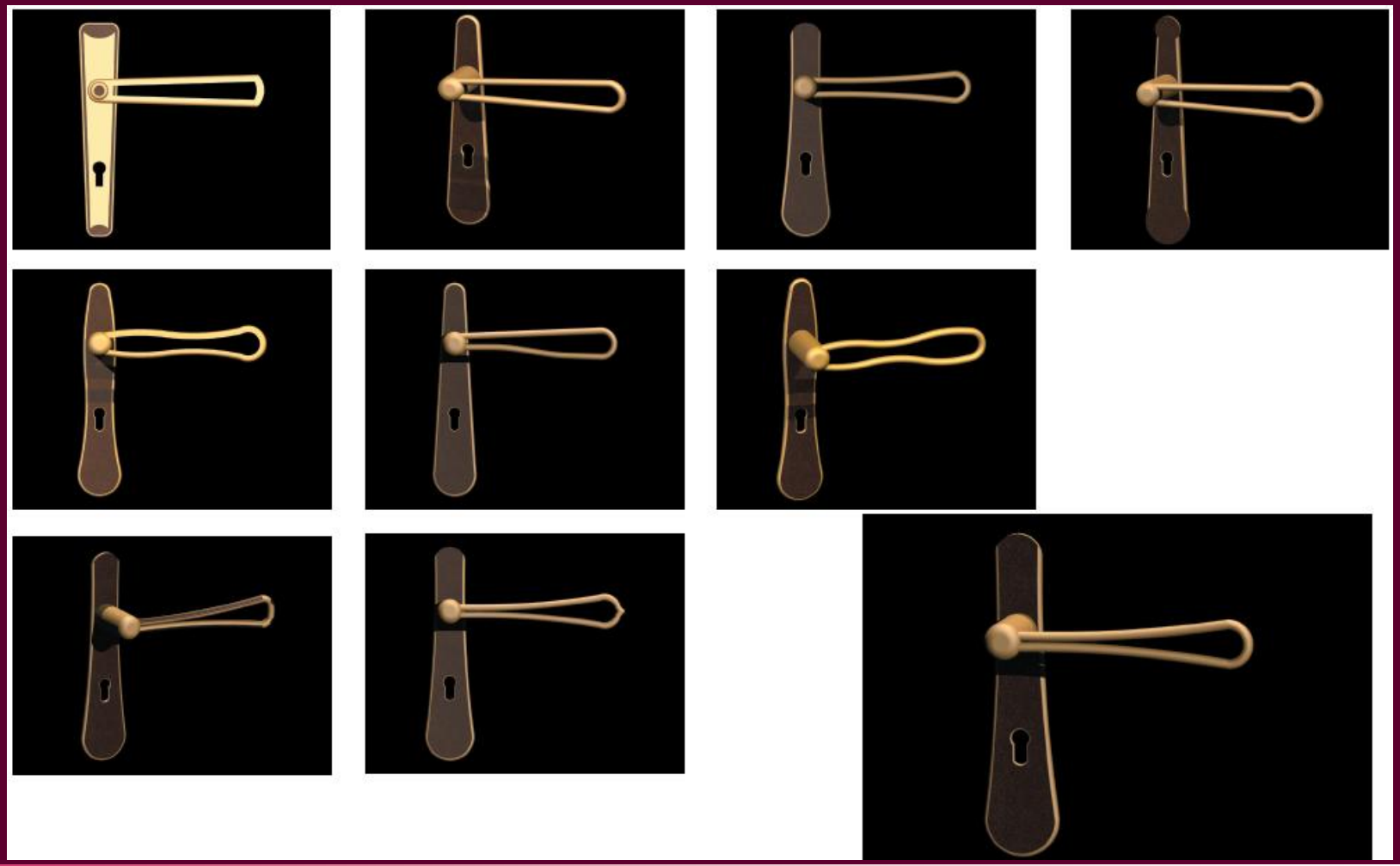
Concept 1 Refinement

Playful - Rod Shape

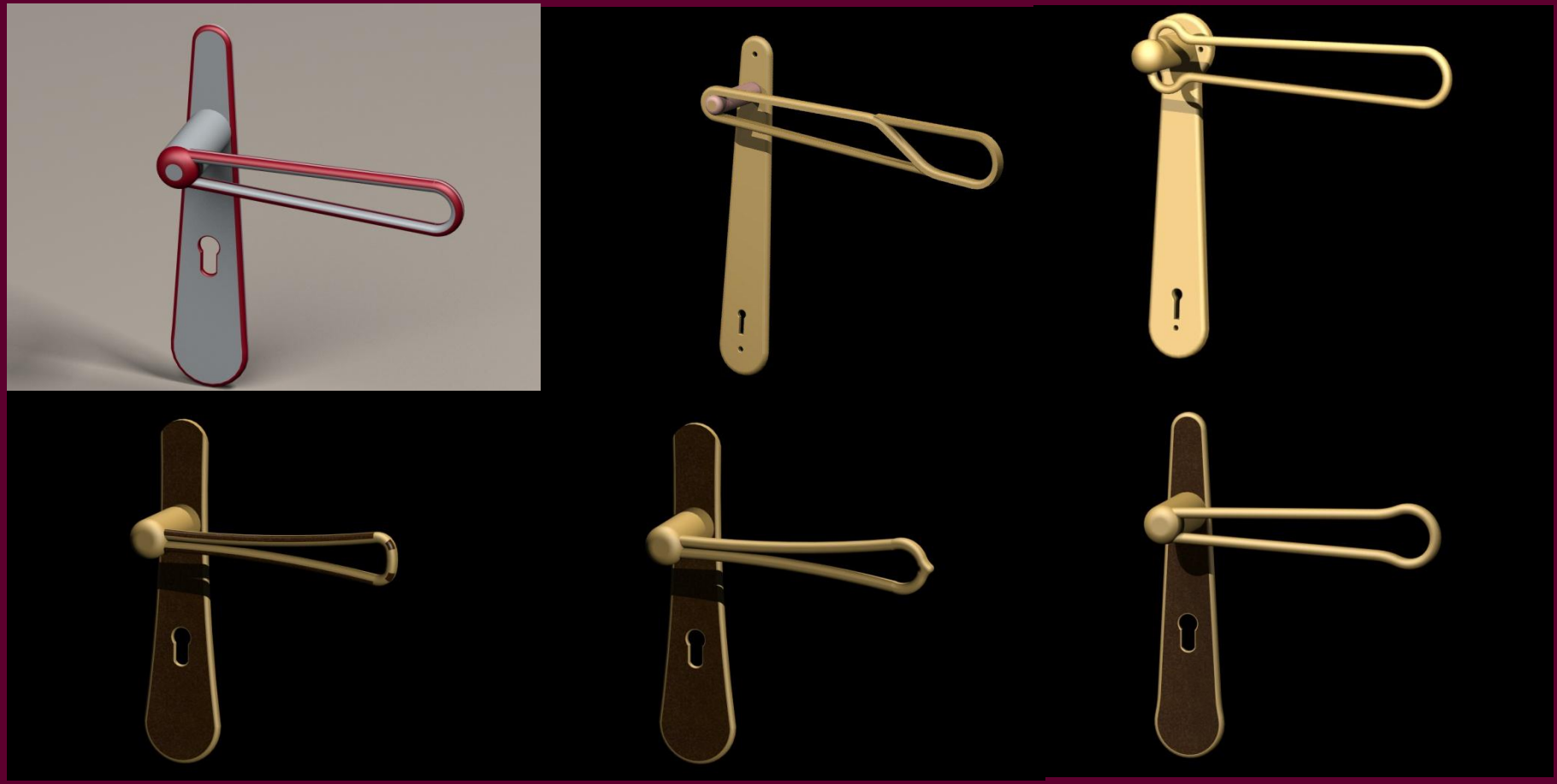


Concept 1 Refinement

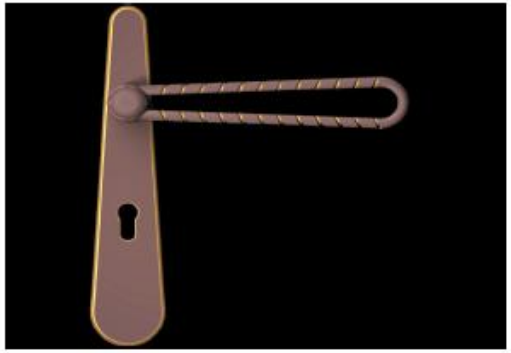
Rod Shape

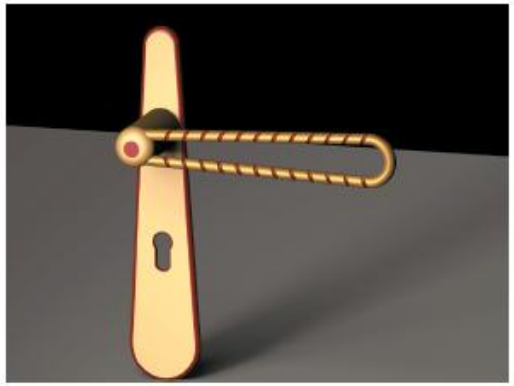


Rod Shape

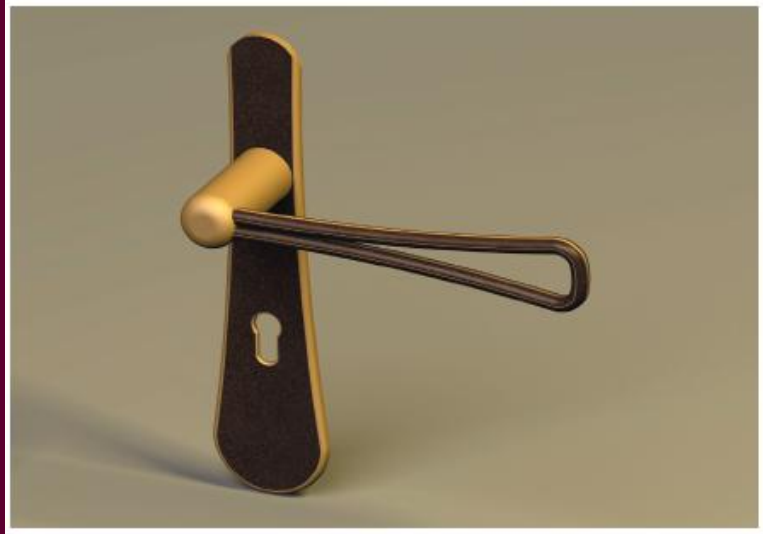


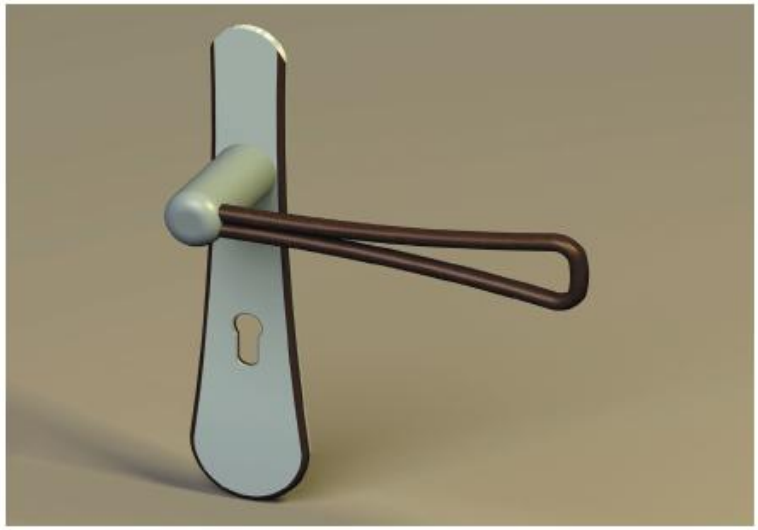
Rod Shape - Graphics





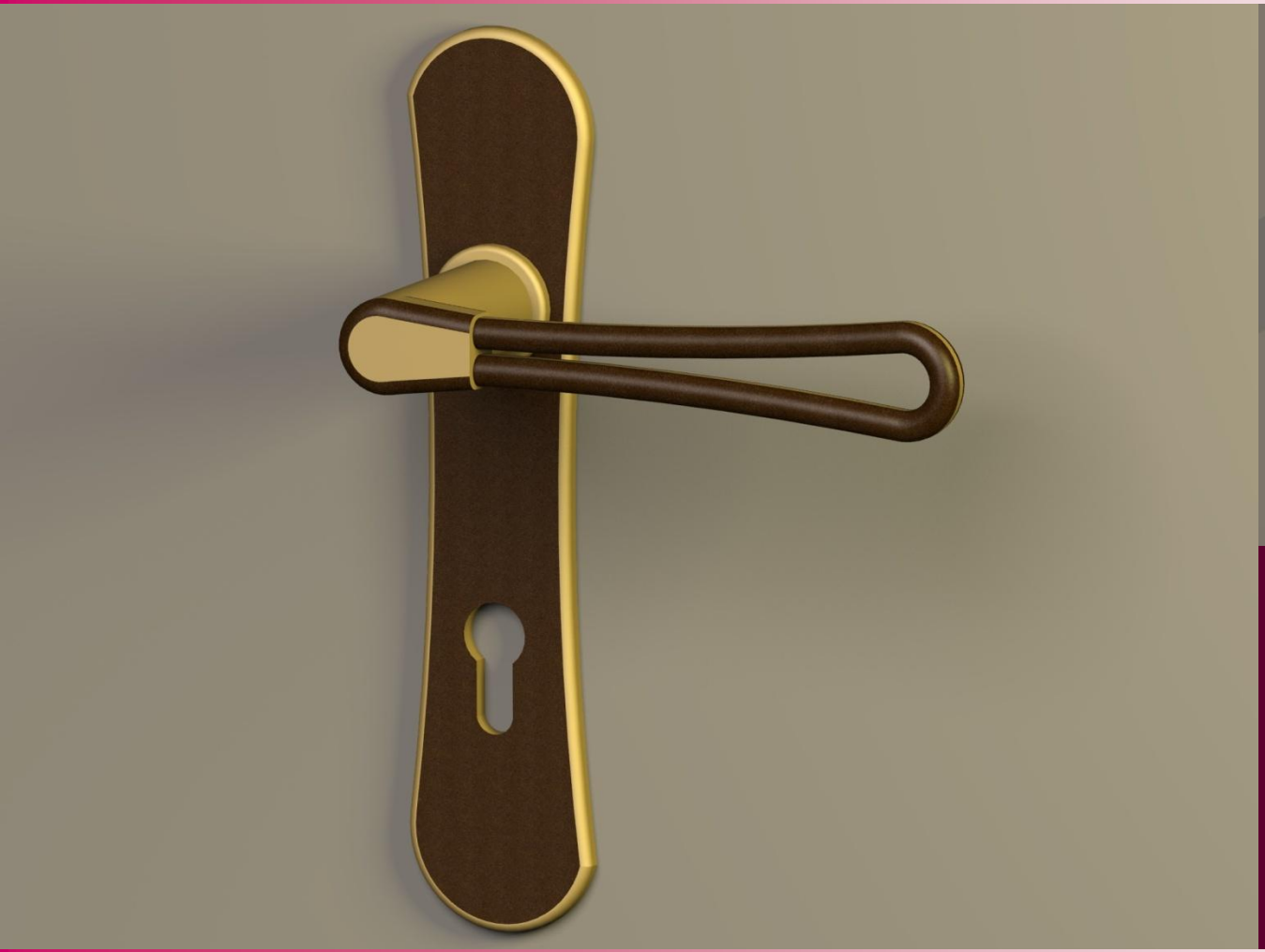
Final Concept Refinement



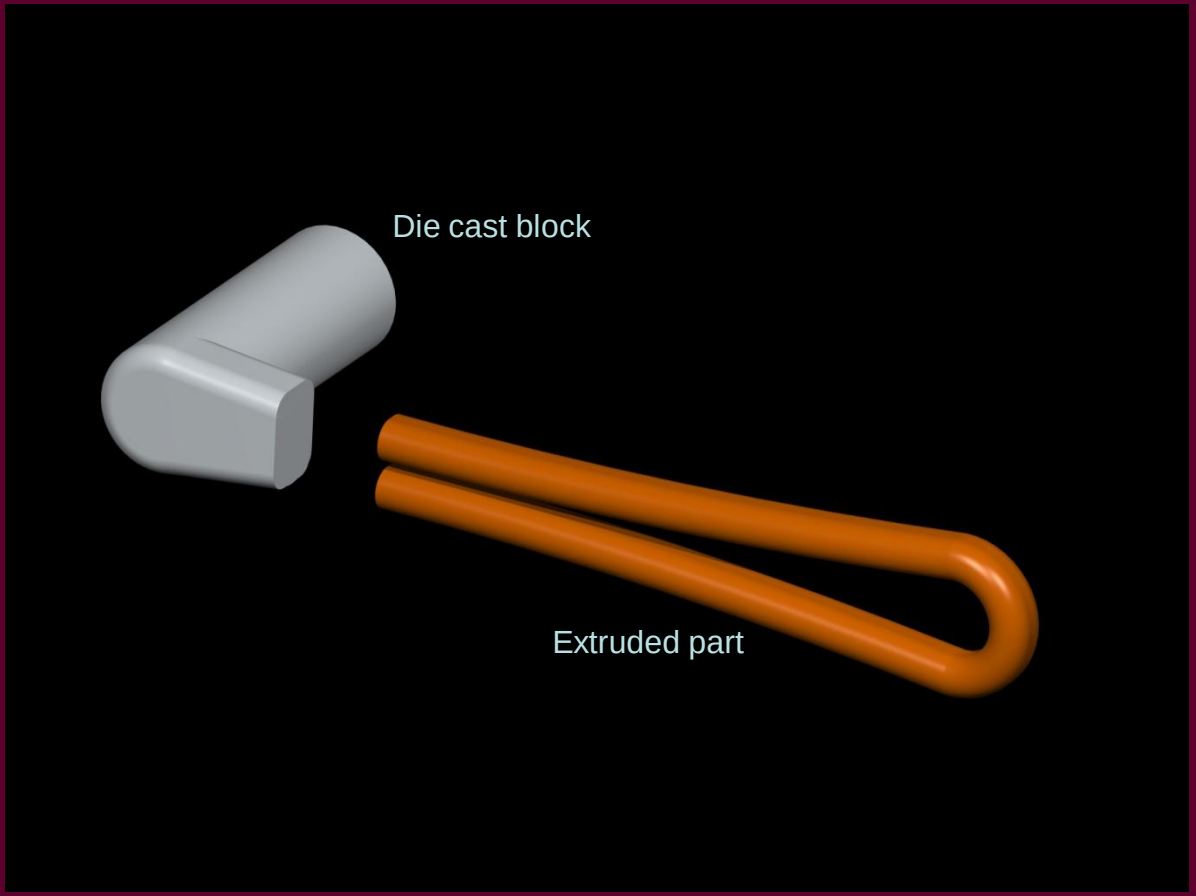


Concept 1

Rod Shape



Rod Shape



Manufacturing :

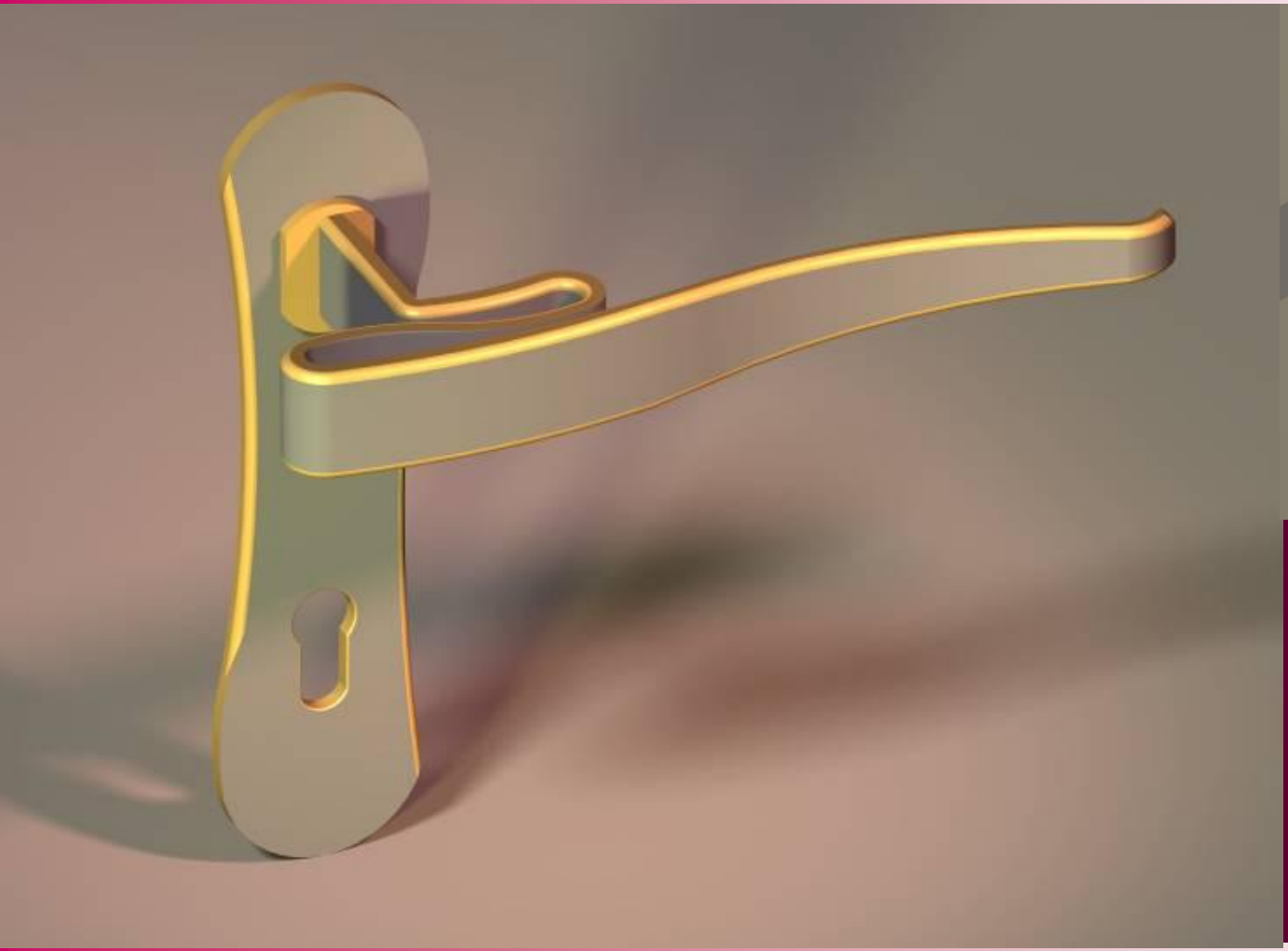
Handle and Knob rod – Welded from Inside

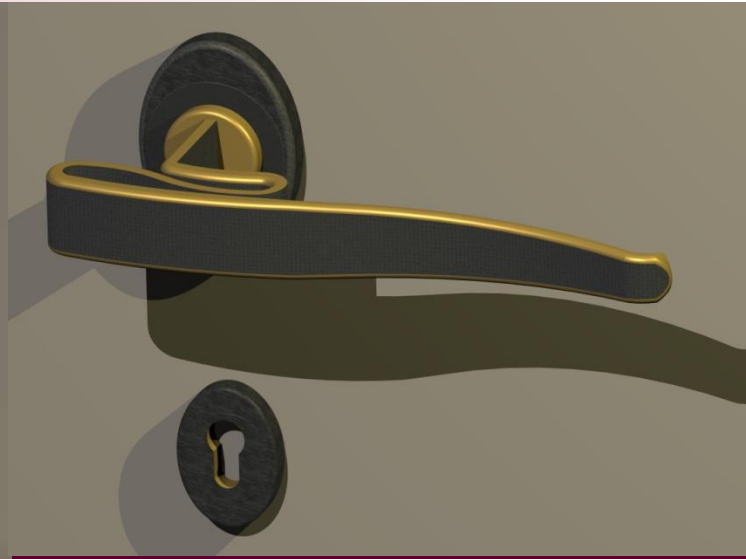
Material : Aluminium / Brass / Plastic

Rod Shape

Concept 2

Sheet Form





Manufacturing :

Multiple Stage Bending

Material : Aluminum alloy, Brass

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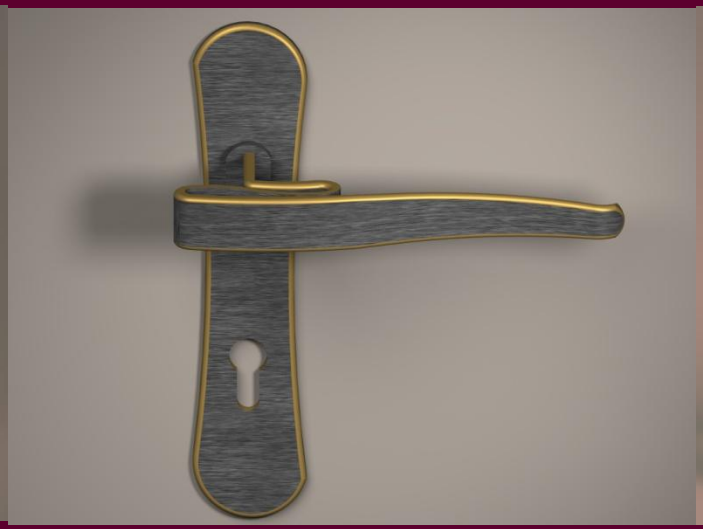
IDC, IIT Bombay

Range of Handles for Mortise Lock

Rupesh Nath. U
05613010

Sheet Form



Sheet Form

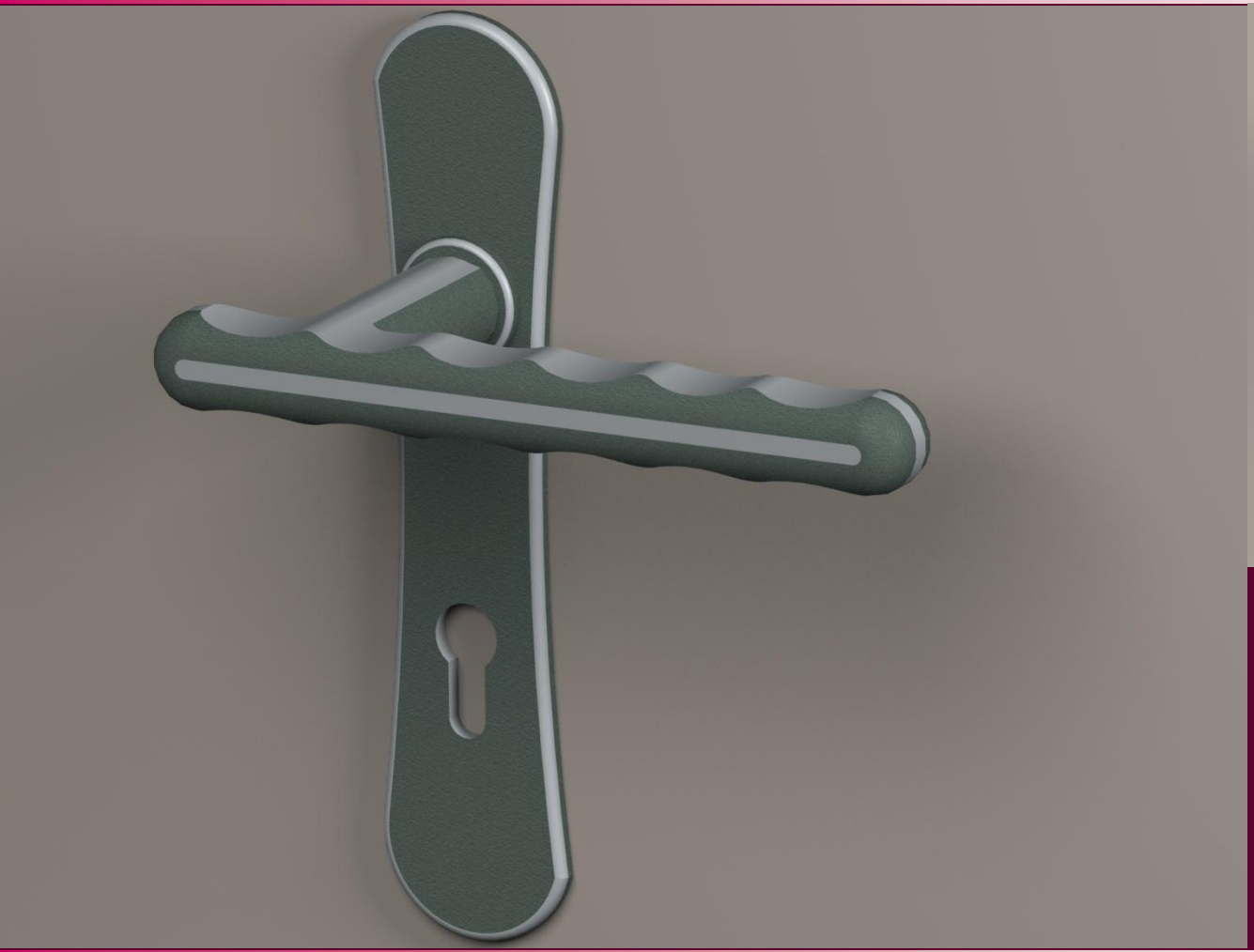
Guide : Prof. B.K. Chakravarthy
IDC, IIT Bombay

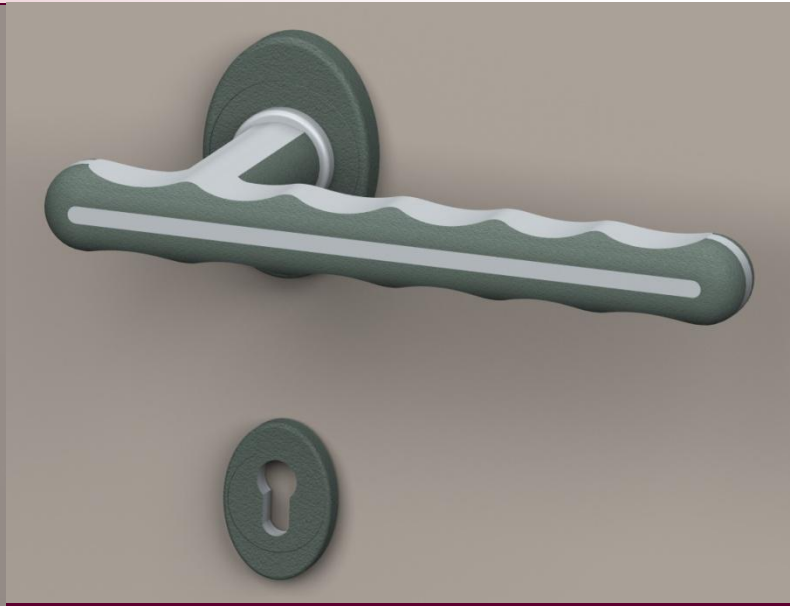
Range of Handles for Mortise Lock

Rupesh Nath. U
0 5 6 1 3 0 1 0

Concept 3

Solid Form



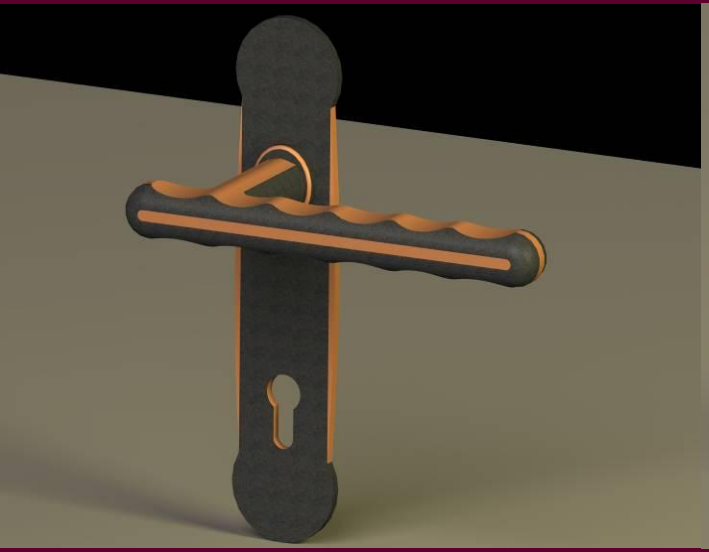


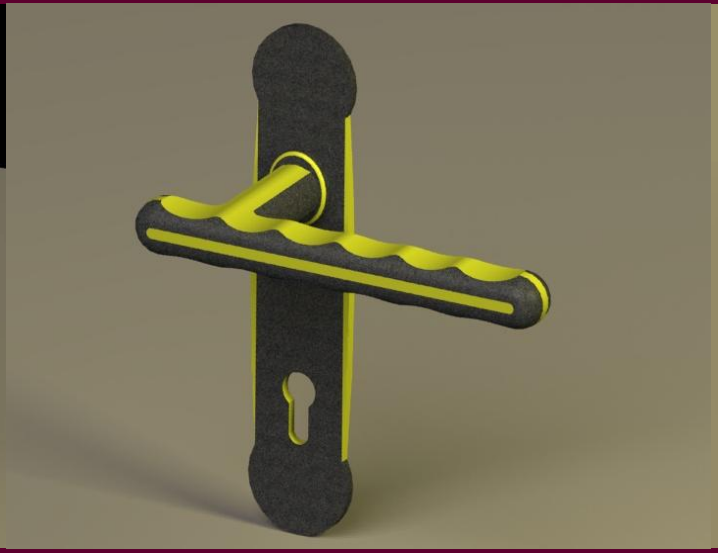
Manufacturing :

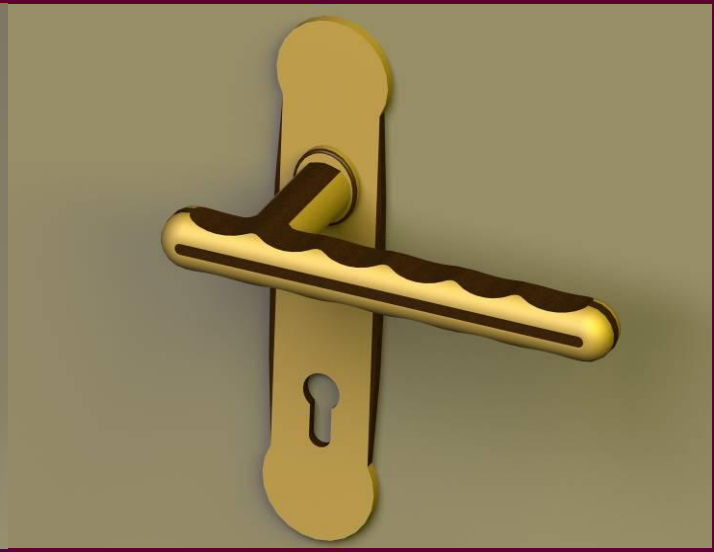
In mold Injection Molded or Die cast

Material: PC-ABS / Aluminum alloy

Concept 3



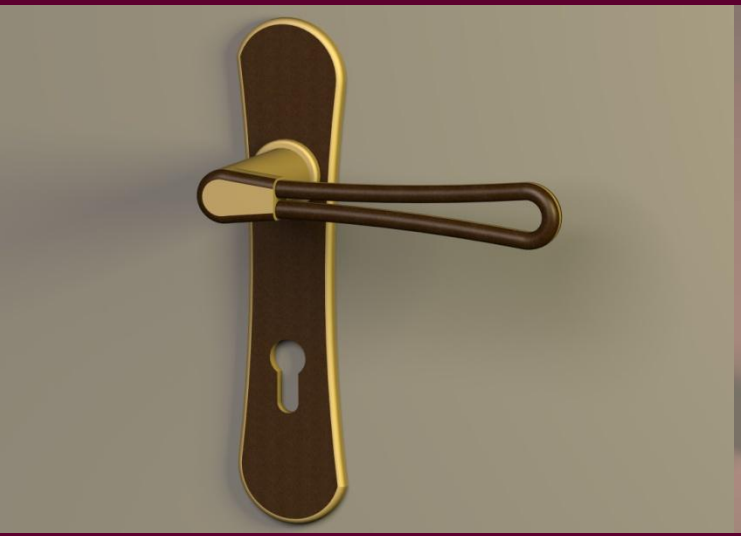




Solid Form

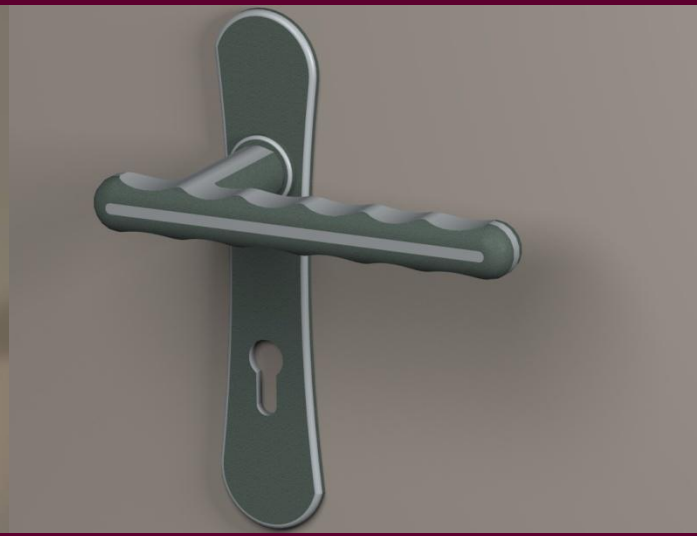
Playful

Extruded

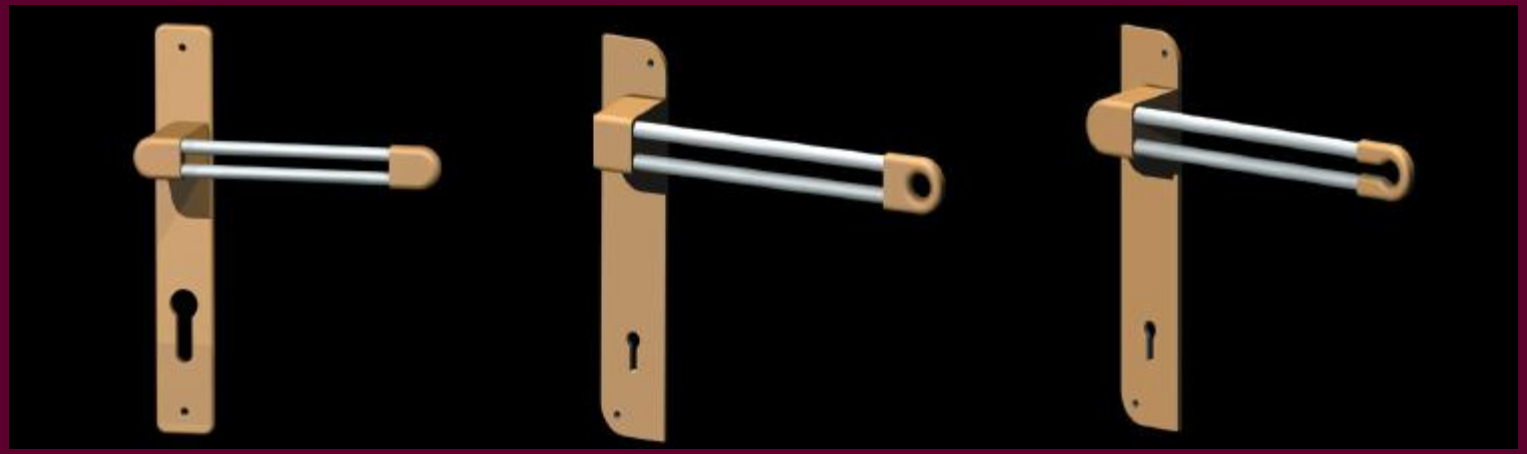


Sheet / Flat

Solid

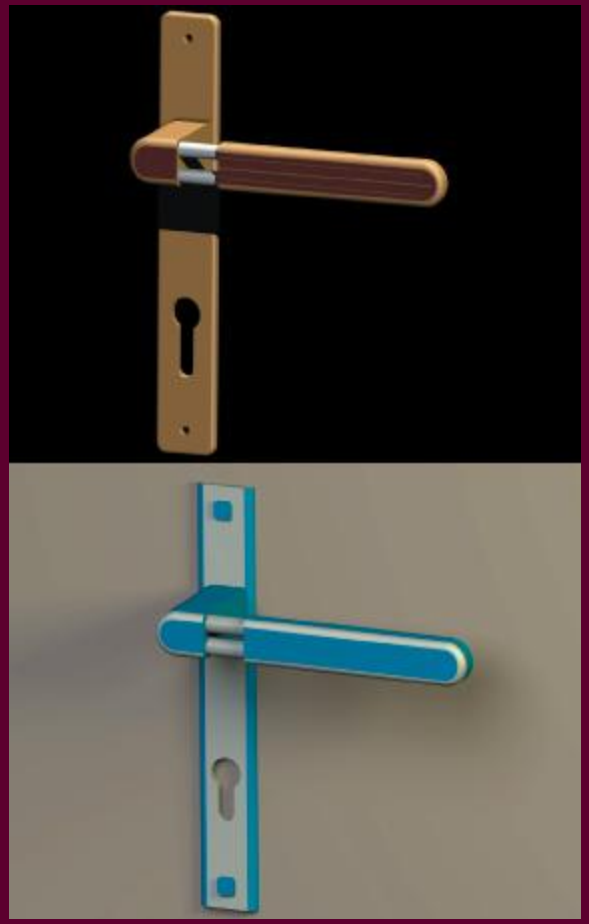


Rod Shape



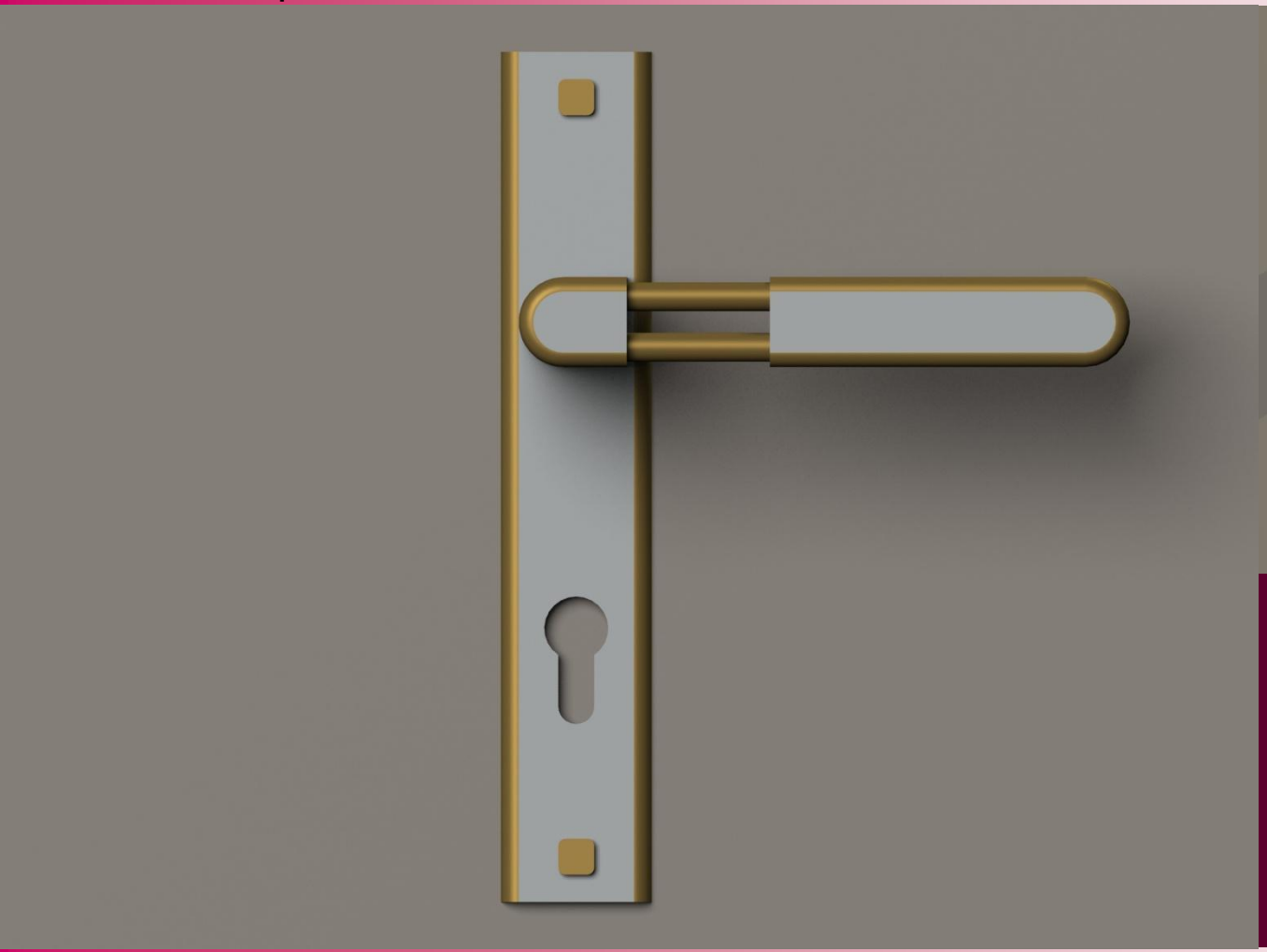
Concept 4 Refinement

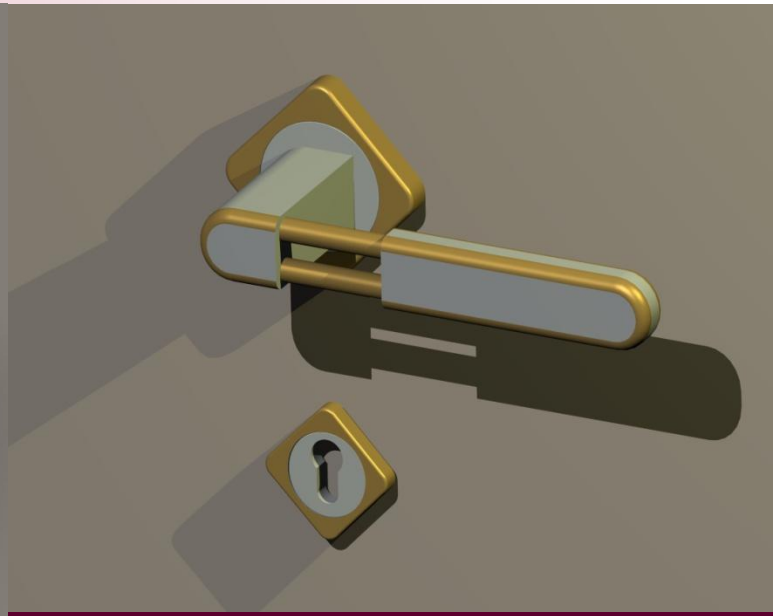
Rod Shape



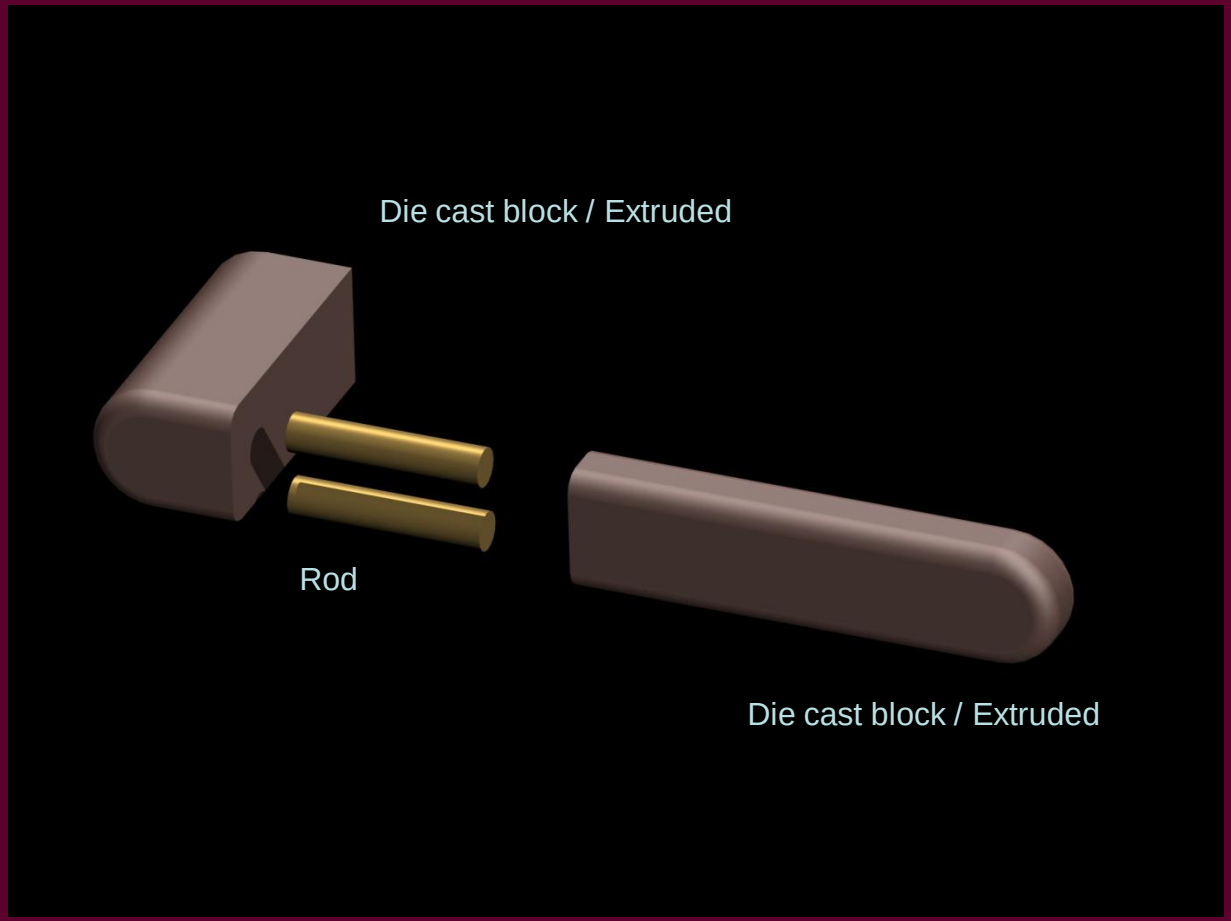
Concept 4

Rod Shape





Rod Shape



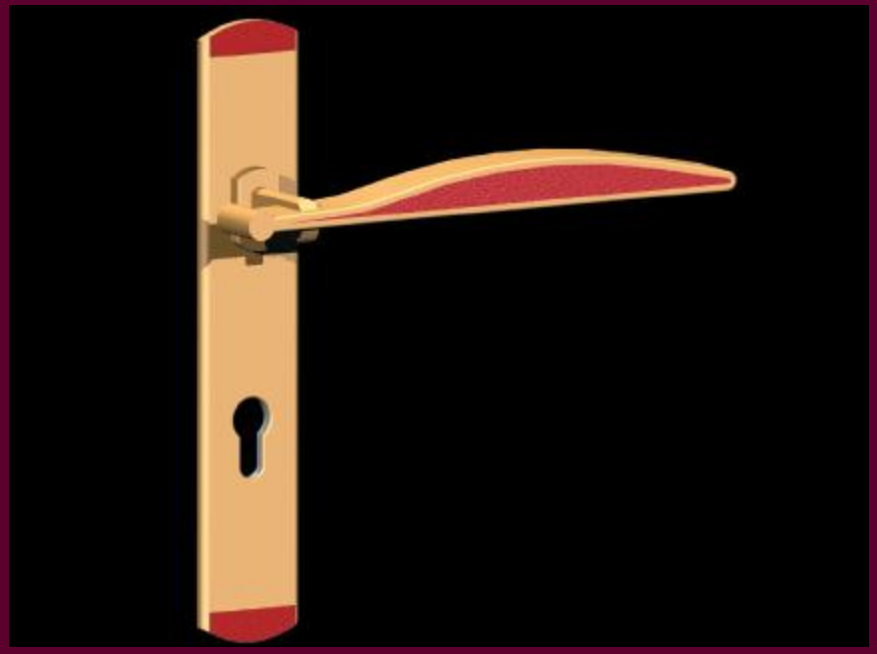
Manufacturing :

Solid section and Rods are welded

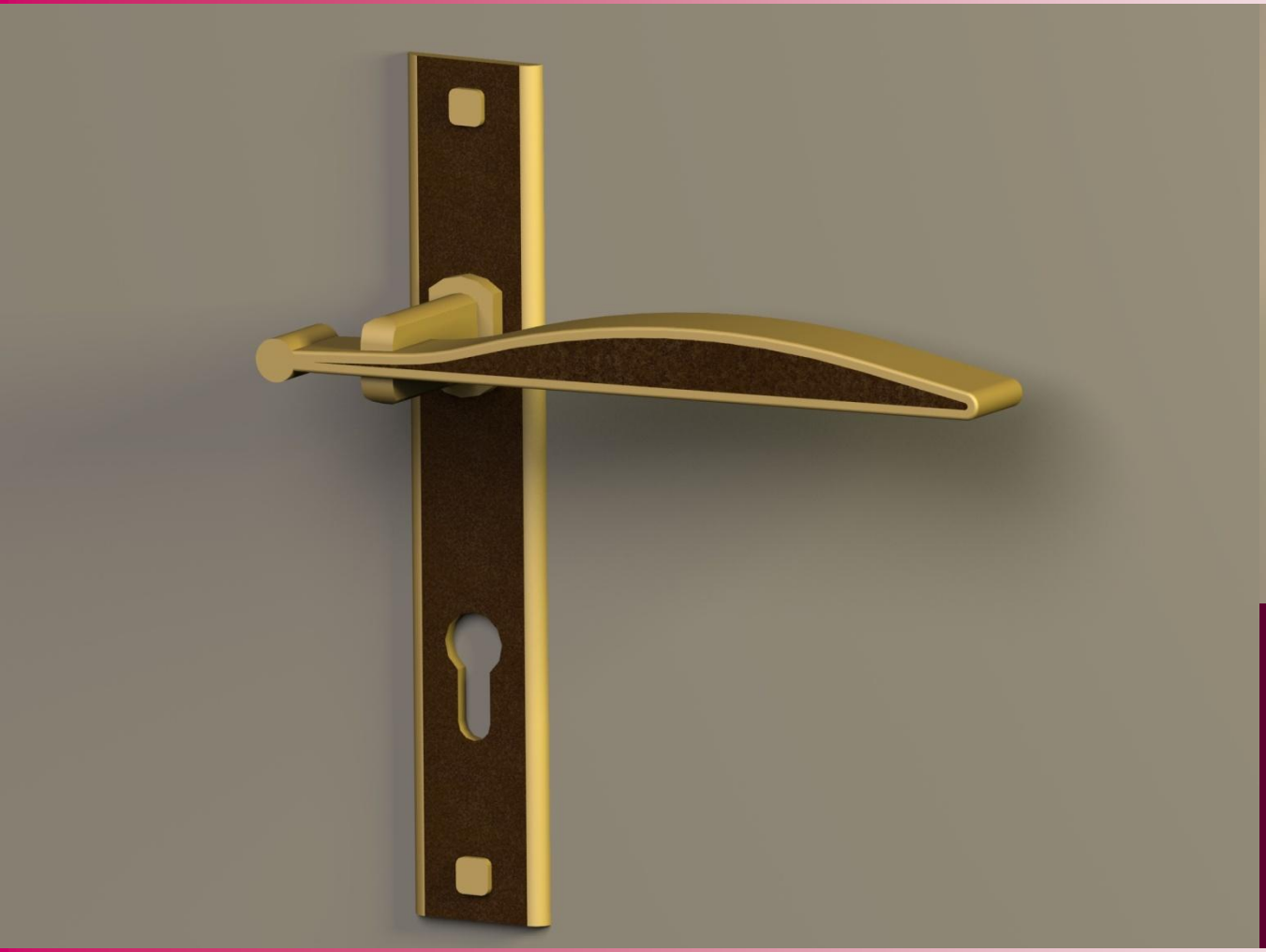
Materials: Aluminum alloy and Brass

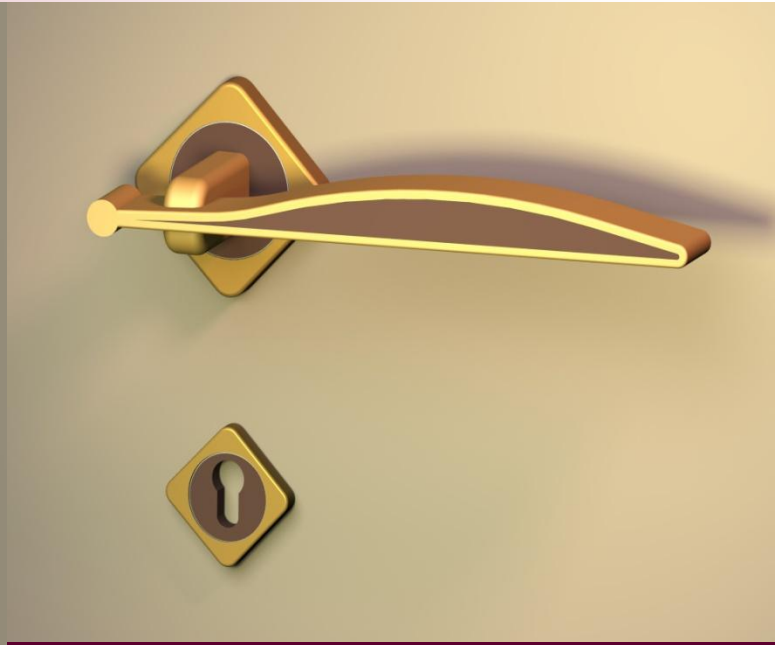
Rod Shape

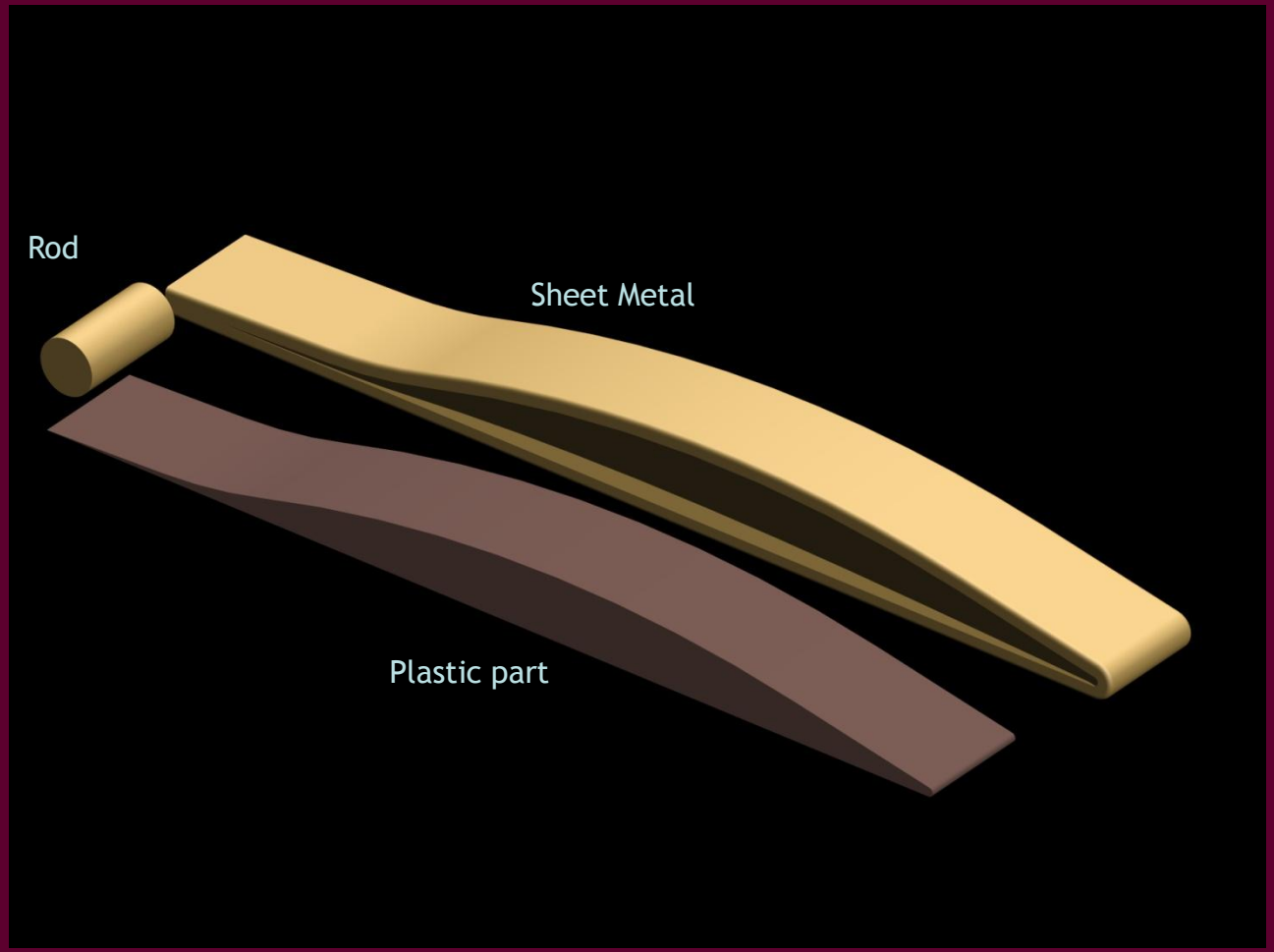
Sheet Form



Concept 5







Manufacturing :

Bending and Welding at the end

Materials: Brass / Aluminum Alloy

Concept 5

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IDC, IIT Bombay

Range of Handles for Mortise Lock

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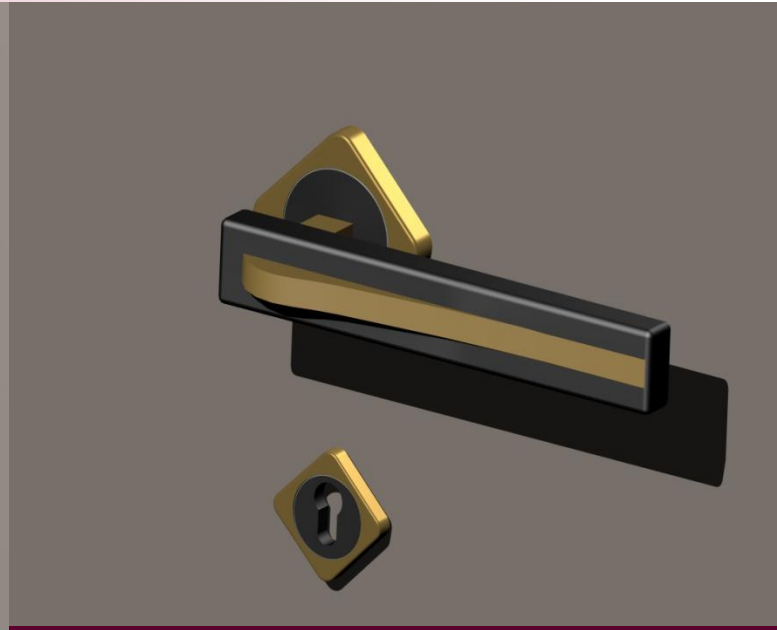
Solid Form



Manufacturing :

Die casted

Material : Brass and Aluminum alloy

Solid Form

Guide : Prof. B.K. Chakravarthy
IDC, IIT Bombay

Range of Handles for Mortise Lock

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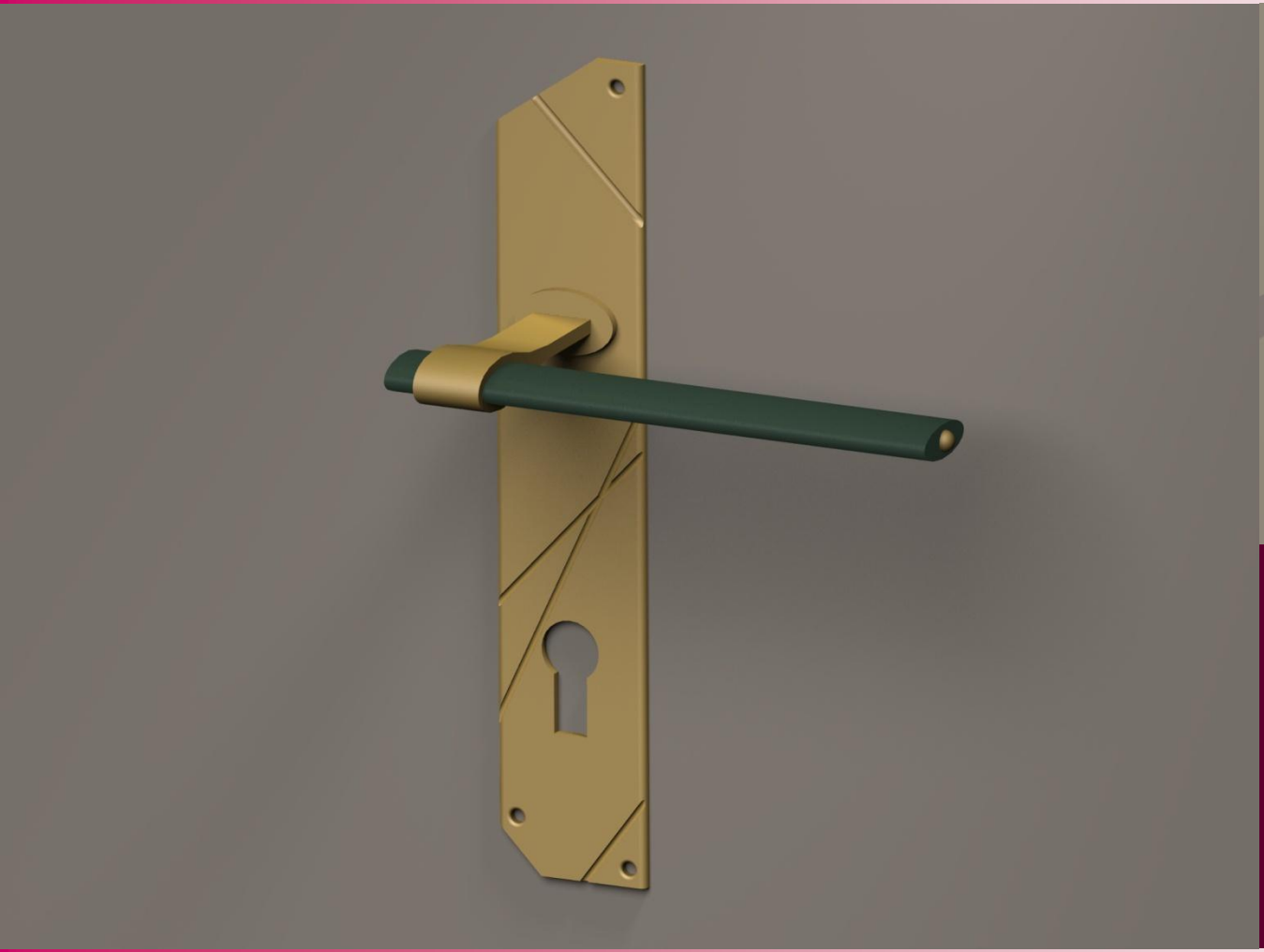
Elegant

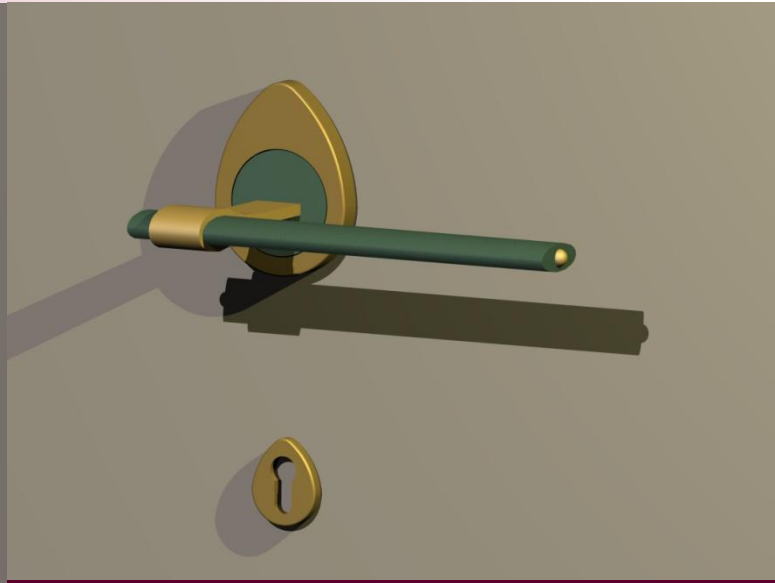
Extruded

Sheet / Flat

Solid

Rod Shape



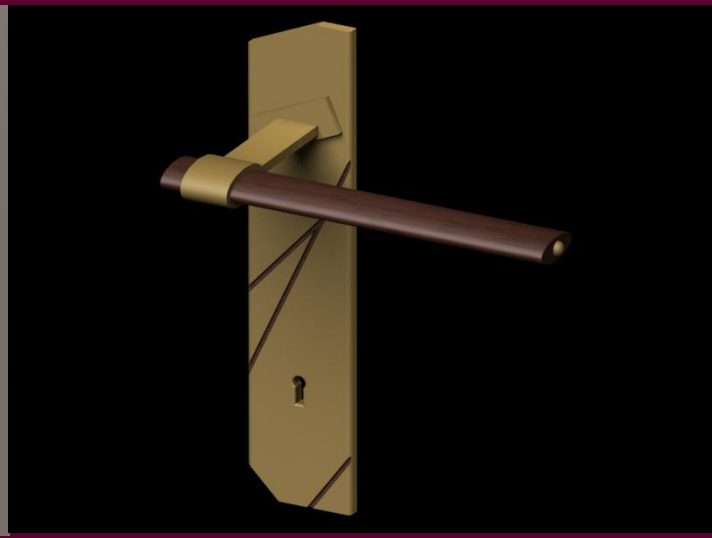


Manufacturing :

Handle – Metal, Wood, Bamboo, Granite, Plastic

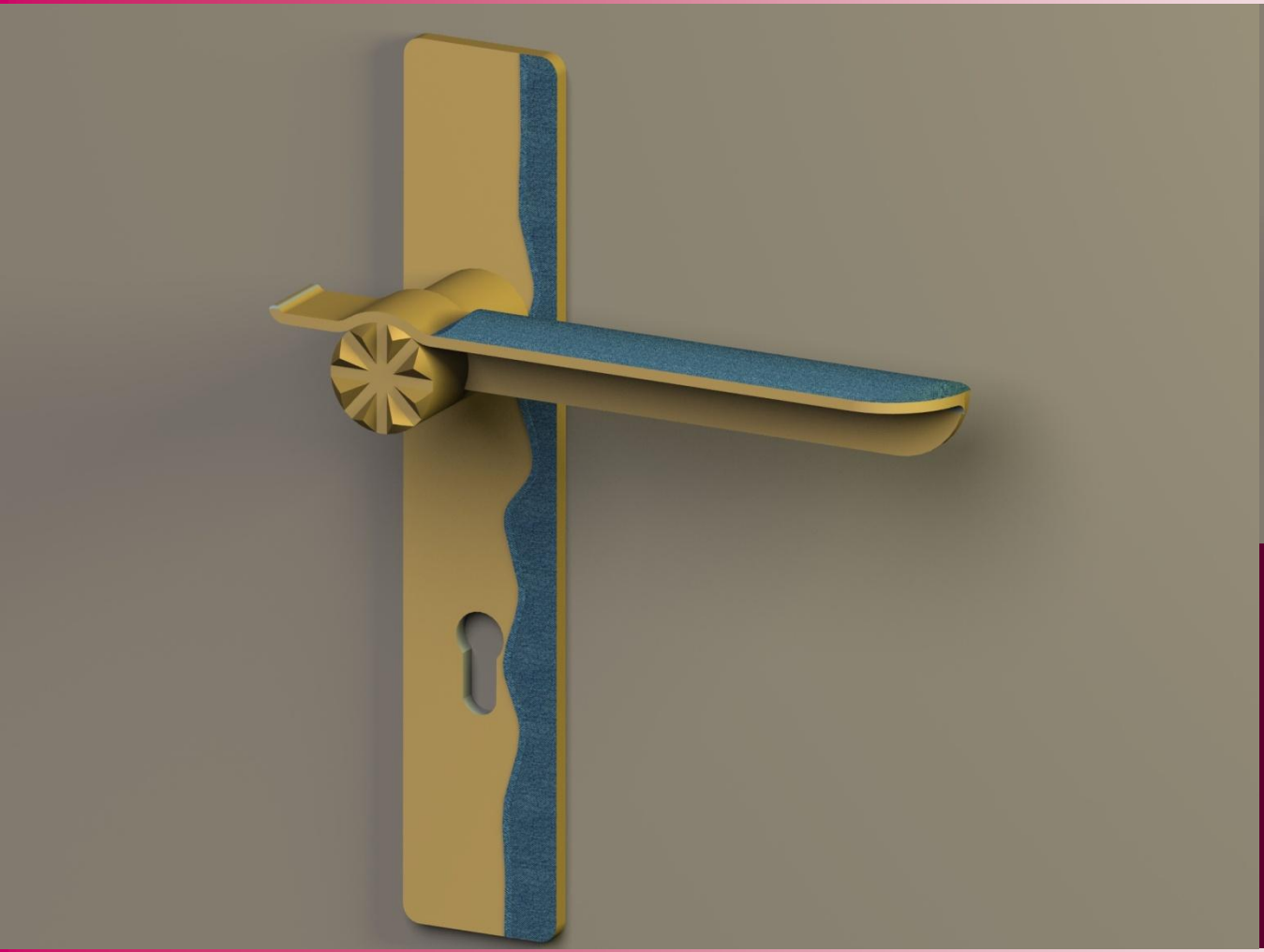
Silicon Glue or Press Fit

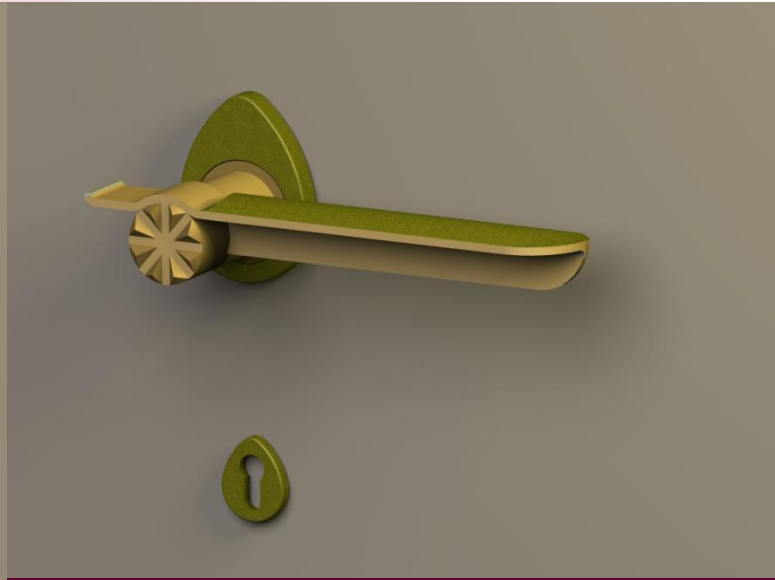
Rod Shape



Rod Shape

Sheet Form





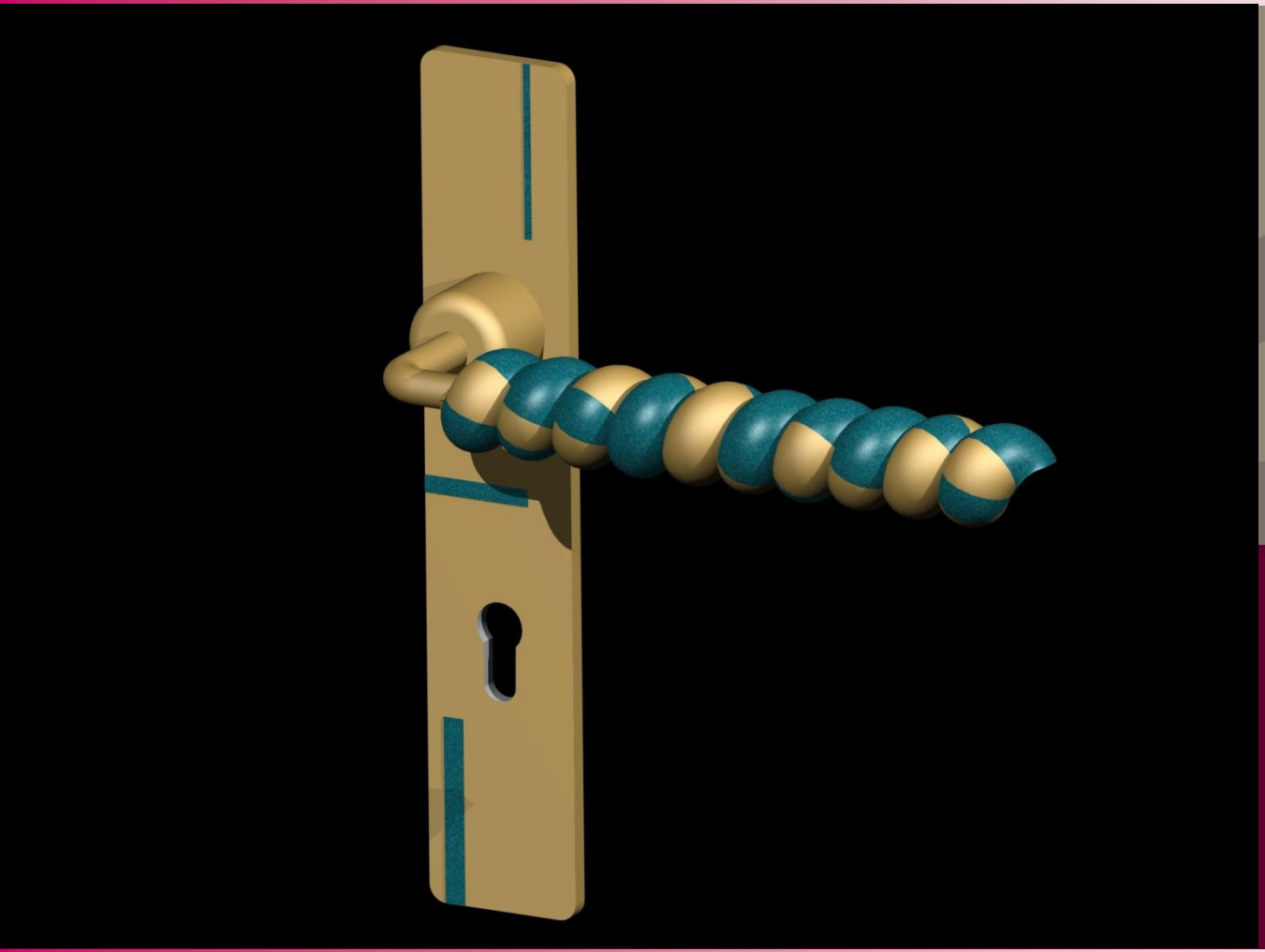
Manufacturing :

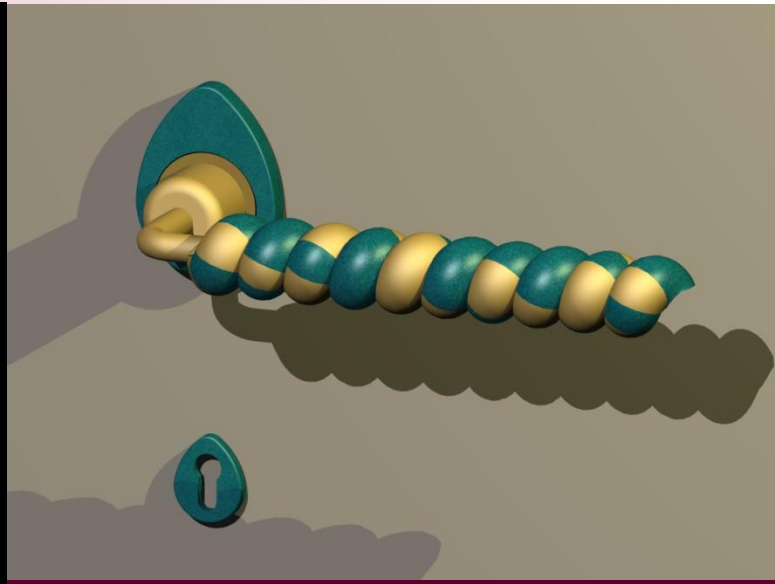
Sheet metal Punching and Bending

Materials : Aluminum alloy / Brass with additional materials like wood / plastics

Sheet Form

Solid Form



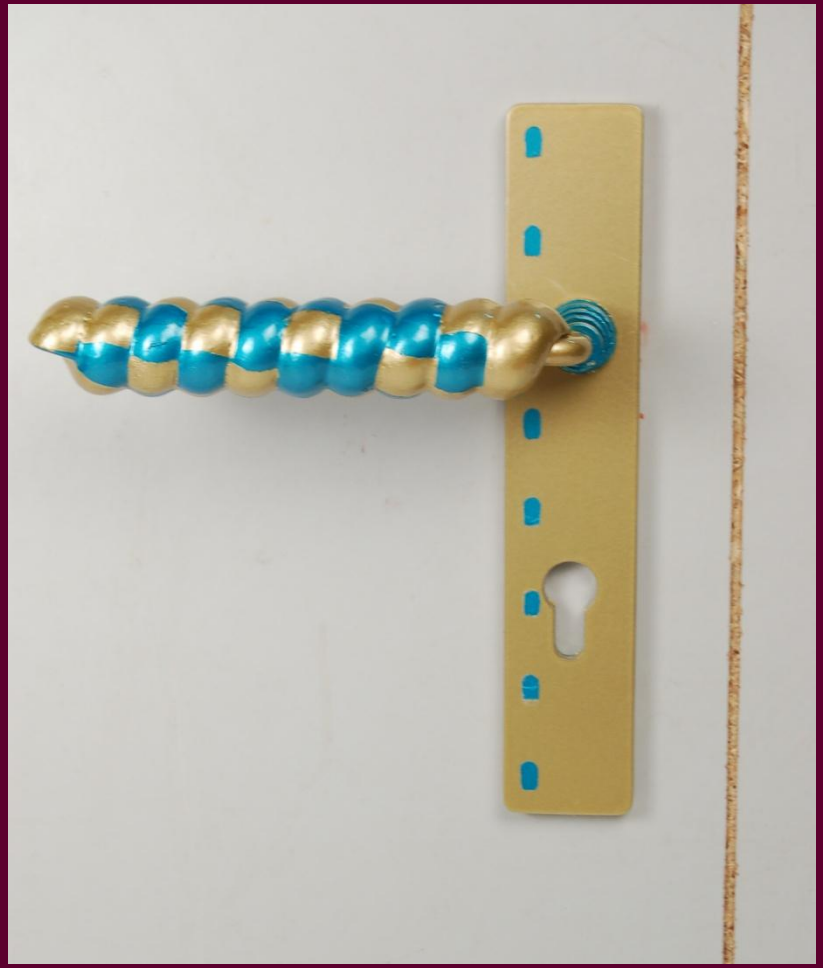


Manufacturing :

In mould Injection molding, Heat transfer printing / Die casting

Materials : PC-ABS, Brass or Aluminum alloy

Solid Form



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Range of Handles for Mortise Lock

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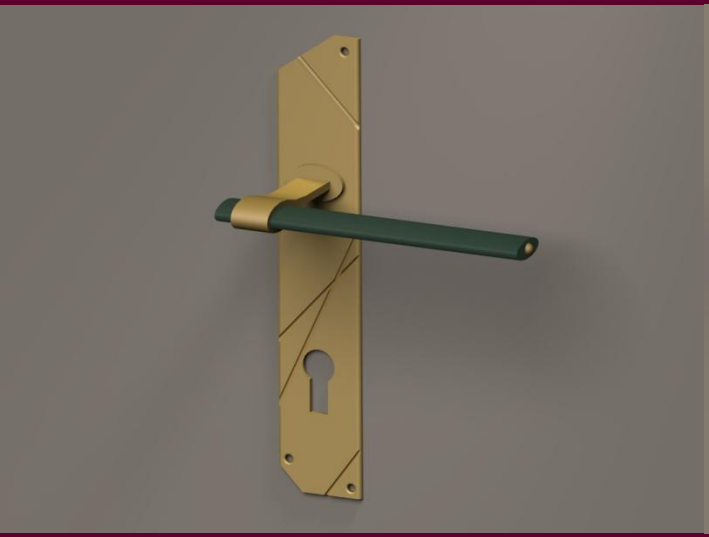
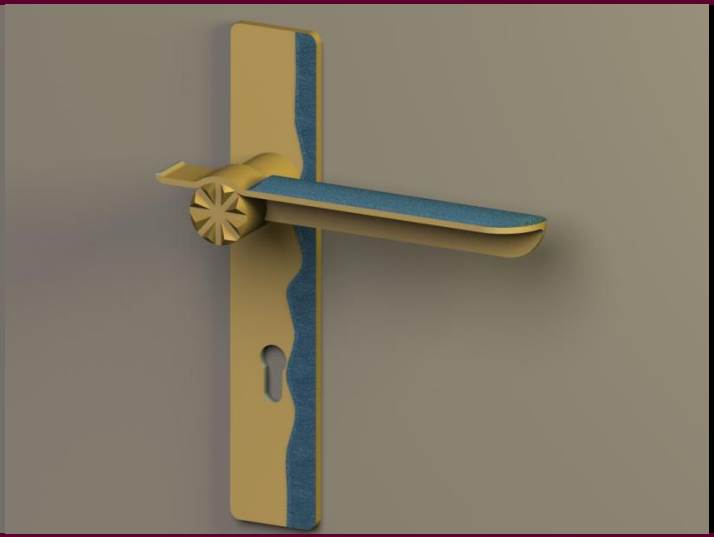
Postmodern

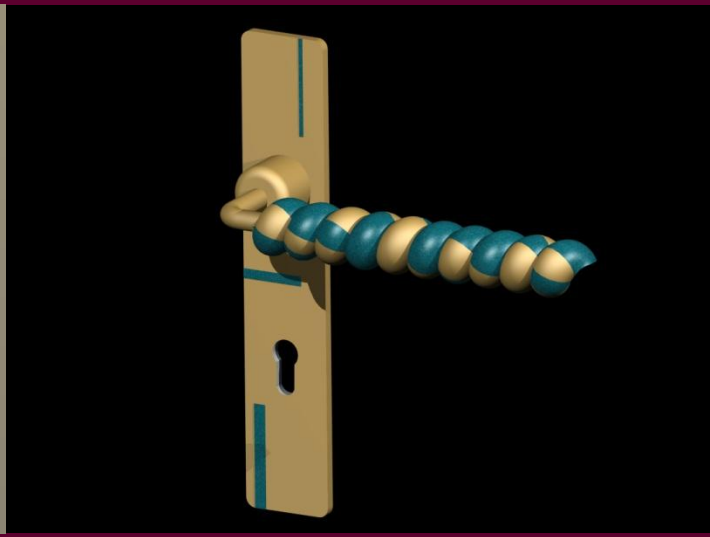
Extruded



Sheet / Flat

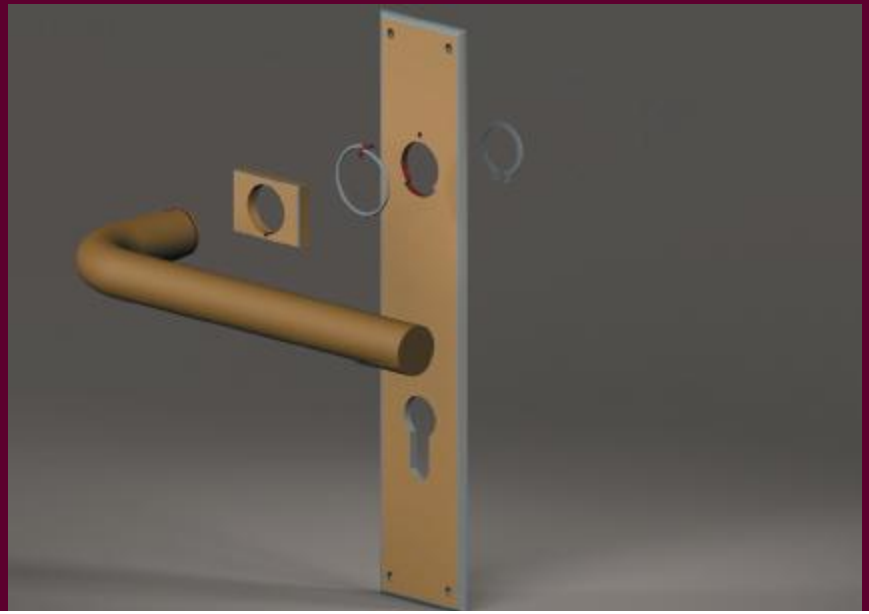


Solid



Detailing

fig1. Handle and fixing Plate



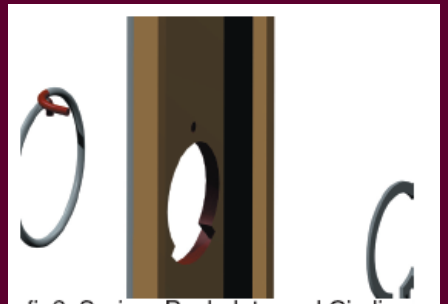
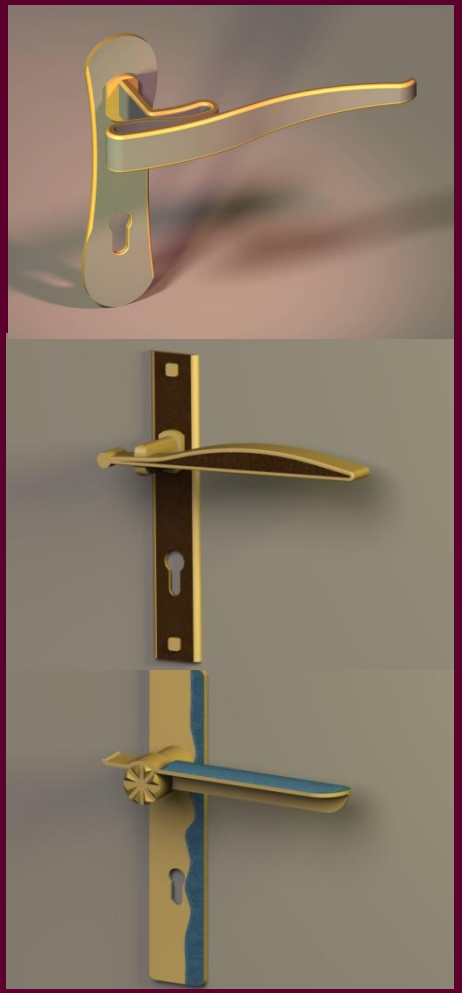
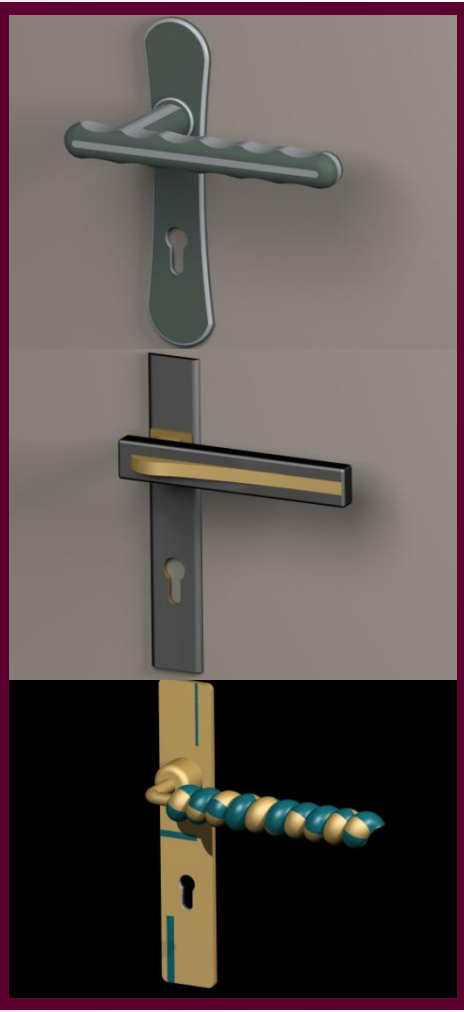


fig2. Spring, Backplate and Circlip

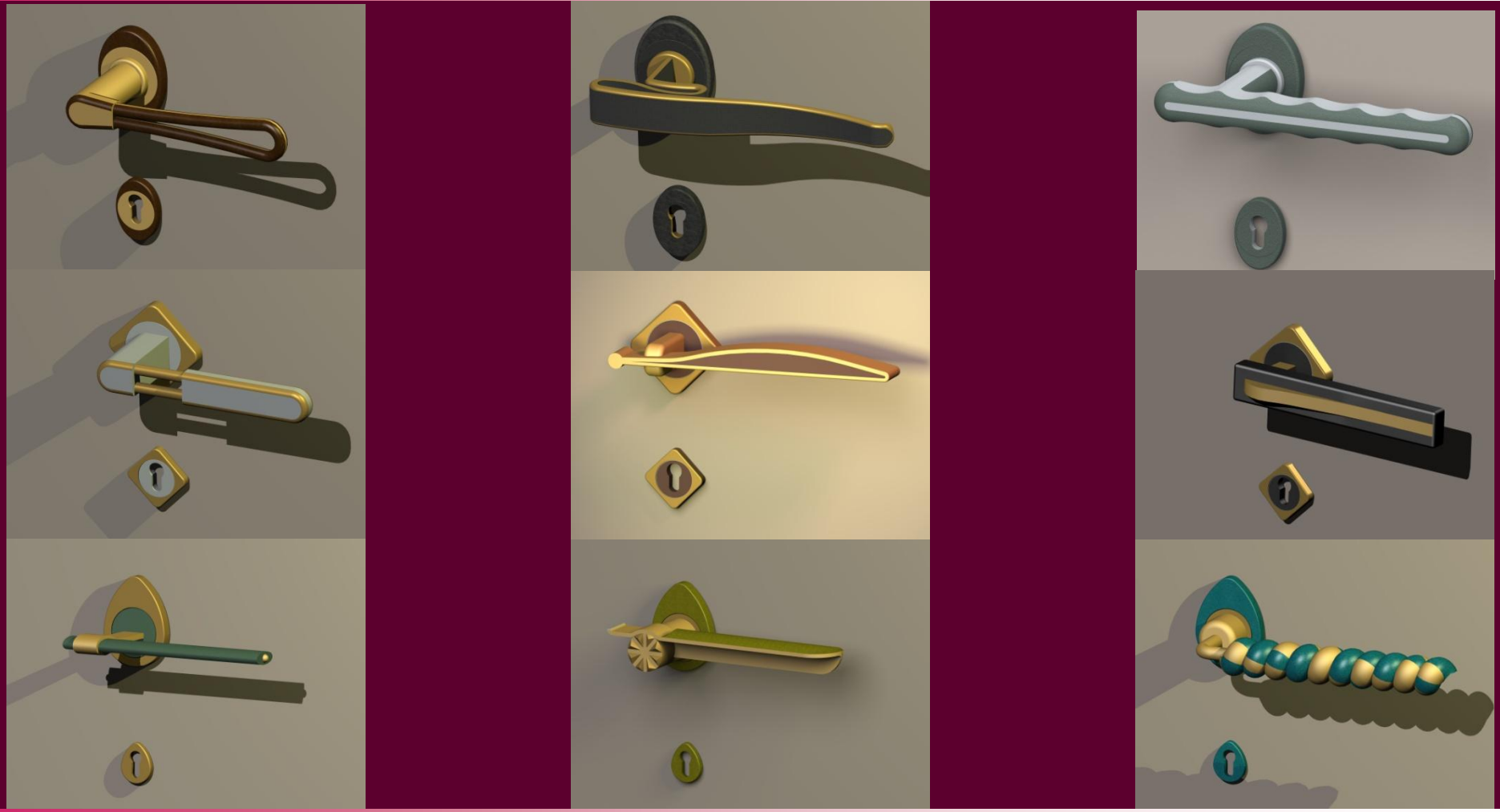
fig3.Locking plate for backplate and door

Final Range : Combi Pack





Final Range : Rose Set



Thank you