Conceptual Design to transfer Handicapped and Old People from One Railway Platform to Another

PROJECT REPORT SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF

Bachelor of Technology

in

Mechanical Engineering

By

Manu Kanchan & Ankur Bansal

Department of Mechanical Engineering

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Under the guidance of:

Professor S.K.Sahoo

Department of Mechanical Engineering

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CERTIFICATE

This is to certify that the thesis entitled **"Conceptual Design to transfer handicapped or old people from one platform to another.''** submitted by **Manu Kanchan**, **Roll No: 10303026 and Ankur Bansal, Roll No: 10303010** in the partial fulfillment of the requirement for the degree of **Bachelor of Technology** in **Mechanical Engineering**, National Institute of Technology, Rourkela , is being carried out under my supervision.

To the best of my knowledge the matter embodied in the thesis has not been submitted to any other university/institute for the award of any degree or diploma.

Date

Professor S.K.Sahoo
Department of Mechanical Engineering
National Institute of Technology
Rourkela-769008

Acknowledgment

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We also express our sincere gratitude to **Dr. B. K. Nanda**, Head of the Department, Mechanical Engineering, for providing valuable departmental facilities.

Submitted by:

Manu Kanchan
Roll No: 10303026
Mechanical Engineering
National Institute of Technology
Rourkela

Ankur Bansal
Roll No: 10303010
Mechanical Engineering
National Institute of Technology
Rourkela

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ABSTRACT

The problem to transfer handicapped or old people is as old as the transportation system itself. Earlier and even now they are transferred by many methods like on wheelchairs or with the help of sticks. But all these methods are time consuming and slow and also don’t have any provision for carrying the luggage. These methods are good in general use, but on platforms these cannot be used as these methods will complicate the transportation and will disrupt the free movement of the people on platforms. So here our aim is to design a system or device which will be able to transfer the handicapped people from one platform to another, within the given constraints and should also comply with the societies exiting conditions. The system may be semi-manually driven or semi-automatic or may be fully automatic.

Here first of all we are defining the Statement of the problem, followed by the analyzation of the need and then we have given various alternatives we have thought off, following it is the description of different alternatives with the problems we are facing in the practical application of the alternatives. The alternatives thus produced has been evaluated and the best one was chosen. Then, morphological analysis, is done on the chosen alternative, thus giving the final design and specification.

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CHAPTER 1

INTRODUCTION

1. INTRODUCTION

The problem to transfer handicapped or old people is as old as the transportation system itself. Earlier and even now they are transferred by many methods like on wheelchairs or with the help of sticks. But all these methods are time consuming and slow and also don't have any provision for carrying the luggage. These methods are good in general use, but on platforms these cannot be used as these methods will complicate the transportation and will disrupt the free movement of the people on platforms. So here our aim is to design a system or device which will be able to transfer the handicapped people from one platform to another, within the given constraints and should also comply with the societies exiting conditions. The system may be semi-manually driven or semi-automatic or may be fully automatic. Normally a common man thinks that to design is to create a system or device which should be perfect or ideal in the given system. But in engineering language **DESIGNING** is completely different. In engineering, it is to innovate or create or to modify the existing system so that it works efficiently under the given constraints or existing conditions.

Here the designing follows some specific steps which even if followed by a layman will make him able to create small and useful things.

Some of the characteristics which the system should possess are:

1. Transferring handicapped people through the large crowd generally present on the platforms, without disturbing their movement.
2. Transportation system should be such that a normal person is able to handle him easily
3. The system should be quick in service.
4. The system should be easily removable (if required to be removed).

Also the system should be comfortable for the handicapped people and safe. The system should be able to carry the load of the old or handicapped people.

Here first of all we will define the Statement of the problem, followed by the analyzation of the need and then we will give the various alternatives we have thought off, following it will be the description of different alternatives with the problems we are facing in the practical application of the alternative.

CHAPTER 2

PRESENT PROBLEM

Statement of the Problem

Need Analysis

2. PRESENT PROBLEM

2.1 Statement of the Problem

To design a device or a system or to modify the existing systems, by combining different machines or equipment together, which will be able to transfer the handicapped and old people from one plat form to another platform.

2.2 Need Analysis

2.2.1 Specification

The system should have following specifications:

- To carry handicapped and old people from one platform to another platform.
- To transfer persons at an optimum rate so that it will not disrupt the railway.
- To have minimum height equal to that of the platform.

2.2.2 Standard of Performance

- It should be durable and less power requiring in case electrically driven or less manual power requiring in case manually driven.
- It should cheap for both manufacturer and user.
- It should be safe. If using electrical devices, then proper insulation should be provided. If some rotating parts are there, the vibration and noise level (maximum of 60 decibel in the crowded places like platforms), should be controlled by suitable means. If manual power is used, the person doing so should be skilful and capable of doing it.
- It’s maintenance should be easy.
  If maintenance is cheap, it can be maintained or repaired frequently.
  If using heavy and costly machinery like electrical machines(lifts, elevators, moving ramps, electronic wheel chair), it should be temper proof or must be protected. This can

be done by either providing web-camera in different places or by employing persons inspecting the system frequently.

- Should be easy to stop and should be people friendly i.e. easy to operate and easy to vacate in case of emergency.
- The services should reach the handicapped or old people i.e. the system should have proper checking and ticketing systems.

2.2.3 Environmental factors

- Out of various environmental factors, the combination of sunlight, rain and temperature (i.e. weather) appear to be the most adverse factors for the problem.

CHAPTER 3

LITERATURE REVIEW

3.1 LITERATURE REVIEW

1. **Technology transfer standards for communication aids for disabled people.[1]**

   Abstract: Performance standards for the transfer of technology for communication aids for disabled people are discussed. A prerequisite and integral part of the design process for products used by disabled persons must be consumer feedback. A disabled person who uses the technology and is articulate in assessing, describing, and documenting the impact of proposed changes on his or her life is key to the efficacy of the product. There are three possible standards for home automation. In Europe, ESPRIT will be used. In Japan, the Home Bus System will be used. At present the BSR X-10 system is probably the most widely used system in the US, but if there is wide support for the CEBus standard by industry, then it is likely that the CEBus microchips will be built into US appliances in the future

2. **IROS special session on “Service robots for the disabled and elderly”. A technique for robotic assisted transfer for people with motor difficulties.[2]**

   Abstract: Elderly people would like to maintain independence for as long as possible in a familiar environment. Limitations within that environment often necessitate a move into residential care facilities where care attendants are available for assistance. This research investigates one potential area where a robot based technology may provide a solution that is usable by an elderly clientele. The application area is that of assisting a person to achieve independent transfer between a seated and a standing position such as might be encountered in moving between a chair, wheelchair, bed, toilet, or shower seat. An important goal of this work is to demonstrate that advanced technology can be simple and effective. To be successful the technology must be easy to use, meet the needs of elderly people and become an accepted component of daily life.

3. **Robotic assistance: an automatic wheelchair tracking and following functionality-by-omnidirectional-vision.[3]**

Abstract: Robotic researches can contribute to the restoration of some functions lost by handicapped people. The over-cost generated by the additive potentialities must be affordable and related to the value of the usual product. In most cases, autonomous functions are direct transpositions of solutions applied in industrial robotics. If we consider that in addition with cost, security is a supplementary constraint of rehabilitation robotics, an important research effort is needed to propose technological components. The aim of this paper is to introduce a functionality within the context of the following plan: "technical achievement and psychological analysis of a master/slave robot assistance for the invalid person" (HTSC: human/technology complex system). This application allows a severely handicapped person to handle at the same time a movable platform and a Manus® arm. In this paper, we will present an "automatic tracking" functionality we developed in order to keep the Manus® arm automatically close to the patient

4. **Study on holonomic omnidirectional power wheelchair - integration of manual-and-automatic-control.[4]**

Abstract: The aged and disabled constitute a growing percentage of the world population, and a variety of systems to assist them are coming into very high demand. The purpose of our study is to develop a power wheelchair that gives the aged and disabled the same degree of mobility that healthy people enjoy, enabling users to rejoin society fully and heartily. To accomplish this, we adopt a holonomic omnidirectional mechanism that provide 3 DOF mobility, the same as healthy people have. In addition, we introduce an intuitive interface and automatic control functions to the power wheelchair. With these technologies, a power wheelchair can provide flexible and intricate motion through simple commands.

5. **Automatic adaptation in the NavChair Assistive Wheelchair Navigation System[5]**

Abstract: The NavChair Assistive Wheelchair Navigation System is an adaptive shared control system being developed to provide mobility to those individuals who would otherwise find it difficult or impossible to use a power wheelchair due to cognitive, perceptual, or motor impairments. The NavChair provides task-specific navigation assistance to the wheelchair operator in the form of several distinct operating modes, each of which distributes control differently between the wheelchair and the operator. This paper describes the NavChair's mechanism for automatically selecting the most appropriate operating mode based on a combination of the wheelchair's immediate situation and its global location. Results from two experimental evaluations of the adaptation-method-are-presented.

6. **Intelligent-robotic-wheel-chair-with-automatic-guidance-system[6]**

Abstract: This paper describes the development of an intelligent robotic wheelchair which can conduct the inverse pendulum control to climb over steps on public streets, and can conduct the automatic guidance in hospitals or old-age homes-as-examples.

7. **Effectiveness of an automatic manual wheelchair braking system in the prevention-of-falls[7]**

Abstract: The purpose of this study was to evaluate the effectiveness of an automatic manual wheelchair braking system in the reduction of falls for patients at high risk of falls while transferring to and from a manual wheelchair. The study design was a normative survey carried out through the use of a written questionnaire sent to 60 skilled nursing facilities to collect data from the medical charts, which identified patients at high risk for falls who used an automatic wheelchair braking system. The facilities participating in the study identified a frequency of falls of high-risk patients while

transferring to and from the wheelchair ranging from 2 to 10 per year, with a median fall rate per facility of 4 falls. One year after the installation of the automatic wheelchair braking system, participating facilities demonstrated a reduction of zero to three falls during transfers by high-risk patients, with a median fall rate of zero falls. This represents a statistically significant reduction of 78% in the fall rate of high-risk patients while transferring to and from the wheelchair, $t(18) = 6.39$, p less than or equal .0001. Incident reports of falls to and from manual wheelchairs were reviewed retrospectively for a 1-year period. This study suggests that high-risk fallers transferring to or from manual wheelchairs sustained significantly fewer falls when the Steddy Mate automatic braking system for manual wheelchairs was installed. The application of the automatic braking system allows clients, families/caregivers, and facility personnel an increased safety factor for the reduction of falls from the wheelchair.

8. **Development of stair climbing wheelchair with leg & wheel system (2nd Report) - automatic stair climbing tests using stair measurement system by image-processor[8]**

Abstract: The number of lower limb disabled people have lately been increasing because of traffic accidents and aging society. Most of the lower limb disabled people daily live on wheelchairs. Stairs and step are considerable obstacles for the people whose living depends upon wheelchairs. Although stair climbable robots have been developed as robots for extreme tasks, they are of large size, and heavy weight, and too forceful for stairs at home or hospitals. Therefore they are not suitable for welfare purpose at home or hospitals. This study aims at the development of stair climbing wheelchair which offers assistance to the lower limb disabled people. The stair climbing wheelchair has been developed for welfare purpose. The second report described how to develop stair climbing mechanism of leg and wheel type wheelchair. This report describes how to succeed in automating stair climbing by loading new developed measurement system-on-the-stair-climbing-wheelchair.

9. **Wheelchair-assist-devices[9]**

Abstract: Three separate devices are presented: a Backpack Retriever, an automatic Door Opener, and an extendable Manipulator. These three devices are either connected or controlled to/from the same wheelchair and are powered from the wheelchair's existing power system. These devices are also easily mounted to any wheelchair and assist its user in-simple-day-to-day-activities

10. **Interfacing users with very severe mobility restrictions with a semi-automatically-guided-wheelchair[10]**

Abstract: TetraNauta is an on-going R&D project aimed to develop a controller for standard electric powered wheelchairs that permits users with very severe mobility restrictions (such as people with tetraplegy) to easily navigate in closed environments (home, hospital, school, etc.). This project intends to design a non-expensive guidance system to help this kind of users to drive the wheelchair with the minimum effort, but maintaining the user as active as possible. For this reason the design of the user interface is a key factor. Some characteristic of this interface can be taken as a workbench for the design of more complex and security-critical-mobile-systems

11. **Development of an automatic travel system for electric wheelchairs using reinforcement-learning-systems-and-CMACs[11]**

Abstract: The existing method for establishing travel routes provides modeled environmental information, but it is difficult to create an environment model for the environments where electric wheelchairs travel because the environment changes constantly due to the existence of moving objects including pedestrians. In this study, we propose an automatic travelling system for an electric wheelchair using reinforcement learning systems and CMACs. We select the best travel route by utilizing these reinforcement learning systems. When a CMAC learns the value function of Q-learning, an improved learning speed is achieved by utilizing the generalizing action. CMACs enable one to reduce the time needed to select the best travel route. Using simulation, a path-planning-experiment-was-performed.

CHAPTER 4

GENERATION & EXPLAINATION OF ALTERNATIVES

Generating Alternatives
Explaining Alternatives

4.1 GENERATING ALTERNATIVES

There are many alternatives or ways by which a handicapped or old person can be transferred from one platform to another platform. The alternatives are as follows:

1. With the help of gravity, in which one end of the bridge will be at the platform's height and other end at bottom of the next platform. The person will be seated in a chair with a seat belt and rolled on tracks. It will be having proper braking system.

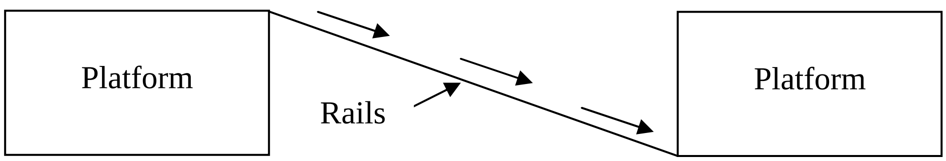


Fig4.1- Schematic dia. of Gravity system

2. On a bridge of platform's height with the help of manually driven wheel chair.

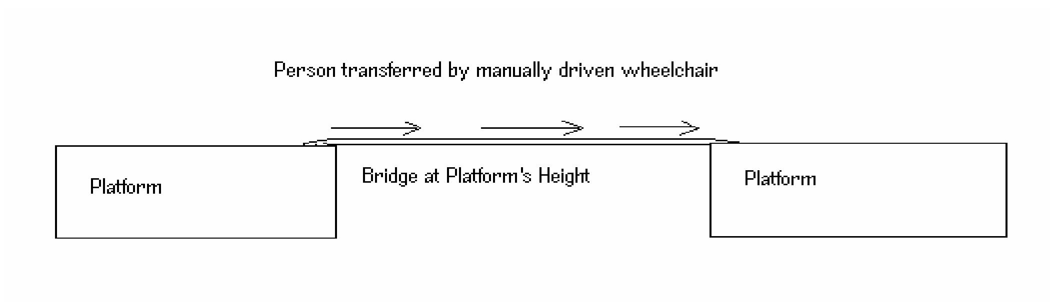


Fig4.2- Schematic Dia. for moving people on bridge at Platforms height

3. On a bridge of platform's height with the help of moving belts or electronic moving wheel chair.

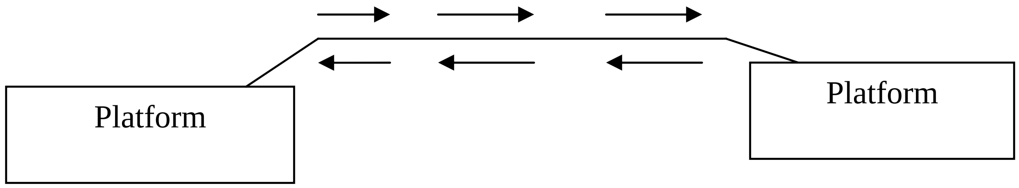


Fig4.3- Schematic Dia. for moving people on bridge at Platforms height

4. Through the over bridge, built on the platforms with the help of
   - Manually driven wheel chair shown in fig 3.4.
   - Manually driven wheel chair for moving on the bridge and escalators or lift or moving belts to lift the person to bridge's height and return also Fig 3.5.
   - Moving (ramp) belts.
   - Moving belts on movement on the bridge and lift for going upto the height of bridge from platform's height level.
   - Electronic wheel chairs fitted with microprocessors and computers and moving on flat ramps.
   - Lifts.

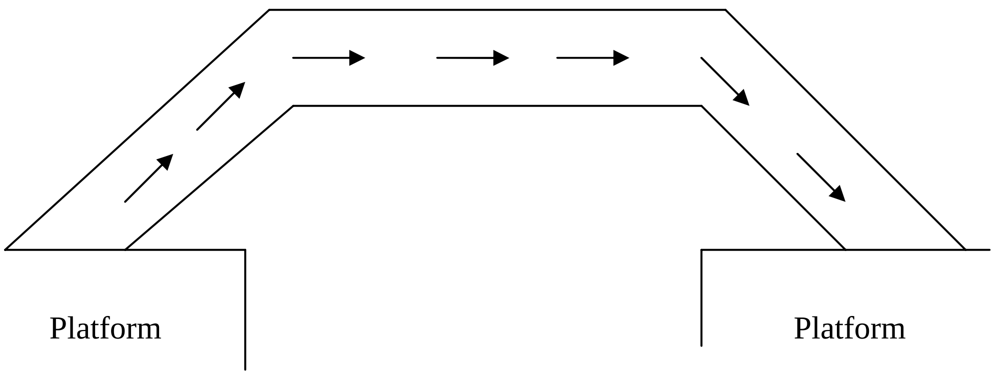


Fig4.4- Schmetic dia. of bridge

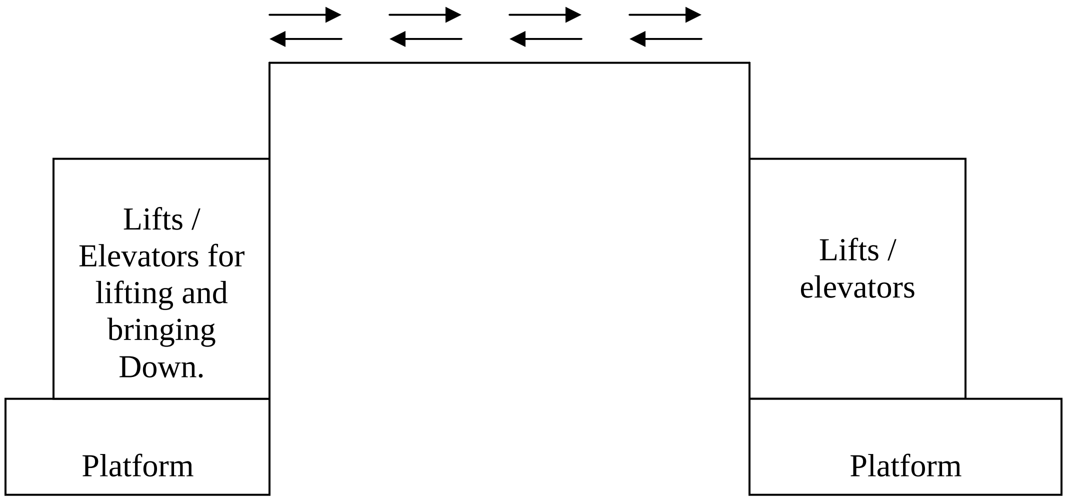


Fig4.5- Schematic dia. for moving people on elevators

5. Through a subway, fig3.6 (wherever subways are there on a platform or easy and cheap to built), transferring of handicapped or old people on
    - Lifts and moving belts.
    - Elevators and moving belts shown in Fig3.7.
    - Electronic wheel chair (as described above).
    - Lifts (may be in rectangular path or circular path).

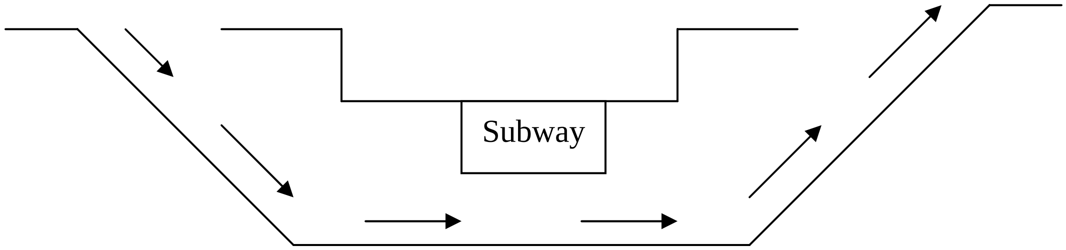


Fig4.6- Schematic dia. for moving people on elevators in subway

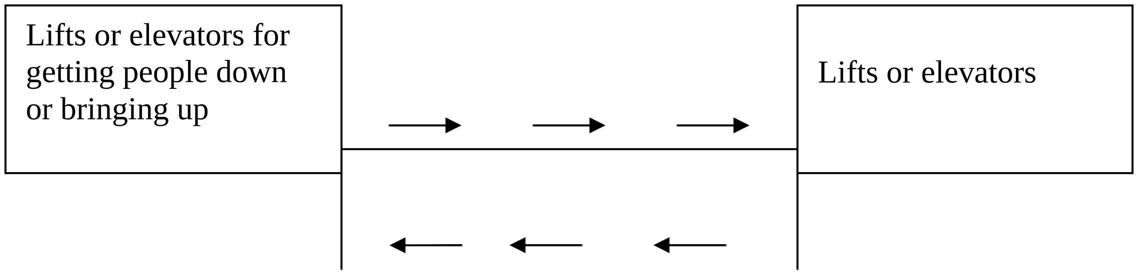


Fig4.7- Movement on Bridge

Handicapped people transferred through subway on moving ramp or manual wheel chair

4.1 Explaining Alternatives

A. **Transferring the handicapped or old people with the help of gravity.** Here the system consists of :

1. An inclined bridge with one end at the top of one platform and other end at the bottom of the other platform. The bridge will have **rails or grooves** fore movement of the wheel chair. The rails or grooves will extend to a distance of 2-3m horizontally.
2. Electric motor will be used to lift the bridge, when it has to be removed. This will be done with the help of thick steel wires.
3. Wheel chair is the equipment on which the people will be transferred. It will be equipped with safety (locking system) devices and will have wheels fitted to it. And also will have braking system.

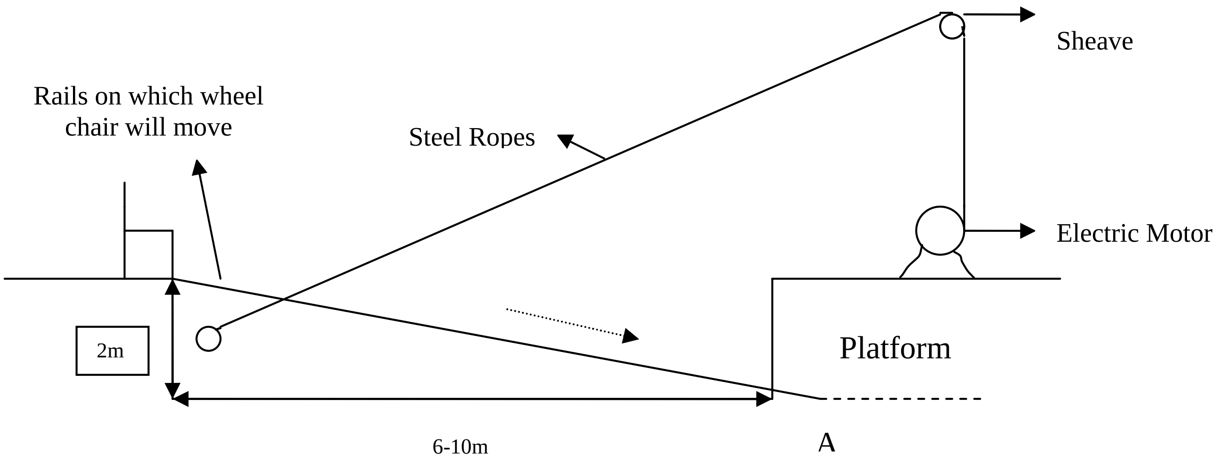


Fig.4.8- Gravity Bridge

The bridge will be hinged about A. When the bridge will be lifted it will rotate about point A. At the end of the bridge a pair of wheels will be attached, which will slide over a round arc.

Motor Arrangement

- Here the motor shaft will carry two gears A and B which will rotate with the motor shaft.
- The gear A is meshed with gear C on the main shaft and gear B is meshed with gear R which in turn meshed with gear D.
- Gears C and D will rotate on bearings, so there will be no direct contact between the gears and the main shaft.
- The main shaft will carry a dog which will controlled by a manual lever. This dog will be used to connect the main shaft with C and D accordingly.

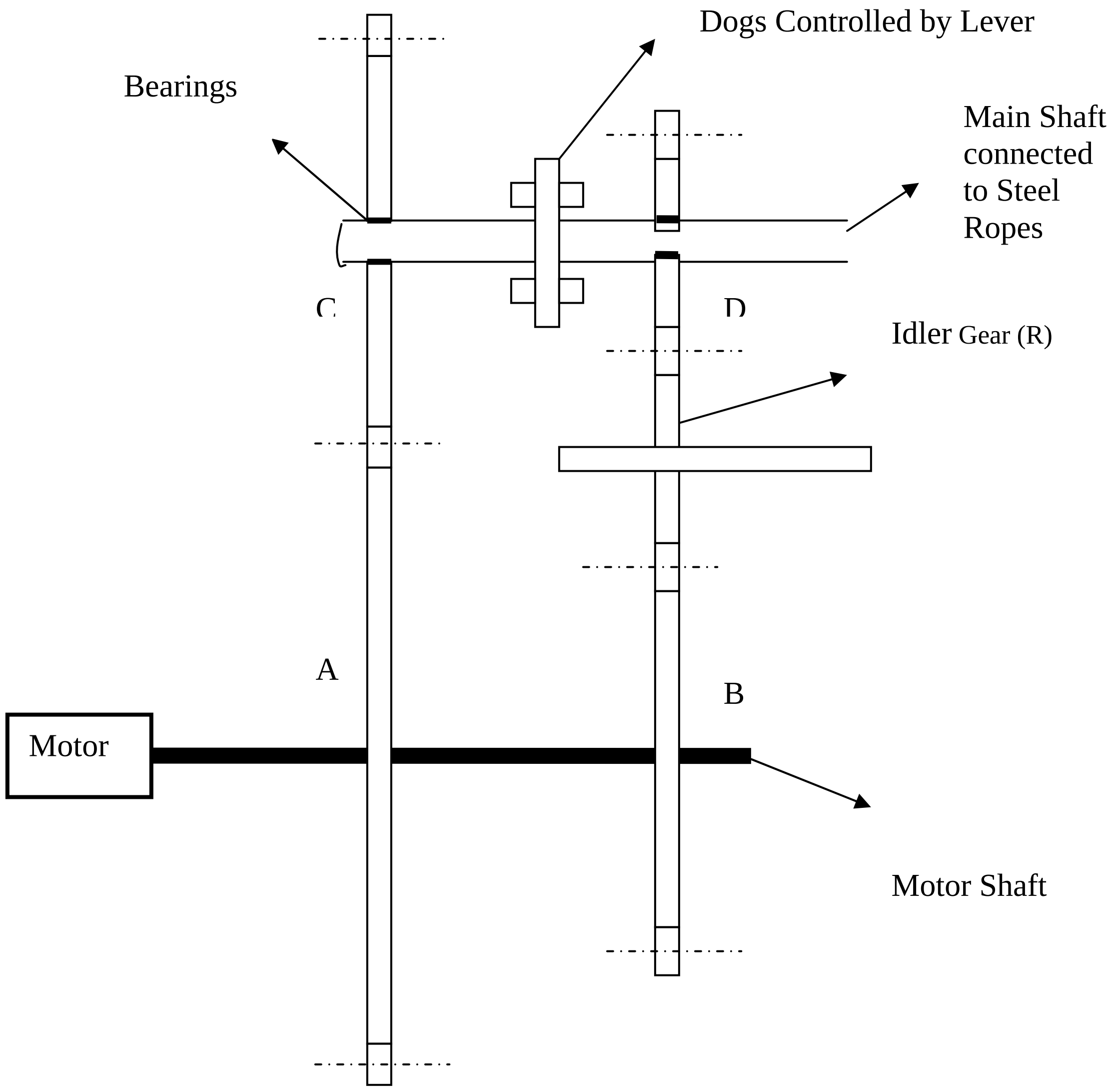


Fig4.9- Gear System

- When the dog is engaged with the gear C, the motor power will be used to lower down the inclined bridge and when engaged with gear D, the reverse will happen.

Rails

- The rails will be made up of steel and will be in the shape of half I-section. The rail will consist of two such members.
- The gap between will be enough accommodate the tyres of the wheel chair.

Wheels of wheel chair

- The shape of the wheels will be as shown in the figure **:**
- The wheels (front and rear) will be connected to each other rigidly with the help of an axle. This will stop them from moving side ways.

Safety

- The wheel chair will be provided with a proper locking arrangement, so that person may not fall.
- Railings will be provided on both sides of the bridge and a shed of tin will be made to avoid environmental factors.

Brakes

- The brakes will be provided on the wheels which will get actuated with the help of an angle sensor or with help of a lever or a pedal.

Problems

- The friction between the tires and the rail is too high.
- The force required to brake the wheel chair is high.
- The handicapped or old people has to be brought up to the height of the platform from the railway platform level to the destination platform.
- The numbers of bridge to be built will be very large (on the stations where number of platforms are very large, like in Kolkata the number of platforms are 24, which will require about 46 bridges which will be very difficult to construct and maintain). Cost of building the bridges has to be high.
- Power required to lift and bring down the system is very high.

B. The handicapped or old people can be transferred on a bridge, built at platforms height.

Here the system consists of **:**

1. <u>Bridge</u> will be a straighter one parallel to the horizontal plane or platforms and will be at the platform's height only. On the bridge the handicapped or old people can be transferred on manually driven wheel chairs.
2. <u>Electric motor</u> will be used to remove the bridge with the help or thick steel ropes or a suitable gear mechanism, which will be discussed later.

Removal of Bridge

One of the main problems of removal of the bridge is when there is arrival or departure of train, which can be solved in following ways **:**

- **With the help of steel ropes :**

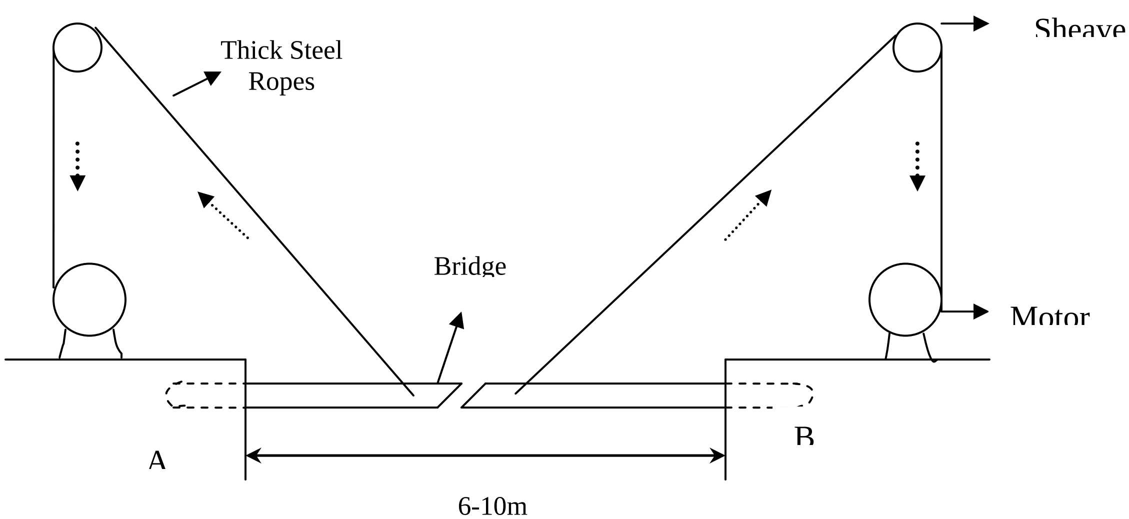


Fig.4.10- Bridge Removal by steel ropes

The bridge can be lifted with the help of steel ropes. Here the motor will pull the wires through the gear system which connects the wire with the motor. The bridge is hinged about A and B.

The bridge can be lifted up to a maximum angle of 80 degrees.

Point A:

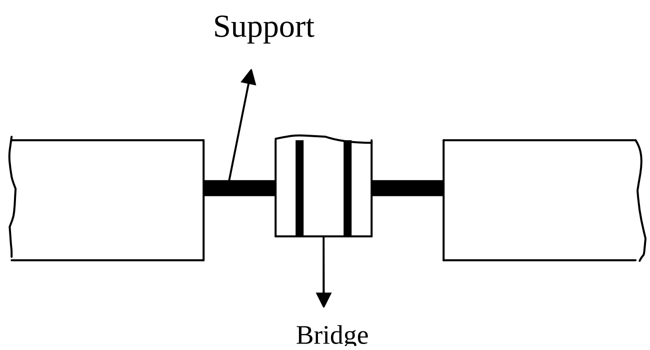


Fig. 4.11- Support for bridge

Here, also the system or gear system will consist of gears, which can reverse the motion of the bridge. The gear system can be controlled with the help of a lever.

- **With the help of bevel gears:** The bridge can be removed with the help of bevel gears. Here the motor will be connected to gear A through a gear system (enabling the motor to rotate gear A in both directions). The gear A meshes with bevel gear B. The gear be turns the motion through a right angle and gives it to gear C mounted on the same shaft. Gear C reduces the speed and meshes with gear D. Gear D’s shaft is splined externally and fits into the internally splined hole which is rigidly attached to the bridge and is mounted on tapered roller bearings.

Truss or Support system

The support system will be built to support the bridge. The system will be fixed to the platform. The system may be a simply supported one or a truss system. This will totally depend upon the length of the bridge which in turn will depend on the distance between the platforms or number of tracks between the platforms. The usage will be as follows :

Length of the Bridge	System to be used
I. < 8m	Simply Supported
II. 8m – 30m	Truss System

Problems

- This will provide a mode of transportation but between two adjacent platforms only. A large number of bridges to be built, wherever there are a large number of platforms.
- Maintenance cost and also the constructing cost will be high.

CHAPTER 5

EVALUATION

1. Evaluation

In this section we are evaluating the different alternatives proposed in the earlier discussions. Various parameters on the basis of which we will be evaluating the alternatives are

1. Safety
2. Quickness
3. Reliability
4. Durability
5. Maintenance
6. Removability

We are evaluating the alternatives on a scale of 10.

Rating is like this

- <5 can't use
- 5 poor
- 6 below average
- 7 average
- 8 good
- 9 best

Table 5.1-Evaluation Table

Alternative / Parameter	1	2	3	4	5
2. Safety	5	8	8	8	8
3. **Quickness**	8	7	8	8	8
4. Reliability	6	7	7	8	8
5. Durability	7	7	8	8	8
6. Maintenance	7	6	7	7	7
7. Remove	7	8	6	9	9
Total (Out Of 60)	40	43	44	48	48

From the above table we find that alternative 4 and 5 have got the highest points out of 6. Hence we select those alternatives as the best alternatives and will develop the alternatives step by step in the further sections.

One of the major reason for choosing alternative 4 and 5is that the over bridges or the subway are already present in Indian railway stations and hence can be built alongside the ones which are present.

CHAPTER 6

ANALYSIS

Functional Analysis

Morphological Analysis

6.1 Functional Analysis

The different functions or systems involved in the alternatives we are developing are:

i. System for lifting up the person to the height of over bridge.
ii. System for moving old or handicapped people on the over or under bridge.
iii. System for bringing down the person back from the over bridge to the platform.
iv. Control system for controlling the whole system, which will contain different systems which in turn will control above three systems.

The four systems discussed can be reduced three by combining the two systems that is first and third, so the system for taking the persons to the over bridge and bringing them down will be same.

In case it is a lift/elevator then there will be a pair. So that both can be used simultaneously.

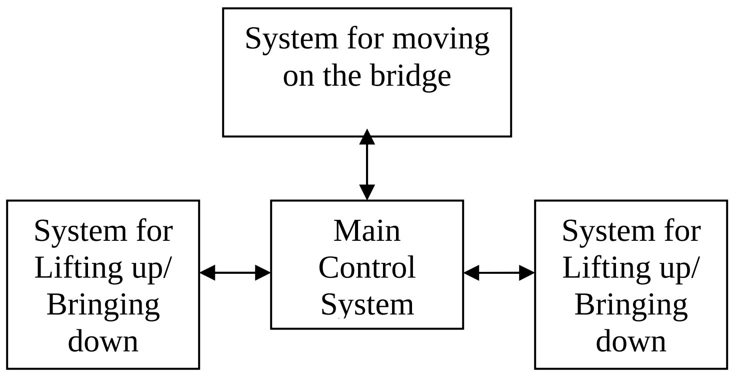


Fig 6.1- Block diagram

6.2 Morphological Analysis

Alternatives / Sub-Func.	1	2	3	4

Lifting up/ Bringing down	Hydraulic Lift	Roped elevators	Circular Lift	Magnetic Levitation
Moving On Bridge	Chain Drive	Moving Ramp	Magnetic Levitation	
Main Control System	Semi-Automatic	Automatic		

Table6.1- Morphological Analysis

Now the main control system can further be divided into three control i.e.

i. Control system A
ii. Control system B
iii. Control system C

Each of these can be made semi-automatic or automatic, hence in all making 1 combination, which in turn make 2 combinations when combined with the main control system.

In all we can have 24(4*3*2) combinations, but out of these many are not feasible. Those we will leave out and discuss only the best ones.

6.2.1 Lifting Up/Bringing Down

a. Hydraulic lift

The main function of an lift/elevator is to carry people from ground to a certain height. And if this is done hydraulically then it is known as hydraulic lift.

In a hydraulic lift a car, using a hydraulic ram, is lifted. Hydraulic ram is nothing but a fluid driven piston mounted inside a cylinder.

The cylinder is connected to a fluid pumping system (typically, hydraulic systems use oil, but other incompressible fluids will also work).

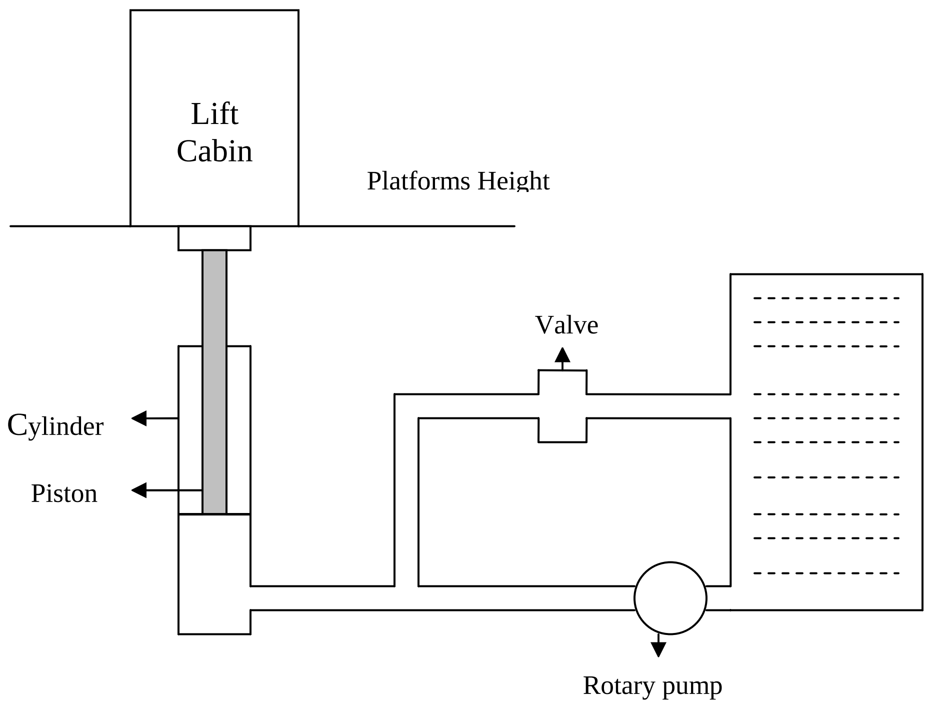
The hydraulic system has three parts :

- A tank (the fluid reservoir)
- A pump, powered by an electric motor
- A valve between the cylinder and the reservoir

The pump fluid from tank into a pipe leading to the cylinder. When the valve

is opened, the pressurized fluid will take the path of least resistence and return to the fluid reservoir. But when the valve is closed, the pressurized fluid goes into the cylinder. As the fluid collects in the cylinder, it pushes the piston up using the elevator car.

Fig6.2- Hydraulic Elevator



When the car reaches the floor(desired), the control system sends a signal to the electric motor to gradually shut off the pump. With the pump off, no more fluid is pushed into the cylinder.

To lower the car, the elevator control system sends a signal to the valve. The valve is operated electrically by a solenoid(electromagnet). When the solenoid opens the valves, the fluid that has collected in the cylinder can flow out into the fluid reservoir. The weight of the car and the cargo pushes down on the piston, which drives the fluid into the reservoir. The car gradually descends. To stop the car at a lower level or a ground, the control system will control the valve again.

The advantage of using a hydraulic lift is that it is very effective and easily built also it multiplies the weak force to get the car lifted up.

But a disadvantage of this is that the whole system is underground and also everytime it has to raise the car by pushing up the piston.

So, to over come all three problems a rope driven lift can be used either in combination with the hydraulic system or alone.

Rejecting this we are left with 18 combinations (3*3*2).

b. Roped elevators

Also the roped elevators are known as traction elevators. As in this system, the car is raised and lowered with the help of traction steel ropes, rather than pushed from below.

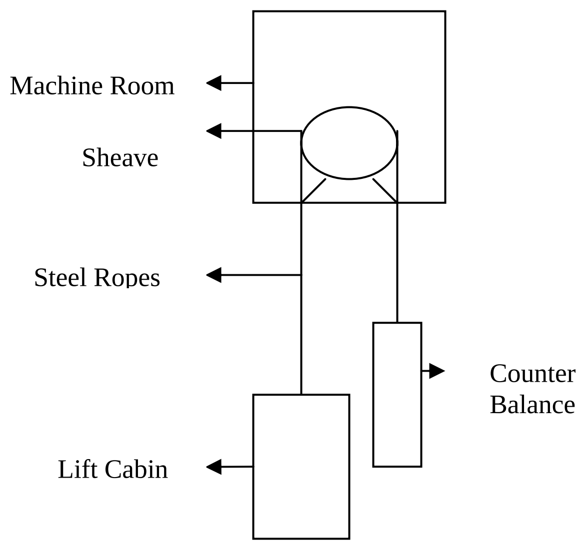


Fig6.3- Roped Elevator

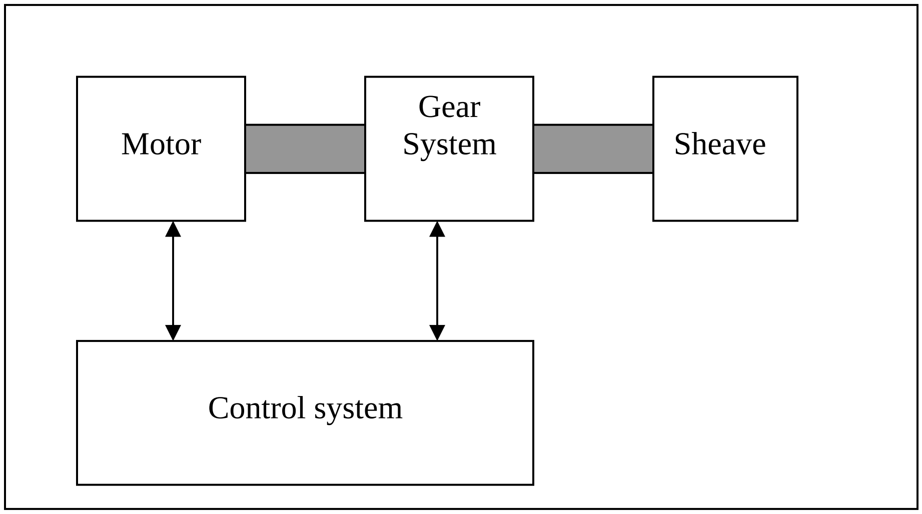


Fig6.4- Controlling system for roped elevator

The ropes are connected to the elevator car and looped around a sheave. A sheave is just a pulley with the grooves around the circumference. The sheave grips the hoist ropes, so when the sheave rotates the ropes moves too.

The sheave is connected to an electric motor through a gear system, which allow the sheave to rotate in both the directions. The gear system is controlled with the help of a control system. All this is contained in a machine room.

Now, the ropes which lift the car are also connected to a counter weight, which hangs on the other side of the sheave. The counter weights weighs about the same as the car filled to 40% capacity.

The purpose of this balance is to conserve energy. With equal loads on each sides of the sheave, it only takes a small force to tip the balance one way or other.

Here the balance maintains a constant potential energy level in the system. Using up the potential energy in the elevator car builds up potential energy in the weight. The same thing happens in the reverse when the elevator goes up.

Both the elevator car and the counter weight ride on guide rails on the sides of the elevator shaft. The rails keeps the car and the counter weight from swaying back and forth and they also work with the safety system to stop car in emergency.

However strong the steel ropes may be, but there is a chance that rope may break at some point of time. In that case the lift/car will fall down to the ground with the large velocity or speed, hence causing a lot of harm.

So, in order to avoid this, some safety systems are provided like cushioning effect at the bottom, which is provided by installing springs at the end.

Also there is a safety system to stop the car at a height. This is done by providing a governor which will be connected to the lift by its own cable and the governor will be consisting of a

- Stationary ratchets
- Fly weights

The fly weights will be anchored on the pins. Now when the lift is moving at its normal speed the fly weights remain in the same position. This is done with the help of a spring, but when the rope break down the car speeds up, hence increasing the speed of the governor. Due to increase in the speed the fly weights, fly outwards and get hooked into the stationary ratchets, hence stopping the governor and the lift. Also at the end of the governor cable two V-shaped blocks will be provided to hold the governor ropes in such a condition.

Also there will be other safety devices like load sensors etc. on the elevators. So in our case we are using roped elevators.

c. Circular lift or Paternoster

In our case, this type of lift cannot be used, as this type of lift is moving continuously and also requires the person traveling to be normal and fast so that he may get into the lift and get himself out of the lift. But in our case the persons we are talking about are not physically fit completely to do the above task themselves. So, this type of lifts cannot be used.

d. Magnetic levitation

This is a method in which our object is suspended over another object with no support other than magnetic fields. In our case this method can be used to transfer handicapped people from one platform to other in a cabin.

Magnetic levitation can be done by two ways :

i. Electromagnetic Suspension

   It is based on the principle of repulsion and attraction of like and unlike poles of magnet.

ii. Electro dynamic Suspension

   It is also based on the same principle as above, but in here in some designs super cooled conducting electromagnets are used.

In the magnetic levitation, the speeds which are reached are very high, which is of not much use in our case. Also in the present scenario in India this method will much more development and research and will also be very difficult to implement. Hence, we are not going to use the method of magnetic levitation to transport people. But in future, this method will have real importance as it consumes less energy and also it is very fast, that can be in the railways transport system.

In the case of using the method of magnetic levitation in moving the persons on the bridge. This method is too dangerous to be used.

6.2.2 Movement on the bridge

Moving ramp: A moving ramp or a moving walk way is generally used in malls, railway stations and airports, where movement of people is required to be high. The reason we are using it is that :

- They are economical as compared to other methods.
- In airports and large stations they are in use and if not can be installed easily.
- Easy to control and easy to use too.

Now there can be two kinds of moving walk ways :

- Pallet type
- Moving belt

b. Chain Drive: For moving the people on the bridge we are not going to use chain drive alone. As here the distance between the elevators is long enough for the chain drive.

But, chain drive can be used along with the moving ramp. In this case chain drive will give the driving force which will drive the moving ramp.

6.2.3 Control System

In case of control system, we are not using a fully automatic system rather we are going to implement a semi-automatic system. As in India, in the present scenario a completely automatic system will not be able to exist for a longer time. Also in automatic system much more technical complications wil be there due, which can lead to many accidents if not used properly.

So, here we are using a semi-automatic control system i.e. the system will be manually controlled.

CHAPTER 7

FINAL DESIGN & SPECIFICATIONS

7. FINAL DESIGN AND SPECIFICATION

The final design of the system will consist of following sub-functions:

- For Lifting up and bringing down : **Roped Elevators**
- For Movement of people on the bridge: **Moving ramp**
- Control System: **Semi-Automatic**

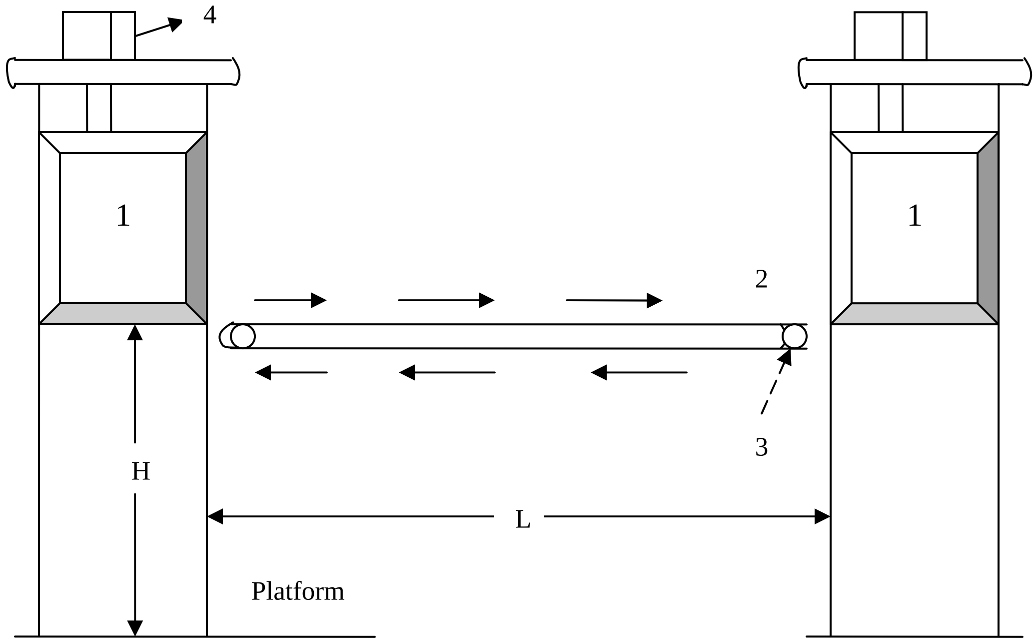


Fig. 7.1- Final Design

1. Roped Elevators (Height H=15m)
2. Moving Ramp
3. Rollers
4. Motor with sheave
5. Moving walkway(Length L=25m)

The specifications of the sub-functions we are using here are described below:

1. ROPED ELEVATORS:

Roped elevator system will look like the diagram shown below:

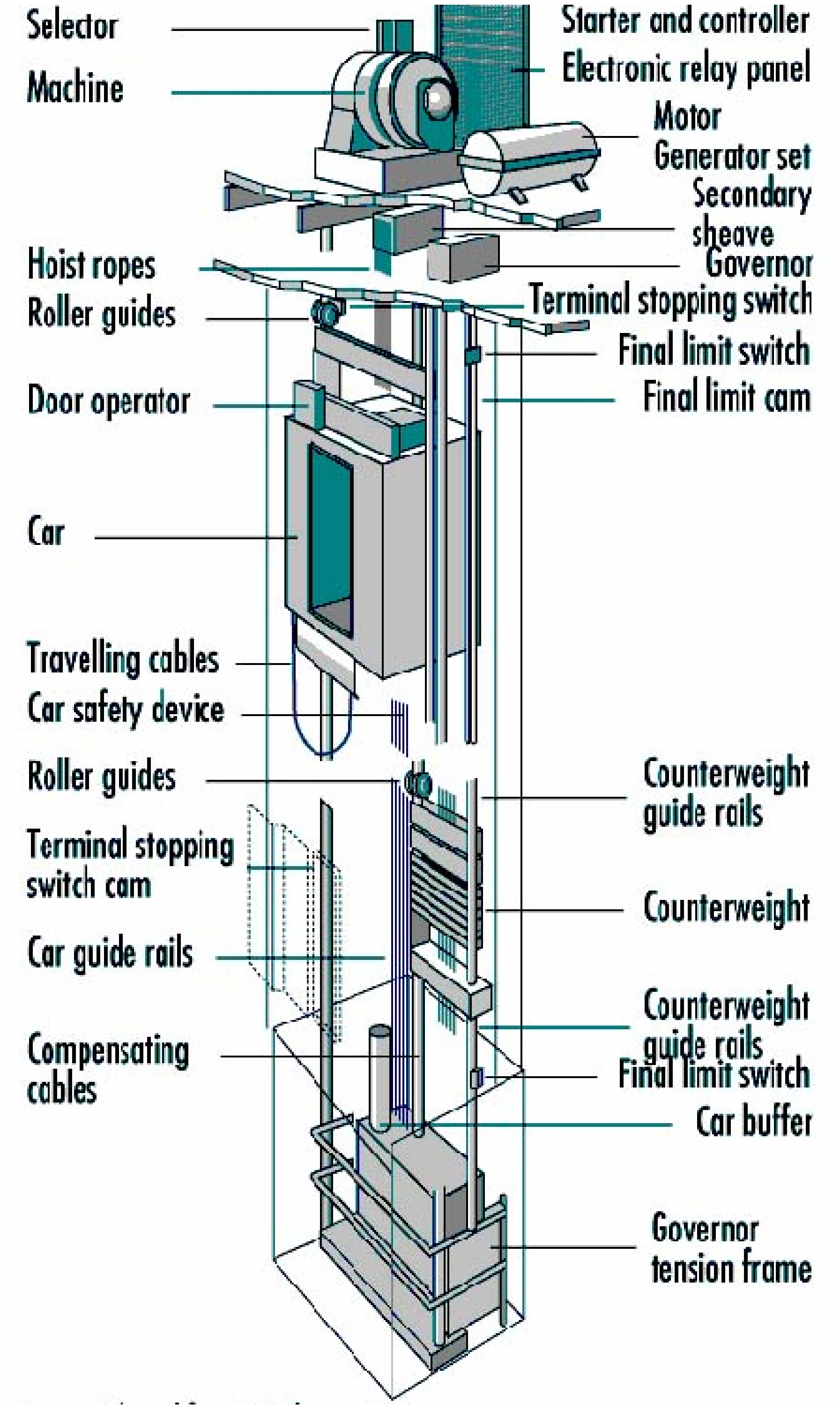


Fig. 7.2- Details of roped elevator

Specifications

A. **Hoist way**

1. A finished plumb hoistway of proper size and construction conforming to ASMEA17.1and CSAB44 all applicable building codes, and the elevator layout drawings.
2. Adequate supports shall be provided for fastening rail brackets as indicated on the layout drawings. Supports must withstand rail forces indicated.
3. A poured pit conforming to all applicable codes, ASMEA17.1and CSAB44 and to the dimensions indicated on the layout drawings must be provided. The pit must be designed for the impact load indicated and must be guaranteed dry and level from wall to wall.
4. Knock-out in walls between the machine room and elevator hoist way for routing hydraulic and electrical lines and for hall buttons shall be coordinated with the elevator contractor.
5. All wall patching, painting, and grouting by others.
6. Hoist way doors, frames, entrances, sills, and associated framing to be provided and installed by purchaser or general contractor.

B. **Machine Room**

1. An adjacent machine room built to conform to the layout drawings, NFPA70, ASMEA17.1 and CSAB44 and all applicable building code requirements. Its hall have suitable access, a lockable door, a convenience outlet, and light switch. Machine room temperature must be Maintained between 60 and100 degrees Fahrenheit. Relative humidity not to exceed 95%.
2. A telephone line to the machine room and tied in to the elevator controller as per ANSI/ASMEA17.1,CSA,etc.
3. Machine room vents as required by local code.

C. **Electrical Requirements**

1. A220VAC, single phase service, with neutral,to a lockable safety disconnect switch, fused with time delay fusess hall be furnished in the machine room inaccordance withNFPA70. a normally open electric interlock contact is required in the switch for battery isolation.
2. A 120V AC, single phase,15AMP service to a lockable fused disconnect switch, or circuit breaker, located in the machine room shall be provided for the cab lighting in accordance with NFPA70/NEC.

Characteristics

Type: Roped

Capacity: 750lbs.

Car Speed: 40FPM

Operation: SAPB/single button collective

Travel:

Number of Stops:

Number of Openings:

Inside Car Dimensions: 36”×48”×80”high.

Power Supply: 220Volt,singlephase,60Hz.

Cab Design:

Push Button Faceplates and Handrail Finish:

2. Moving Ramp:

Moving walkways are widely used for transporting passengers in facilities such as railway stations and airport. The speed of these walkways is determined by the need for safety upon entry and exit- which generally limits it to approximately half normal walking speed or 30-40m /min. The slow speed of the walkway causes impatience and passengers often walk on the walkway itself or on the adjacent floor rather use the slower walkway.

Various components of the moving walkway and speed pattern are shown in the figure below:

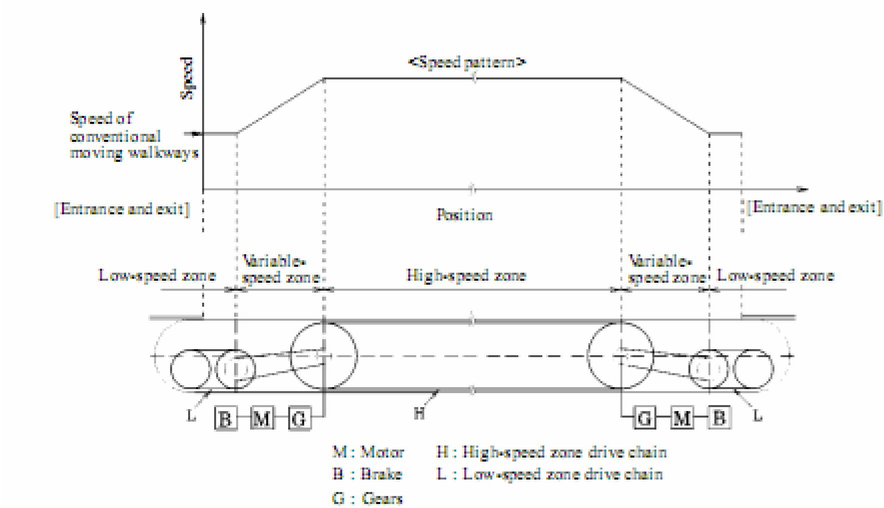


Fig.7.3-accelerating moving walkway

Specifications of various parts of the moving walkway are given below[12]:

Item	Specification
Type	1200
Distance between supports	20m
Width exposed tread way	1000mm
Speed at entrance and exit	30-40m/min
Speed in high speed zone	54-72m/min
Ratio of high speed and low speed	1.8
Type of tread way	Pallet type
Type of hand rail	Moving Handgrips
Driving Machine	Link coupling and drive chain
Transport ability	10000passengers/hr

Table7.1- Specifications of Moving Walkway

CHAPTER 8

RESULT & CONCLUSION

8.1 RESULT

Among the various alternatives we have proposed for transferring people, the system comprising of roped elevators and moving walkways is found to be the most effective. The system developed is easy to control, maintain and also can be easily installed as the over bridges are already present on railway stations. So the installation becomes cheaper.

8.2 CONCLUSION

The main importance of this study is that, if, the developed system is applied to the railway stations, then the handicap or old people on the station will be self dependent means they can cross the platforms by themselves. And the other thing is that, in this can transportation will be faster across the platforms.

In this project we have searched for new alternatives to deal with the problem of transferring people from one platform to another. In order to reach the best possible alternative we have gone through a no. of processes. First of all, we find out all the possible alternatives, then evaluate them in which, we rank the alternatives according to some parameters like safety, quickness, reliability etc. and after that we have done the functional and morphological analysis of the best ranked one. After all this, we have given the final design and its specifications.

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