

# Design and Fabrication of 3D Storage Retrieval System

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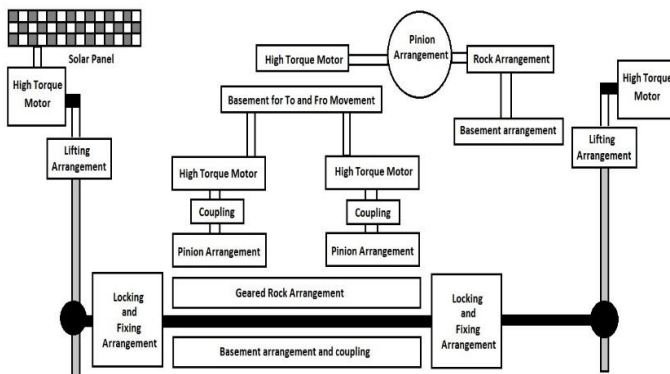
**Abstract** - As per explicit turn of events and latest models pondered, here sufficiently made an unquestionable level imaginative system for instance Plan and making of 3 Dimensional controlled Movement of Lift with influenced of degrees of progress in multi limit structures, which will critical for 3 D improvement of lift, 3 D improvement of crane for material unloading at plans and pinnacles, 3 D improvement of robotized staggered vehicle leaving system.

This structure uses 2 indistinguishable rack and 4 pinions for level new turn of events. This 4 pinion contraption moving in excess of 2 long racks. The control movement followed by switch board. In this level rack and pinion improvement uses high power motor. for also and fro headway correspondingly uses rack and pinion. This forward and in switch improvement is use to put a particular

Article on the floor. For this forward and in reverse new development, here used little rack and pinion gathering followed by motor.

The standard massive rack and pinion gathering with lifting structure use to lift all above get-together. This lifting system uses pulley, thick metal string and high power motor with 30 RPM turn. In this undertaking all above part control by switch board. This system can be tremendous in 3 D improvement of lift, 3 D movement of crane for material unloading at advancements and zeniths, 3 D improvement of robotized staggered vehicle leaving structure. This system can be significant in Multi-storeyed arrangement, long and heightened malls, Schools and colleges, crisis centres.

## BLOCK DIAGRAM



## 1. INTRODUCTION

As indicated by the specific advancement latest examples examined here effectively made a general structure for staggered improvement of lift. This system can prepared to move with 3 estimations with wherever inside the design.

This assignment uses 2 equivalent rack and 4 pinions for level turn of events. This 4 pinion device moving in excess of 2 long racks. The control improvement followed by switch board. In this level rack and pinion advancement uses high power motor.

For also and fro development moreover uses rack and pinion. This forward and in reverse development is use to put a particular thing on the floor. For this also and fro development, here used more modest than anticipated rack and pinion gathering followed by motor.

The essential critical rack and pinion gathering with lifting part use to lift all above party. This lifting segment uses pulley, thick metal string and high power motor with 30 RPM turn. In this errand all above segment control by switch board.

This system can be useful in 3 D advancement of lift, 3 D improvement of crane for material unloading at designs and zeniths, 3D improvement of modernized staggered vehicle leaving system. This system can be useful in Multi-storeyed construction, long and heightened retail plazas, Schools and colleges, facilities. This system can be change in future up to with the usage of Highest power this undertaking can be important in significant transmission tower industry to lift profound iron focuses, machines and contraptions.

With the usage of excellent sensors course of action this system can be convert into customized far off system. With the usage of human revelation assembling, this structure can be useful to in multi limit lifts. With the use of fitting sensor and PC interface it is achievable to track or control the advancement through wherever place. This system livelihoods.

## Rope Pulley Mechanism

This system utilizes Rope pulley part to lift a specific lift. The pulley is by and large included mild steel and this pulley is constrained by grub. This pulley [laced over the shaft having thickness is 20 mm so we have set up a drag of 20mm on

pulley. There is rope system shot on pulley and rope here utilized I metallic treated steel rope to go without breaking and cutting. As this rope is combined treated steel with various turned wire so it is non rust fit and high weight uncovering limit. As shown in picture there is grub contained carbon steel grub with locking limit. This pulley is put on 20 mm shaft which is sensitive steel mind blowing bar. This system utilizes relationship for example fence approach for vertical lifting. These 2 vehicles slides over shaft. Totally when engine turns over pivots this pulley turns in like way pulley turns and gadget begin to lift.

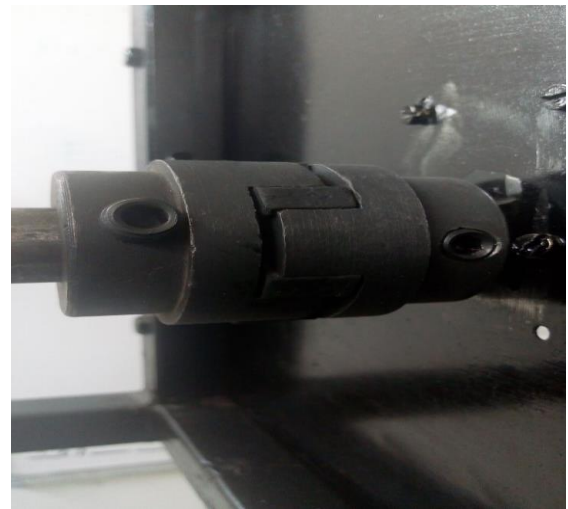


### Pulley Specification

- Quantity = 2
- Diameter of Pulley = 1524 mm
- Thickness of Pulley = 52 mm
- Locking Case = 26 mm
- Rolling Case = 0.7 mm
- Casing Bore = 10 mm
- Material Used = Mild Steel
- Rope Material = steel wire

### Coupling

This system utilizes jaw coupling with left and right course of action. This coupling made with various assessments. Here is this undertaking jaw coupling with 3 inch 20 mm shaft sharp shooting approach utilized. This jaw coupling with 3 inch long capable to pass on 20 mm shaft enough with exceptional outcomes so this coupling used to do a specific undertaking. This jaw coupling is having 2 specific plans can able lift an outright construction with the turn of high force engine.



### Rack and Pinion Arrangement

For level advancement system uses rack and pinion approach for even turn of events. To rotate pinion here used high power DC 30 rpm motor. Besides if there is need to pass on gigantic or strong weight we can fabricate the restriction of motor and moreover we can have the choice to use gear box also for synchronous speed. This errand uses 2 different motor with 2 pinion plan so system can prepared to keep up consistency and prepared to pass on and turn colossal weight. This system used after assurance of pinion. Pinion used 2.5 inch with 25 teeth's. Here in this undertaking uses 2 particular pinions which is turns over high power motor.



### Geared Rack

- Length of Geared Rack = 915 mm
- Teeth of Geared Rack = 195 Teeth
- Breadth: 13 mm
- Thickness of Teeth = 0.3mm
- Spacing Between Teeth = 0.2mm

### Geared Pinion

- Diameter of Pinion = 40 mm
- No of Teeth = 25 Teeth's
- Thickness of Teeth = 0.3mm
- Spacing Between Teeth = 0.2mm
- Thickness of Pinion = 30mm

- Centre Shaft Diameter=6 mm.
- Teeth Face Width=12.5 mm.

### Bearing Arrangement

This system uses spine bearing which is surface fixed bearing. This bearing can prepared to pass on enormous weight in like manner we can prepared to bolt that hanging on for the help of grub screw. This bearing having 2 interesting openings for lacking. This rib having 20 mm bore furthermore the bearing base contained treated steel and outside spine involved delicate steel.



### Pinion Gear

A gear is a turning machine part having cut teeth, or pinions, which network with another toothed part to give power, all things considered conversing with teeth on the one stuff of poorly characterized shape, and a critical piece of the time equivalently with that shape on the other gear.

### High Torque Motor



- Certification: CE, ROHS
- Type: Gear Motor
- Torque: 100 Nm
- Construction: Permanent Magnet
- Commutation: Brush
- Protect Feature: Totally Enclosed
- Speed(RPM): 1-200rpm

- Continuous Current(A): 1.3A
- Output Power: 40W
- Voltage(V): 12
- Efficiency: IE 3
- output shaft: steel shaft size and shape custom

## 2. CALCULATIONS

### 1. For To-Fro Motion

$$W = 2 \text{ kg} = 19.61 \text{ N}$$

$$I = 1/12 \times b \times d^3 = 254 \text{ mm}^4$$

$$M = -19.61 \times 381 = 7471.4 \text{ N-mm}$$

$$\sigma_{max} = (M \times Y_{max}) / I = 294.14$$

### 2. For Horizontal Motion

$$W = 34.32 \text{ N}$$

$$R_a + R_b = 34.32$$

$$\sum M_a = 0$$

$$R_a = 17.16$$

$$I = 7853.9$$

$$R_b = 17.16$$

$$Y_{max} = 10 \text{ mm}$$

$$\sigma_{max} = 9.98 \text{ N/mm}^2$$

### 3. Top Shaft

$$\sum M_a = 0$$

$$R_a = 49.03 \text{ N}$$

$$I = 853.98$$

$$\sigma_{max} = 38.08 \text{ N/mm}^2$$

$$R_b = 49.03 \text{ N}$$

$$Y_{max} = 10 \text{ mm}$$

### 4. Factor of Safety (FOS)

$$FOS = \text{Ultimate Tensile Stress of material} / \text{Maximum stress generated in Material}$$

$$= 450 / 294.15$$

$$= 1.529$$

## Electrical calculation

### For lifting mechanism

Require motor = 2  
 Motor specification  
 Voltage rating 12v to 24v  
 Current rating 8 wattage capacity on load  
 Power required = Voltage\*current = 12\*8  
 Power = 16 watt per motor  
 For 2 motors  
 Total power 2\*per motor power consumed  
 Total power required for lifting operation = 2\*16 = 32 watts

**Power required for to and fro mechanism**

Motor used 1  
 Voltage rating 12v  
 Current rating 2amp  
 Total power = voltage \*current = 12\*2 = 24 watt

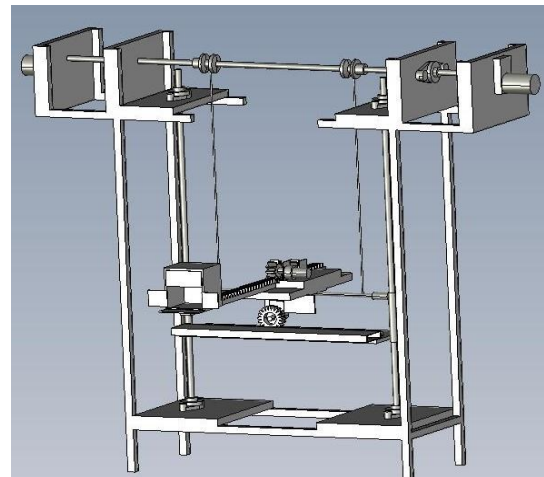
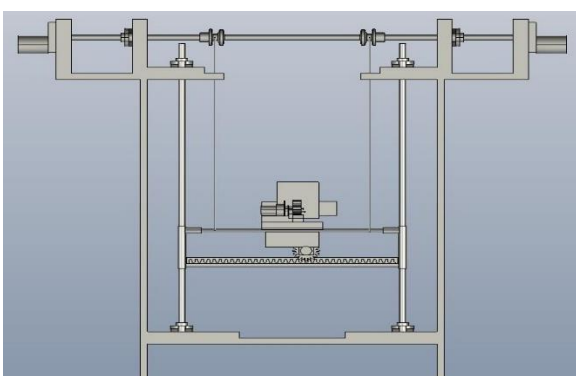
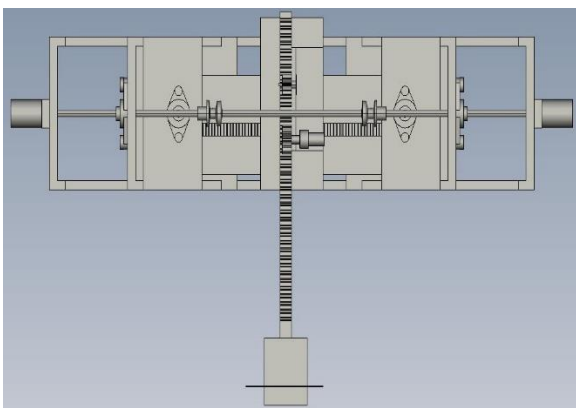
**Power required for left of right movement mechanism**

Motor used 1  
 Voltage rating 12v  
 Current rating 2amp  
 Total power = voltage\*current = 12\*2 = 24 watt

**Total power required for complete operation**

Power consumed by lifting operation+  
 Power consumed for to and fro operation+  
 Power consumed by left and. Right movement = 32+24+24  
 = 80 watt

**3. CAD MODEL**



**CONCLUSIONS**

From this project we conclude that,

- This project utilizes three unique movements for example all over, left and right, and forward and backward movements is conceivable.
- The complete three dimensional development is conceivable with the assistance of single battery having 12v 8Amp.
- This complete framework can have the option to lift with the utilization of high force engine with most extreme 25kg lifting limit.
- This complete framework is power hopeful and simple to utilize.
- With the utilization of rack and pinion innovation even and forward and backward development is conceivable.
- This framework can utilize wherever as indicated by load limit and force produce.

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