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1 INTRODUCTION

Autism is a development disorder which is identified one in every 150 children regardless of any aspects of economy or socio cultural. The autism spectrum consists of various branches; however most of the therapies and treatments remains common for these children. India has seen various

milestones to illustrate the awareness of autism. India has experienced tremendous growth in less than a decade. Growth has occurred in numerous domains: diagnosis, treatment and educational options, parental involvement, vocational options, human resource development, and legislation.

The Bye-laws have successfully contributed to the growth of barrier free architecture in terms of physically handicap children. However, despite the high incidences of autism there are yet to be developed architectural guidelines catering specifically to the scope of autistic needs. These can be developed by recognizing the required spaces such as inclusive school, therapeutic clinics, residences, play areas, etc. Since autism is a condition much linked with the perception of space, architecture is one such field which can majorly contribute to the development of an autistic person. Therefore, in terms of architecture, autism can be defined as :

“¹Autism, a development disorder which is characterized by delayed communication skills, **challenged social interaction** and **repetitive behaviour**, has long been excluded from various architectural guidelines and codes of practice for special needs. Autistic behaviour is credited to a form of **sensory malfunction** when assimilating **stimulatory information from the surrounding physical environment.**”

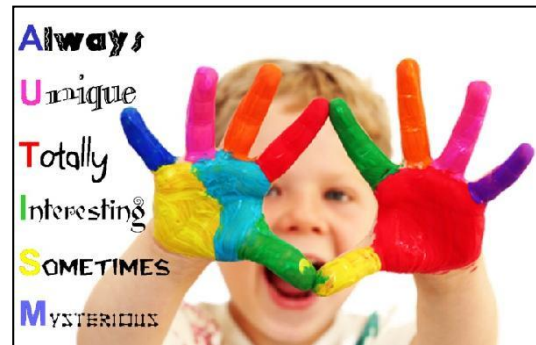


Figure (a) : Autism Characteristics

¹ An architecture for Autism : Concepts of Design Intervention for the Autistic User by Ar.Magda Mostafa

As per the above definition spaces must be created to counteract the psychological symptoms. The struggle fought by them fitting into the community has been the core reason for providing an integrated complex mainly focused on the social upliftment of the children while generating employment for the society surrounding the site / location.

An inclusive complex like the one proposed in this thesis would be helpful in the growth of an autism child for his experience in this world. This progress will not only benefit the child but the parent to neutralize the spectre of “What after us?”. A campus which would counteract symptoms like challenged social interaction, keeping in mind their behaviour like repetitive behaviour. Children with special needs, while in their prime age can be moulded and helped to be independent and “fit in”. Families living in the city avoid taking their children to public spaces for the purpose of avoiding the abandonment and isolation the children feel as they are not accepted by the people.

Keeping all of the above in mind, the government has initiated the project ²ANANDA— a supported living for the people of Autism. Based in Haryana and First of its kind in India, the project was based to suit the local environment providing all the necessary commodities like residential, school and therapy centre for the autistic.

However, there are certain cities which are more in need of such complexes due to long term prevailing neurological conditions. One such city is Bhopal. The Bhopal gas leak³ of 1984 has been one of the most disturbing and traumatic tragedies in the lives of the people of Bhopal. The effects of the tragedy though 30 years back , still prevails in the coming generation. The children are often born with neurological effects much like autism, Down syndrome, cerebral palsy and many more of the conditions under the Autism Syndrome. The number of births with neurology defects is increasing in Bhopal and these effects have led to the shortage of hospitals of children. Organisations⁴ under The Bhopal Medical Appeal are constantly engaged against the fight of these neurological defects today. Although there are clinics

² <http://www.autism-india.org/residence.php>

³ INDIA: AFTER 30 YEARS, BHOPAL IS STILL SIMMERING : BY JOHN ELLIOT AT <http://europe.newsweek.com/>

⁴ SAMBHAVNA CLINIC: <http://bhopal.org/about-us/sambhavna-clinic/community-healthwork/>
COMPOSITE REGIONAL CENTERS : <http://www.crcbhopal.nic.in/default.htm>
CHINGARI TRUST : <http://www.chingaritrustbhopal.com/>

engaged to help the affected population, it has not been sufficient. Therefore, there is a need of such an inclusive enclave in Bhopal.

Bhopal stands as one of the upcoming and developing cities. It requires a boost which is generated much by the employment opportunities especially in the rural areas. With abundant of schools and welfare organisation of Autism available in Bhopal, it fails to fulfil the requirement of the city. Hence, the project would help not only the Autistic children but also generate opportunities for the villagers or the local people. Studying the requirement of this centre in Bhopal will also stand as an aim of the project. Interviewing localities, doctors of Bhopal, visiting the research centres would help us develop a statistic and further give the necessary guidelines.

2 NEED AND SIGNIFICANCE OF THE ENCLAVE:

The proposed project at Haryana has been one of the major milestones countered by the Indian Government in terms of guidance for the autistic families. The project at ANANDA would also serve as the foundation to the growth of the design guidelines which require to be set for the people with special needs. A careful examination of the dynamic between the built environment with its various



Figure (b): A mother with her neurologically affected child in Bhopal

attributes like acoustics , visual character , spatial quality , colour , texture, geometry , etc and autism behaviour can lead to the development of more specific and sensitive design guidelines. Autism is a condition where the parents are the primary people who know their child's behaviour and the secondary people are they therapists and teachers. Even if 50% of the knowledge remains with the therapists about the symptoms and therapies, each autistic child is different. The parent/Guardian of the children are the other ones who know the other 50%. Therefore it is necessary for children suffering from Autism to be treated with a coordinated relationship between the health care professional and the child's guardian. A complex like this will develop this much needed interactive environment for the best development of the child. Although intensive research has been already

carried out regarding this field in the foreign countries by leading researchers like
⁵Ar.Magda Mostafa , India has started initiated a step towards catching up with them.

One such city which has developed an intensive research and implementation is Bhopal, only due to the increased number of neurological cases since the Bhopal Gas Leak Tragedy of 1984. The city has grown and expanded after 30 years of the disaster, however the development to assist the growing population of such children has been long drawn out. The affected population belongs the Lower Income Group and the Middle Income Group. They are specific to Old Bhopal which is the northern part of the city close to the disaster point. The campus like an Enclave for Autism will not only help the children with proper school and therapy. It can generate employment for the Autistic adults as well as the parents. This campus will be an integrated hub of autistic children, adults, parents who seek employment and help. The Group Housing could either be used by Autistic children or adults who cannot afford the travelling. Thus, a modern outlook is required for the city which has been achieved through intensive research to best suit the requirements of People with Autistic needs.

2.1 AIM:

The aim of the architectural design project is to create a sensitive built environment with characters that address directly to the symptoms of the autism.

2.2 OBJECTIVE:

- i. To understand the Autism Condition: Symptoms and Treatment
- ii. To understand the correlation between Architecture and Autism
- iii. To withdraw sensitive Design Guidelines specific for Autistic Based spaces where the outcome will be Therapy building, An Inclusive school and residential spaces.
- iv. To find a suitable location for the Autistic Enclave Project based on the distance from the affected and population and other requirements.

⁵ An architecture for Autism : Concepts of Design Intervention for the Autistic User by Ar.Magda Mostafa

2.3 SCOPE:

In this architectural project thesis the following points will be studied:

- i. Intensive Literature Review of Autism as a condition and the symptoms which can be countered with the help of built environment.
- ii. ⁶Sensory Zoning based on Inclusive and Exclusive spaces as per the circulation of Public flow and circulation of children.
- iii. Observing of Autistic children to understand how they perceive an institute environment.
- iv. Interviewing the Therapists and Parents to receive their insight about the children's perspective.
- v. Studying of existing cases to with draw space requirements.

2.4 LIMITATIONS:

The thesis, however, will be limited in the following ways:

- i. Behavioural study of children will be restricted to children suffering from Autism from the vast ⁷Autism Spectrum.
- ii. The enclave will be limited to accommodate children who are above 10 year old.
- iii. The autistic design would not be segregated for the Hyper and Hypo sensitive characters. An intermediate state of mind would be considered.
- iv. The design would not be based completely on Sensory Approach or Neuro Typical Approach.
- v. The enclave would not provide a healthcare hospital centre. However, an emergency medical ward with fast ambulance pick can be provided.

⁶ An architecture for Autism : Concepts of Design Intervention for the Autistic User by Ar.Magda Mostafa

⁷ Autism Spectrum : **Autism spectrum** disorder (ASD) is the name for a group of developmental disorders. ASD includes a wide range, "a **spectrum**," of symptoms, skills, and levels of disability. People with ASD often have these characteristics: Ongoing social problems that include difficulty communicating and interacting with others.

3 LITERATURE REVIEW

3.1 AUTISM: CONDITION AND SYMPTOMS

A literature review was necessary to understand the condition of autism in terms of its characteristics and symptoms. Understanding these can help us derive variables which can be countered using the built environment. Thus, one needs to define the condition in terms of architecture:

*“Autism, a development disorder which is characterized by delayed communication skills, **challenged social interaction** and **repetitive behaviour**, has long been excluded from various architectural guidelines and codes of practice for special needs. Autistic behaviour is credited to a form of **sensory malfunction** when assimilating **stimulatory information from the surrounding physical environment.**”*



Figure (c) : Autistic Child moving to his escape place for a breakdown



Figure (d): Autistic Children are socially isolated

Symptoms of autism are usually noticed first by parents sometime during the child's first 3 years. Although autism is present at birth (congenital), signs of the disorder can be difficult to identify or diagnose during infancy. With early and intensive treatment, most children improve their ability to relate to others, communicate, and help themselves as they grow older. The earlier the treatment is given the better the child learns and adapts. However, some times the symptoms are visible after a few years.

Apart from delayed communication skills and challenged social interactions the child may be hyper sensitive or hypo sensitive to his surroundings. It is necessary

to understand these two categorization since certain environment may be over stimulating to an autistic person while certain environment may have no effect at all. If out of their comfort zone and over stimulated the children may get extremely hyper and may self inflict any injuries. Extreme climatic conditions may also get them hyper. Since they are oversensitive, they are extremely prone to allergies and other diseases. But since the symptoms are vast and different with each individual, their basics remain the same. Thus, the therapies⁸ given to them is categorized as the following:

1. Behavioural Therapy
2. Speech Therapy
3. Physiotherapy
4. Hydro Therapy
5. Occupational Therapy
6. Audiology therapy
7. Sensory Therapy



Figure(e) : Autistic Child given Occupational Therapy (Taught daily chores)



Figure (f) : Audiology Testing Done of Autistic Children and therapy given for the same.



Figure (g) : Autistic child given Physiotherapy

These therapies help the child's growth and development. The stages of development are marked not by age, but by certain activity milestones. If he can successfully pass a milestone without any assistance, he is preceded to the next level of training.

An education institute works with the same concept. The children are taught one on one. A classroom is not equipped with more than 8 -10 students. A hands-on help is always present, in case the student has any sort of break down or incident.

⁸ <https://www.autismspeaks.org/family-services/tool-kits/100-day-kit/treatments-therapies>

Relaxing activities are constantly put intermediate like dancing , singing, gardening , playing , etc.

3.2 ⁹ARCHITECTURE AND AUTISM

Various definitions and theories have been developed in the past regarding the mechanism of autism. An architect withholds the power of altering the physical design environment and hence can create a sensitive environment conducive of skill development and learning.

Autism is characterized by the following “¹⁰*Triad of impairments*” :

- i. **Social Interaction:** Impaired social development especially interpersonal development. They find it hard to relate the changes in social rules due to change in context of the situation. They are often misinterpreted as “socially inappropriate”.
- ii. **Language and Social Communication:** Little or no communication either verbal or non verbal.
- iii. **Thought and Behaviour:** Rigidity of thought and prediction of situations and environment, poor imagination and major reliance of ROUTINE. Ritualistic behaviour is adapted by them, since they have to be trained. It helps them to perform the day-to-day activities.

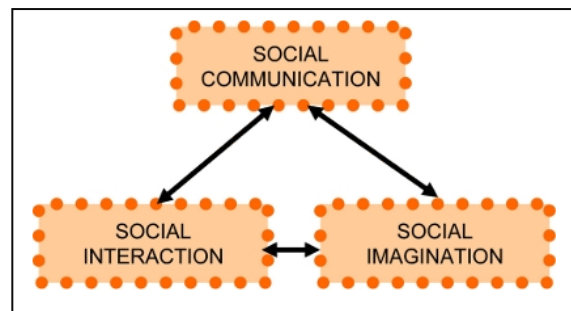


Figure (h) Triads of Impairments

Intensive study and observational research have been conducted by various architects to understand the correlation between the two factors.

Based on the extensive research conducted by Ar. Magda Mostafa in her paper, specific behavioural indicators are measured and observed after modification

⁹ An architecture for Autism : Concepts of Design Intervention for the Autistic User by Ar.Magda Mostafa

¹⁰ <http://www.autismbedfordshire.net/about-autism/triad-of-impairments/>

of built characteristics like spatial sequencing, acoustic modification, etc. She has been a pioneer in study of the relation between architectural spaces and autism. She developed the theory of ¹¹SENSORY ARCHITECTURE. In her study, the following indicators are the ones affected by the built environment and further help the development of the child:

- Attention span
- Response Time
- Behavioural temperament
- Social Interaction

The conclusions withdrawn in the paper suggest that the main architectural factors which affect the above indicators are acoustics, spatial sequencing or compartmentalization, colours, texture and olfactory.

In behavioural mapping in this paper a new space was discovered: “Escape Space”. These were particularly used by the severely autistic child. The child would constantly separate out of the routine or group for 10minutes. The child would either sit quietly or bang her head and then rejoin the group. Once a proper escape space was allotted, the use of the space eventually reduced. However, she would constantly check over her shoulder for the presence of the space. A mere “presence of option” was enough. Thus, the campus must have escape spaces within the circulation, therapy rooms and the classrooms.

^{11 11} An architecture for Autism : Concepts of Design Intervention for the Autistic User by Ar.Magda Mostafa



Figure (i) Compartmentalization of Classrooms

Sequencing or Compartmentalization is another theory discussed about. Sequencing of activities inside classrooms and to the building as a whole may help the child with a routine circulation. The activities could be allotted to follow a “one-way” circulation arrangement, according to their daily schedule. Sensory Zoning such be done in a way which is less distracting and diverting.

Another¹² paper written by Srivani Manchala , talked about using curved corridors to help create an element of surprise for the children , which triggers a thought of walking to the end of the corridor to discover the space. It also helps visually guide the child and helps him predict the flow. This inculcated in the design would be extremely helpful in the routine-based circulation.

A predictable environment must be provided .This can be achieved by using spatial volumes, compartmentalization, colours, etc. Predictable environments calm the children and allow them to focus. Distinctive landmarks must be provided using colours and textures which act as signage boards in case of normal people.

¹² A study on architectural spaces for psychological perspective emphasizing the autism rehabilitation clinic

3.3 ¹³DESIGN APPROACH FOR SPACES FOR AUTISM

Autistic perception is an integral part which helps us determine the type of design approach which can be adopted for the centres like the one proposed. Due to autistic people's inability to adapt to certain environmental conditions, the design of any treatment center can become as important as the therapy itself. Circumstances considered normal by most of us, may become toxic environments to them. There has been an extensive debate among the architects all over the world which has led to the conclusion of two basic approaches:

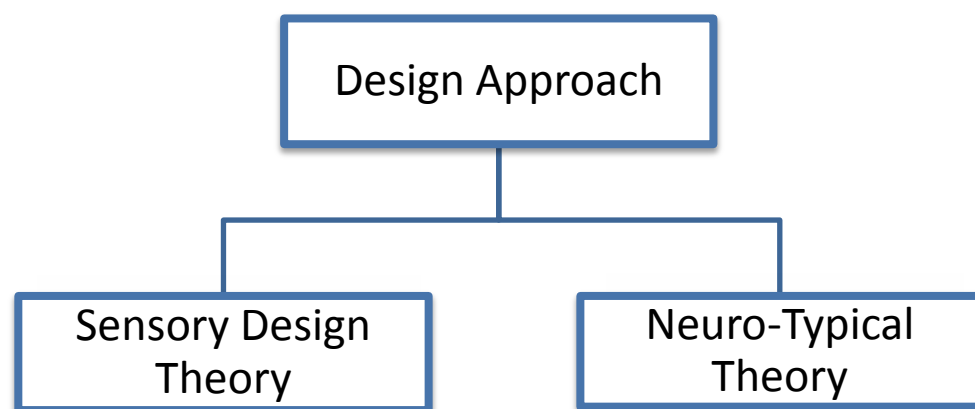


Figure (j) Types of Design Approach for People with Autism

Even though the goal of both the approaches remains the same, they have seemed to have contradictory solutions. The difference between them has been slight, however the ways in which architecture has been developed to accommodate this shift has resulted in their opposition. Up until now the first approach-Sensory Design Approach has been set as the default design theory and has been used all over the world. However, the Neuro Typical approach is accepted by a few organizations – mainly in the United States.

3.3.1 SENSORY DESIGN THEORY:

The theory of Sensory Design is based on the fact of altering the characteristics of environment to benefit the autistic people. This environment created must be created to make the patient as comfortable and secure as possible.

¹³ gn Approach for Autism Treatment Centres by Andrei Pomana

Developed by Ar. Magda Mostafa , the aim of this method is to create an appropriate environment which is acts as an autistic therapy. Applying this theory to a treatment facility for people with autism means to rigorously separate the space into two distinct areas: a high stimulus area which functions as developed public interface with training and conference rooms and a low stimulus area which is destined for treatment activities. Since the two spaces differentiate with one another both by function and by building environment character, usually they require two separate volumes. Therefore, the treatment facility needs to be integrated into an introverted type of layer that communicates only with its inside spaces and proper controlled outside environments, while the public interface becomes an extroverted spaces which needs to communicate and interrelate with the public environment surrounding the institution. The alterations in character of space like colour, perspective, sound, orientation, lighting, etc has proven to be an effective therapy.

3.3.2 NEURO-TYPICAL APPROACH:

As a design philosophy, the Neuro -Typical Approach is almost in opposition to the sensory design theory. This theory has been determined to give a direct approach to integrate in basic day to day circumstances. It is achieved by creating a physical environment that patients would come across in their everyday use of space. The person with special needs is directly put in a highly stimulating environment which forces them to develop a sense of familiarity with the different circumstances that they may observe in normal public spaces. For example, develop transit areas that look like streets and alley, therapy rooms which look like classrooms and libraries, the cafeteria which looks like a restaurant, etc. Here the approach is extremely practical. However, the results of this approach can be drastic if not positive. Therefore the debate still runs.

The location of such institutes if designed with either of the two approaches must be focused on establishing communication with places and public institutions that encourage the peer to peer learning.

The above points, needed to be studied before proceeding to the further primary study which basically involves interviewing and conducting case studies. A number of analysis and conclusion are withdrawn from these reviews. The literature review forms the backbone of this dissertation. However, since the location of the

proposed enclave has been decided to be Bhopal. One needs to understand the tragedy that had occurred in brief.

3.4 ¹⁴**BHOPAL: GAS TRAGEDY AND ITS CONTINUED EFFECTS.**

On the night of December 2nd, 1984, a Union Carbide plant in Bhopal, India, began leaking 27 tons of the deadly gas methyl isocyanate. None of the six safety systems designed to contain such a leak were operational, allowing the gas to



Figure (k) Bhopal Gas leak

spread throughout the city of Bhopal .

Half a million people were exposed to the

gas and 25,000 have died to date as a result of their exposure. More than 150,000 people still suffer from ailments caused by the accident and the subsequent pollution at the plant site. ¹⁵ Cancer, brain-damage and birth-defect-causing chemicals were found in the water; trichloroethene, a chemical that has been shown to impair foetal development, was found at levels 50 times higher than EPA safety limits.

In a sample of 865 women who lived within a kilometre of the plant and who were pregnant at the time of the gas leak, 43 percent of the pregnancies did not result in live births. Of the 486 live births, 14 percent of babies died in the first 30 days. The impact of poisonous gas, methyl isocyanate or MIC has now passed down to the second and third generations of the victim. People suffer from the effects now more than ever-even after 30 years. This was mainly because the soil as well as the ground water was polluted by the toxic gas that spread.

The people who suffer are successive generations, almost all poor, whose ill health now affects babies and young children of parents who may not have even been born in 1984. Recently, the ¹⁶Chingari Trust, which deals with handicapped

¹⁴ <http://www.newsweek.com/india-after-30-years-bhopal-still-simmering-288144>

¹⁵ <http://bhopal.org/about-us/sambhavna-clinic/community-healthwork/>

¹⁶ <http://www.chingaritrustbhopal.com/>

children, staged a play and candlelight vigil in Bhopal's old city. They have 700 children registered with autism, behavioural problems, sensory disorders and developmental delays, some not able to utter any kind of vocal sound. As per the ¹⁷article by John Elliot - Medical experts report a high incidence of lung cancer, adverse outcomes of pregnancy, and respiratory, neurological, psychiatric and ophthalmic problems among those exposed to the gas.

As the number of cases increase there are more and more people who are engaged in setting up of clinics and therapy centres. However, the numbers of centres available at the moment are very less to accommodate the growing population of the children affected. Therefore, the city requires an Enclave where the affected population can receive proper therapy and education.



Figure (I) Children Suffering from Neurological Conditions like Autism , Down Syndrome , Epilepsy , etc in Bhopal

¹⁷ <http://www.newsweek.com/india-after-30-years-bhopal-still-simmering-288144>

4 RESEARCH METHODOLOGY:

The types of research that are conducted vary exceptionally. A research can also be a combination of various types. This research project is a qualitative research based on more subjective conclusions. Since the main aim of the project is to study about the inter-relation between the two variables it suggests a correlational research. Similarly, the research follows its sequence of Basic research, a correlational research and applied research.

A¹⁸ correlational research refers to a systematic investigation or statistical study of relationship among two or more variable (In this case Architecture and Autism). This requires understanding of the two variables from various aspects. A qualitative research is a subjective approach to design where the results rely on descriptive analysis.



Figure (m) Correlational Research between the variables

However, since the research will be applied to solve a practical design problem, it is also to understand what applied research is about. Thus, Applied Research refers to a scientific study and research that seeks to solve a practical problem. It is used to find solutions to everyday problems, cure, illness and develop innovative technologies rather than acquire knowledge for the sake of it.

This paper is purely based on understanding the architecture and autism relation, where the occupants play an important role. As the characteristics of the relations are defined, the design problems are solved. However, to understand a special child, direct interviews were not possible. Therefore interviews with the secondary and tertiary users were conducted. In this case the therapists and the parents. Hence, the primary method of collection is limited to Interviews of the occupants. This would help us understand the first variable (Autism) and if it holds any relation with our second variable (Architecture)

The second variable will be studied in the form of cases. The studying and comparing of the existing cases will not only help develop a space constraint and a

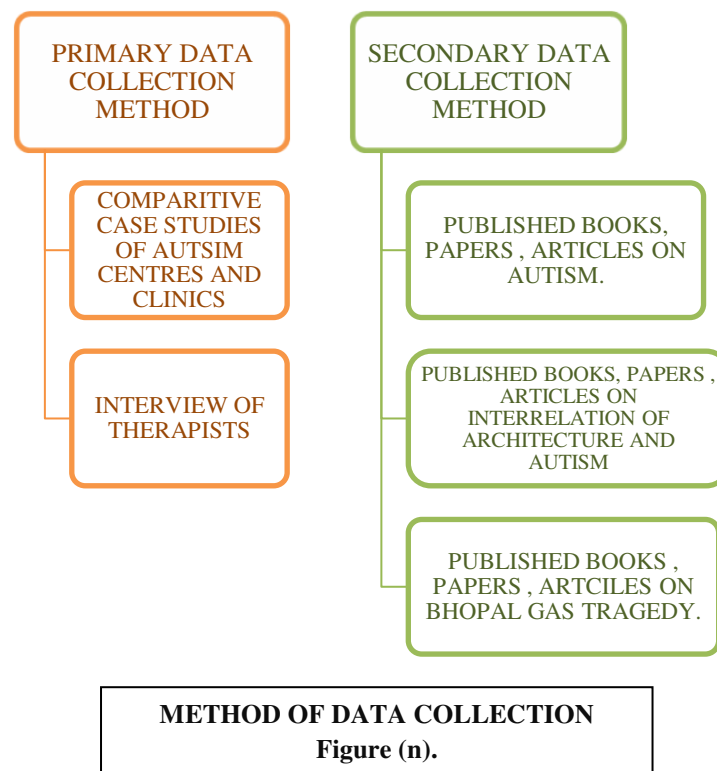
¹⁸ Research Methodology , Second Revised Edition by C.R.Kothari

design matrix but will also help us observe the children when they are put in such spaces. However, since India has only one such Autism Residential Centre, a comparative case study will be carried out with another existing Centre in a developed country. This can help us develop design guidelines for the Indian context.

For the purpose of understanding of spaces and design matrix of an inclusive school inferences will be drawn from the case study conducted during the dissertation.

Hence the primary data collection method is limited to Interviews and comparative case studies as per the requirements of the research.

The literature review, formulated the basis of the research. Without knowing the background study, conducting interviews or conducting a case study is not possible. Hence the secondary data collection which was the literature review helped set a foundation to the research. Reading the existing literature not only helps us constraint our study but also helps us understand the important points which need special concentration.



The primary method of data collection includes:

CASE STUDIES:

- i. Case study conducted of ANANDA –Supported Living for People with Autism at Gairatpur Bas village , Haryana.
- ii. Autism Treatment Centre , Dallas
- iii. Chingari Rehabilitation Centre at Bhopal
- iv. Composite Regional Centre at Bhopal.

INTERVIEWS:

Interviews help us understand the practicality of a situation and what people expect from a particular establishment. Interviews also help us understand the various problems faced by them. This helps immensely to provide a solution and becomes us a little closer to coming up with a design solution.

The interviews of the following people were conducted:

- i. Therapist working at the Clinics and who are engaged in the battle against autism in Bhopal.
- ii. A few inferences are withdrawn from the interview conducted during the dissertation. The parents and special Ed teachers were interviewed regarding the perception of space from the special child's point of view.

For interview purpose, the¹⁹ questions were framed in a manner which is easily interpreted by the person. A personal interview is conducted which will give a better chance to explain the questions.

The order of the questionnaire was such that the questions which are more related to the person's field of interest and are easier to answer were given the priority. This makes the person comfortable and patient for the further questions .These were prepared based on the analysis done of the literature review. The relation between space and

¹⁹ Appendices : Page 41

autism is introduced directly; this helps the person understand well enough what the expectations of the interview are.

The questions are subjective in nature, which helped understanding the requirements of the teacher. However, options were given to constraint the answers. Furth more, the parents were able to answer about their child in a more subjective manner. Since every autism child is different, answers could not have been objective when it came to parents.

Secondary means of data collection include the following:

- i. Published books, papers, articles on glass, spaces of an inclusive educational institute and Condition of Down syndrome and Autism.

Based on the information collected we would comprehend the factors that would influence the location of the enclave. Thus two comparative site analyses will be done, in order to finalize the location of the site.

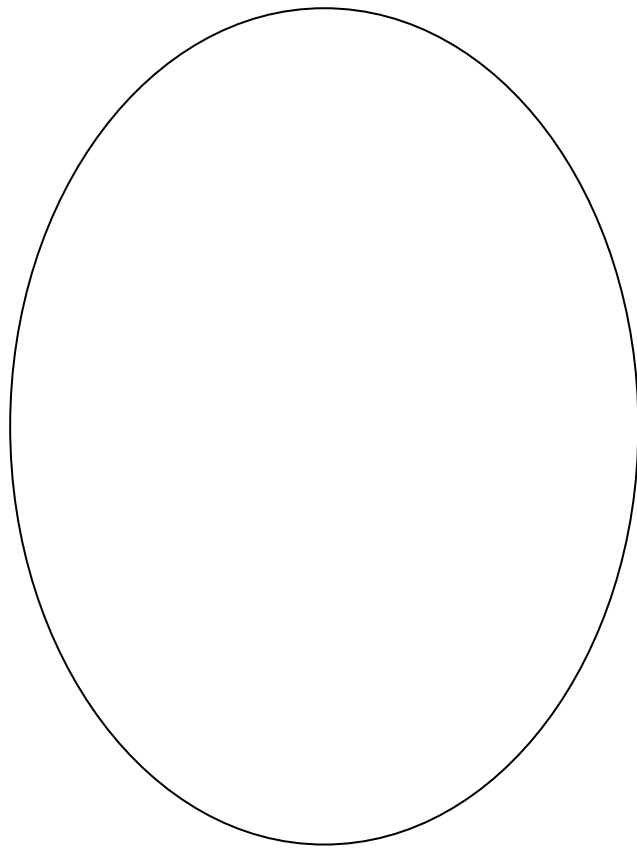
5 DATA COLLECTION AND ANALYSIS (STUDY OF CASES, INFERENCES AND ANALYSIS)

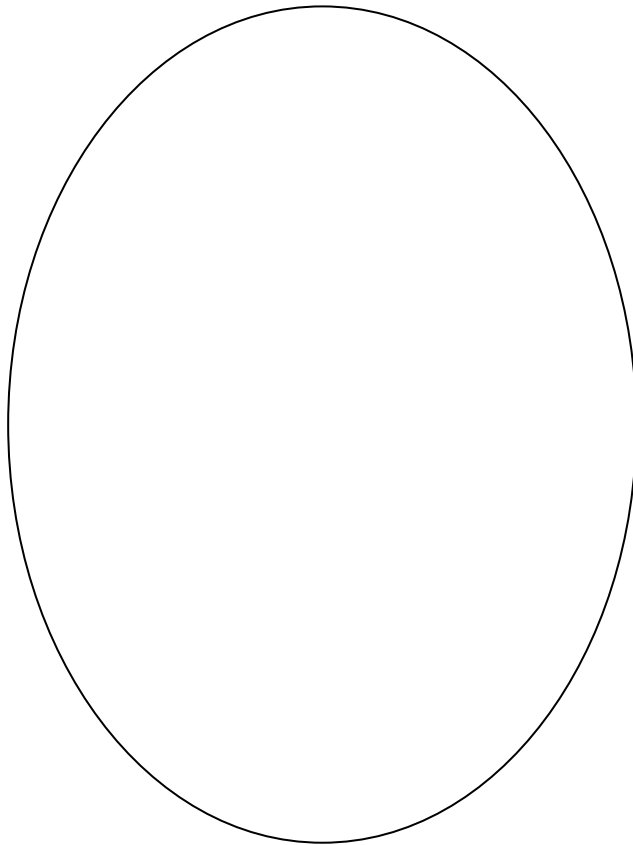
5.1 CASE 1: INTERVIEW WITH THERAPISTS

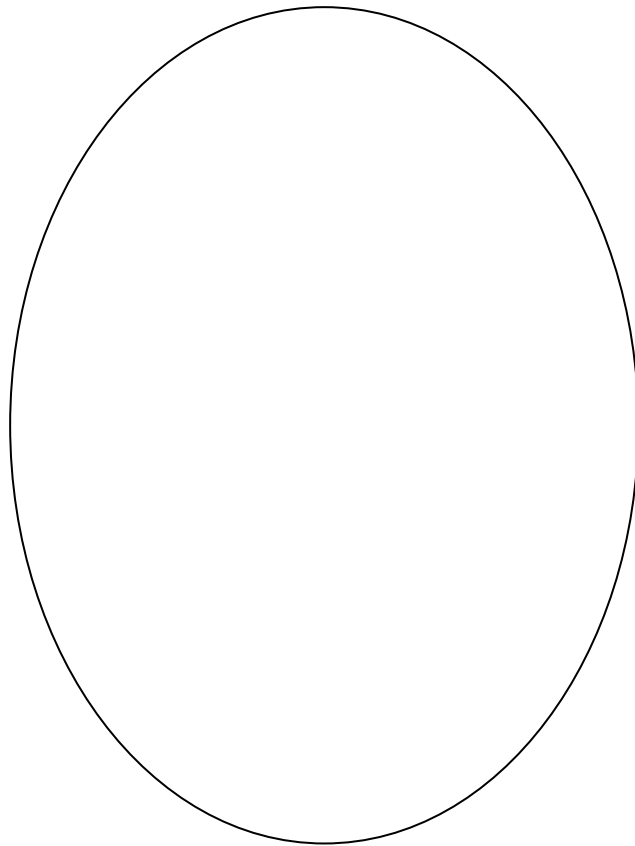
The therapist currently at Bhopal working with Chingari Clinic and Composite Regional Centre not only helped us get an insight about the current situation of the city but also gave us an idea of how Autism can be tremendously affected by the space created around them.

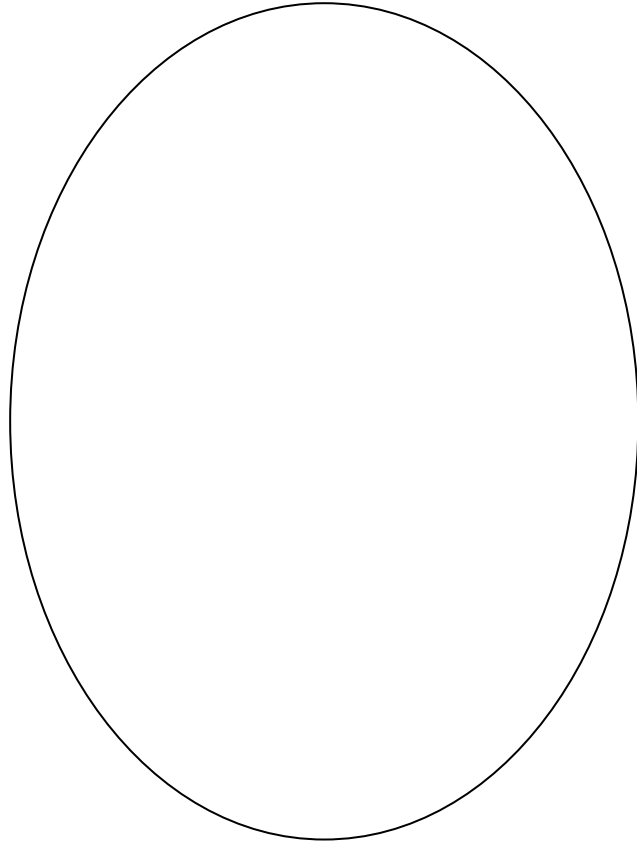
Location : Bhopal , Madhya Pradesh

Occupation: Physiotherapists, Speech therapists, Audiology therapists, Behavioural Therapist, Occupational Therapist.









5.2 CASE 2: COMPARITIVE CASE STUDY OF ANANDA: SUPPORTED LIVING FOR PEOPLE WITH AUTISM WITH AUTISM TREATEMENT CENTRE, DALLAS.

²⁰Action for Autism is a government organization - involved in lifespan activities including

- * early intervention and education
- * assessments
- * Work and employment
- * independent living
- * awareness
- * Advocacy
- * research.

ANANDA :Is a project initiated by AFA. The main aim of the project being that- most persons with Autism requires lifelong support. The society provides no viable alternative support mechanisms for these persons with autism when they lose their caregivers and are on their own. No specialist residences or homes are currently available in India. To fill this gap in services AFA has launched this project. Group Homes providing a structured environment and predictable routines is internationally identified as the most suitable for adults with autism. Ananda is to be a first of its kind residence-cum-rehabilitation complex for persons with Autism, providing the best practices from across the globe modified to suit local conditions

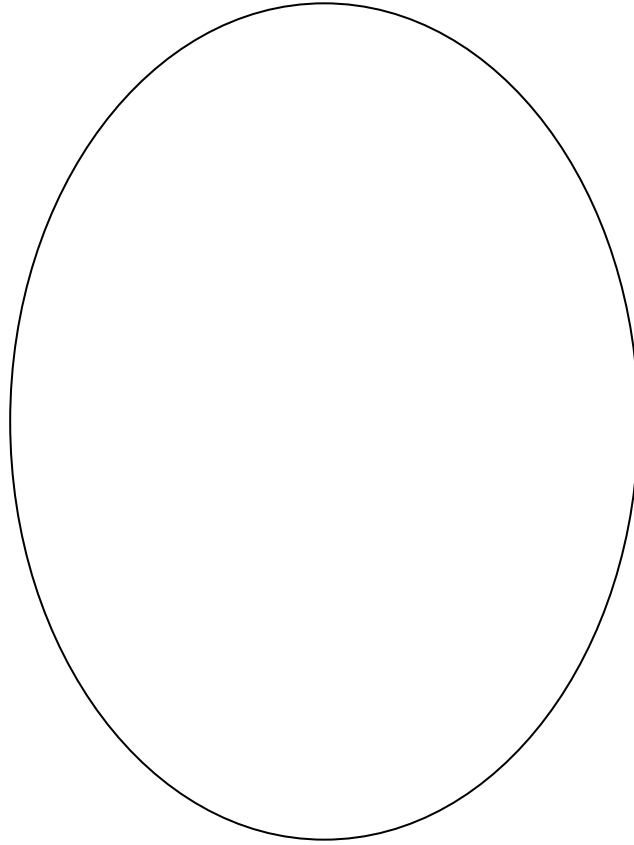
In addition to being a model residence for people with autism, setting up work and employment options for adults at ANANDA are also important objectives of the project. The latter includes work options at a small inclusive school where children of all abilities will learn and grow together. ANANDA hopes to knit together youngsters with special needs with the local community, through shared work and recreational spaces. ANANDA provide services for the residents as well as opportunities for the local community, through...

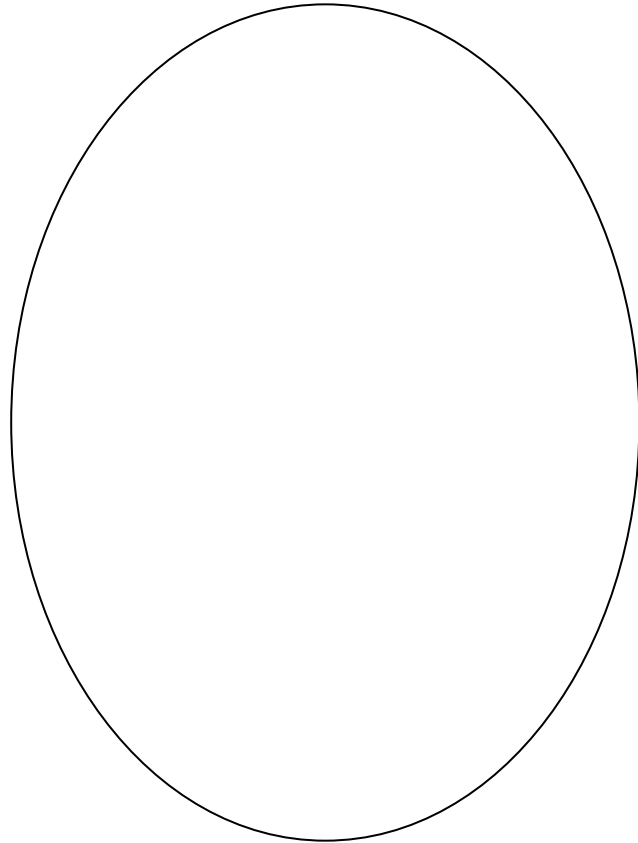
1. Model Group Homes
2. Eco-friendly environment & infrastructure

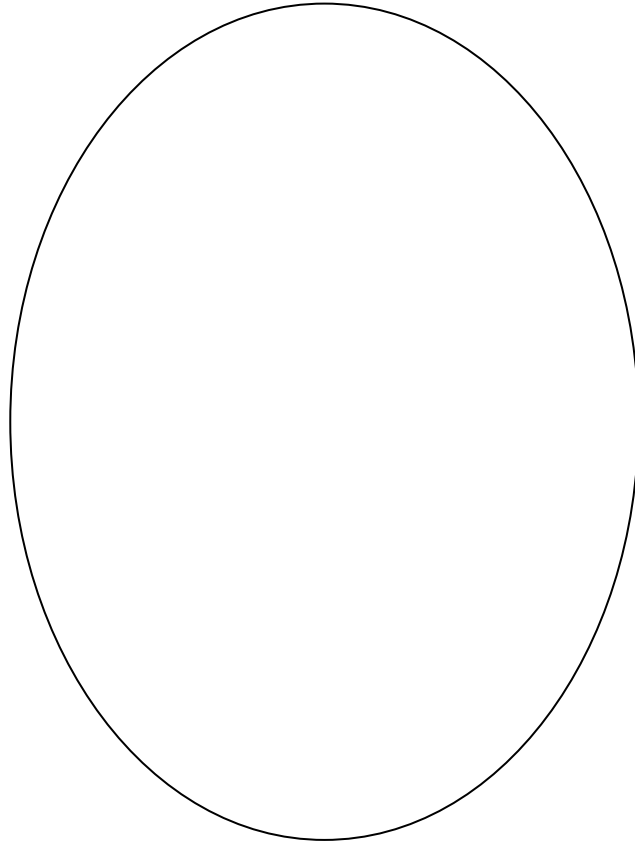
²⁰ Action for Autism : Organization working for Autism in India.

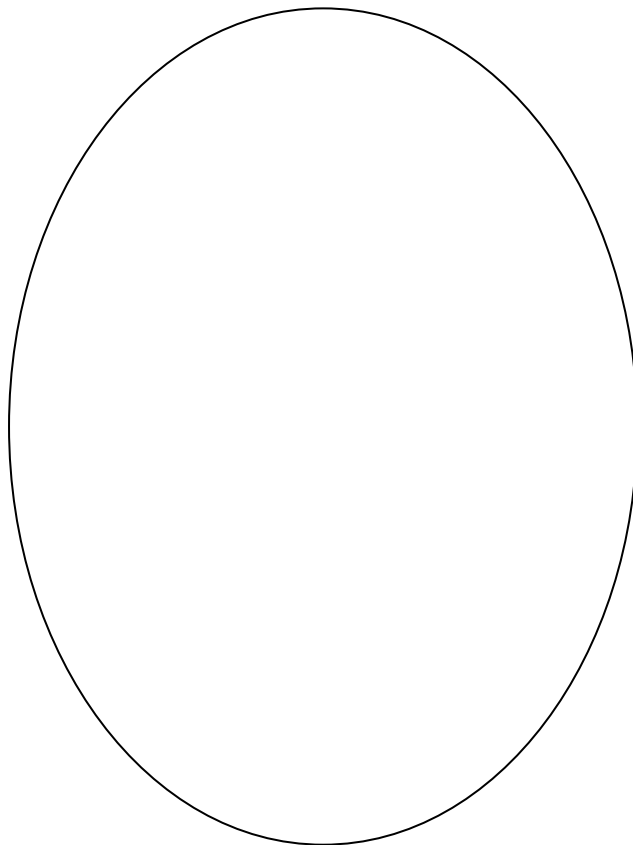
3. Sheltered vocational workplaces and work opportunities
4. Vegetable and herb farming
5. Health and sports facilities
6. Leisure and recreational areas
7. Kitchen and cafeteria facilities
8. Therapeutic services
9. Medical centre
10. Inclusive school

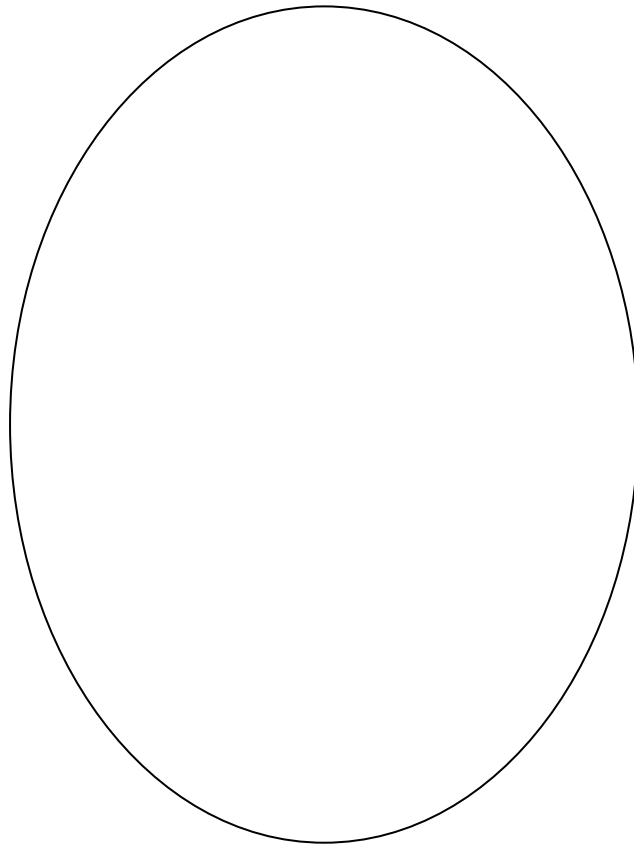
All of the above will provide income and work opportunities for residents.

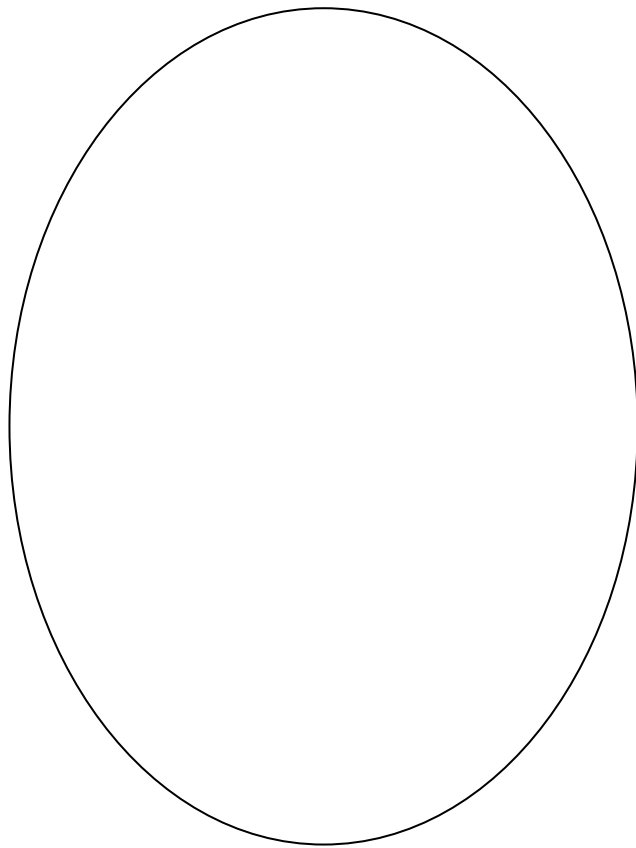








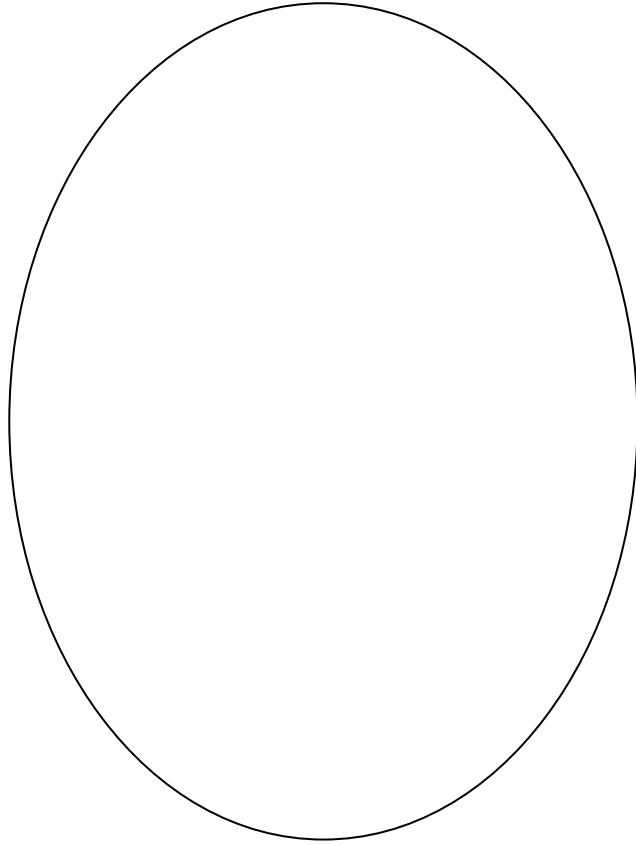


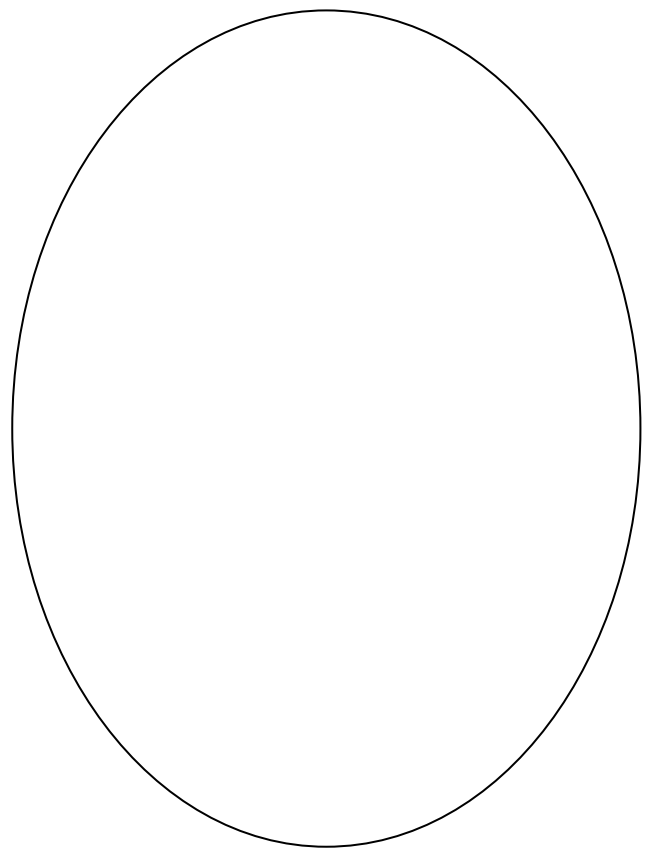


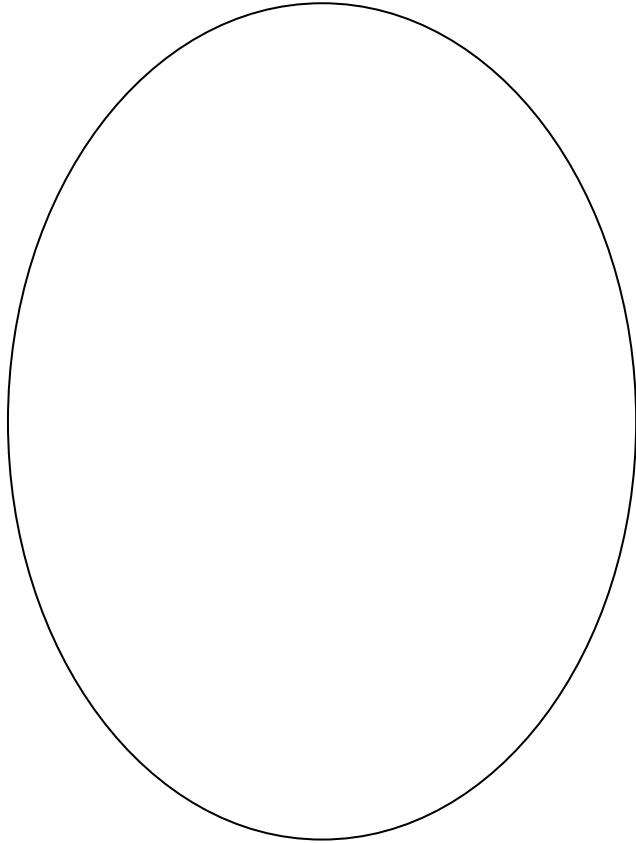
5.3 CASE 3: COMPARITIVE CASE STUDY OF CLINICS AT BHOPAL (CHINGARI CLINIC AND COMPOSITE REGIONAL CENTRE)

Since the disaster, a number of clinics opened to help the children who were affected by the gas. Two of such clinics were- The Chingari Clinic and the Composite Regional Centre Clinic . Presently 800 children are registered with the Chingari Clinic and 250 children come to the clinic every day. However, the space is not sufficient to support the growing population.

Both the clinics were visited and studied in terms of spaces, staff and the number of people visiting the clinic. Further a comparative analysis was drawn out.



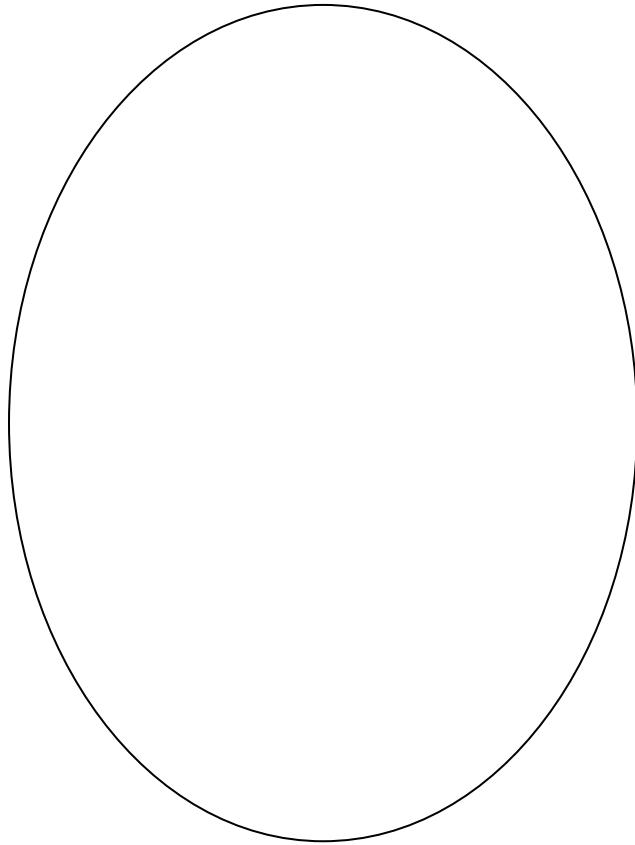


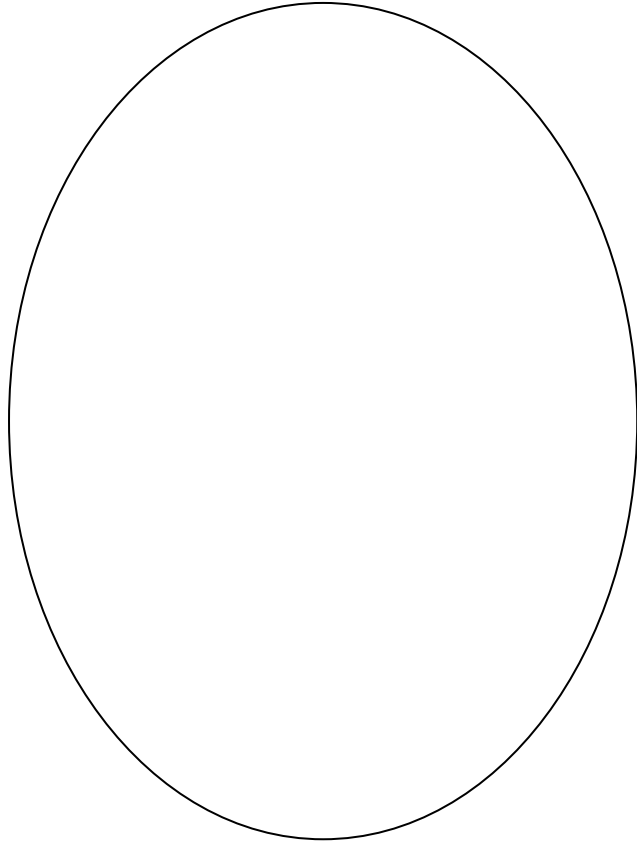


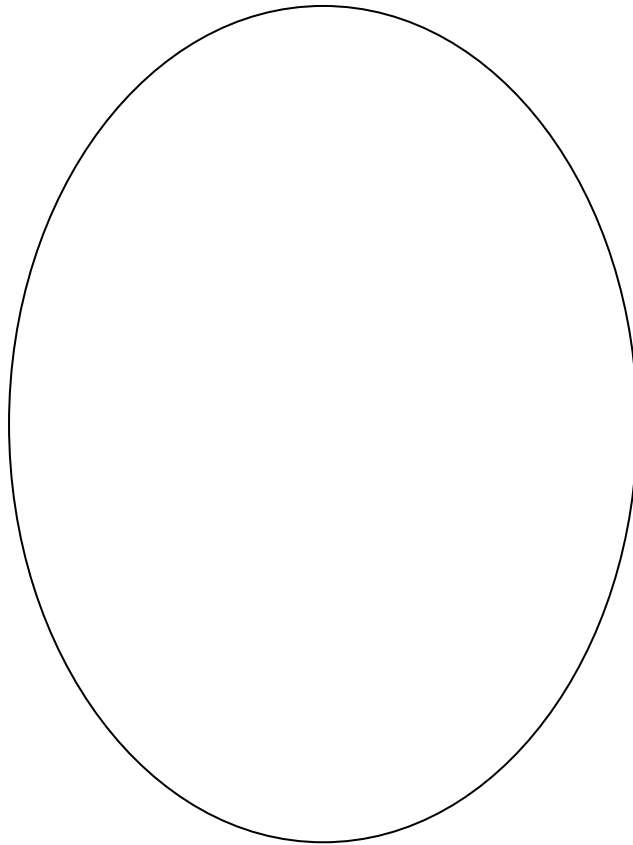
6 SITE ANALYSIS COMPARISON:

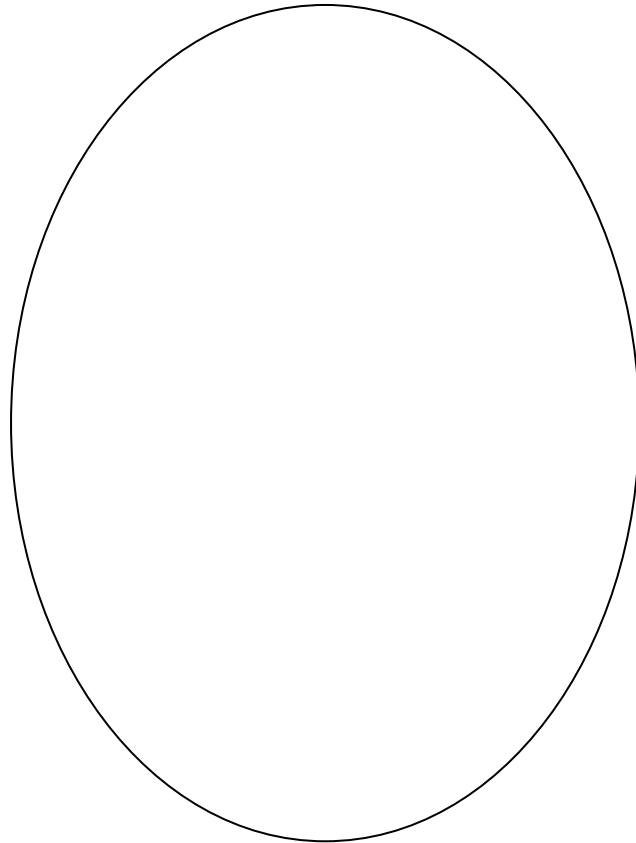
Bhopal is known as the city of lakes. The city has grown from Old Bhopal located in the northern hemisphere to New Bhopal which falls to the south. The Bhopal Gas disaster struck in Old Bhopal which has the maximum number of Lower Income Class. This population was the most affected by the gas leak. However, there is no place for any development in the crowded old city. Therefore a site must be chosen which is located in New Bhopal but closer to Old Bhopal. This would make the enclave easily accessible to the population residing in Old Bhopal.

This led to selection of two sites. Further a comparative analysis, led to the selection of one site.









7 DESIGN APPROACH AND CONCEPT EVOLUTION

As discussed earlier there are two types of design approaches which can be inculcated in the design- Sensory Design Theory and the Neuro-Typical Approach. With the outgoing debate on the two design theories, it was difficult to decide on a particular theory. Therefore this question was asked during the interview of the therapists at Bhopal. Based on their answer, it was concluded that the campus would be a combination of the two design theories. 80 % Sensory and 20% Neuro Typical. This balance would help with the environment to be sensory stimulating to the children and not overwhelming.

As per the research conducted and the main observations made, the research opened an insight to the development of the concept of the enclave which would be based on:

1. One way circulation – Routine based circulation

The campus circulation must be in such a format that the child should end his day where he began. This way he can predict the next activity and would be more comfortable. Thus circulation of 2 types of children should be given consideration:

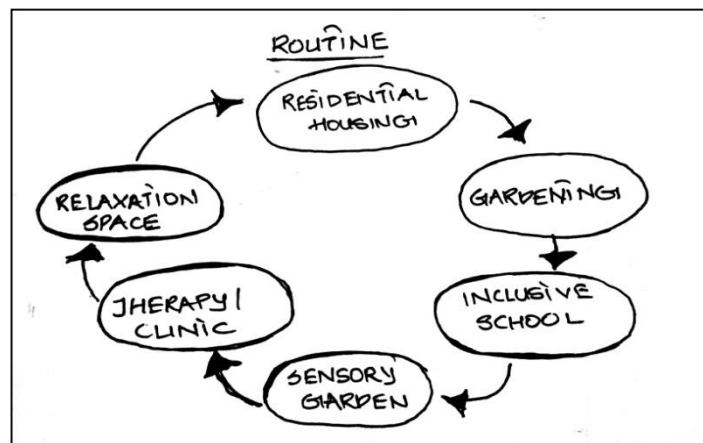


Figure (t): Routed Circulation aimed in the Design

- Primary : Students and children staying in the residential facility provided within the campus
- Secondary: Students or day comers who would visit the school and therapy clinic from outside every day.

After these the tertiary users are the Therapists, Teachers and Public. Even if tertiary they have an important role and are the ones who need a proper outpour. Thus calming views and peaceful environments must be provided for them.

2. Curved Corridors

The curved corridor as suggested by the paper written previously is an important factor for the children with special needs. Since we are providing an enclave where we are training to be independent, it is necessary that they are

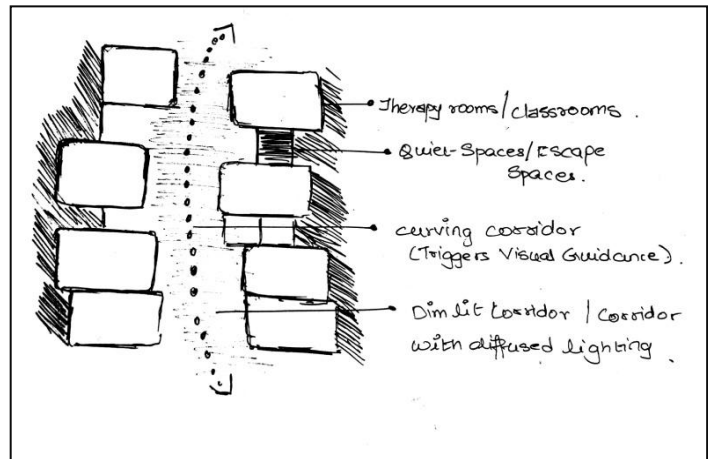


Figure (u) Curved Circulation with escape spaces

provided with some guidance. Providing curved corridors will not only give a child a visual guidance, but also help create a proper flow and keep the element of surprise intact.

3. Escape Space

The new concept of introducing a space which not only acts like a buffer but also gives a psychological escape to the child is important. Any environment can be overwhelming to a special needed child. Thus we must provide spaces within the buildings for them to escape in case of a break down.

4. Sensory Zoning as per Inclusive (Non Public) and Exclusive (Public) spaces.

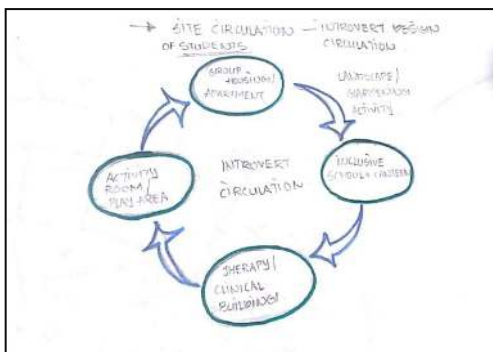


Figure (v) Introvert Circulation : Circulation of children within the campus

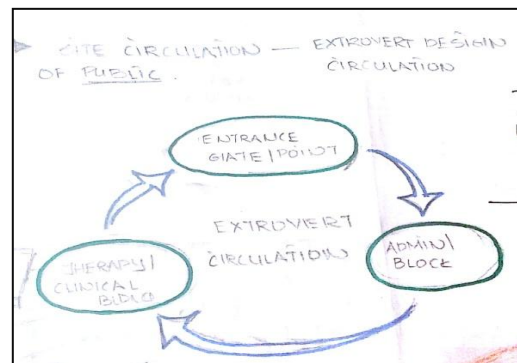


Figure (w) Extrovert Circulation : Circulation of Public

The children must have an undisturbed flow without any distractions. This can be achieved by segregating the children’s block from the places most accessed by public. This segregation is done mainly to avoid the children to be overwhelmed by crowded area. However , they must have one spot where they do cross the paths with public – this would help them getting used to situations in real life.

5. Visual Guidance with the help of landscape features, colours, textures and patterns.

Public usually rely on signage on roads, malls , parks and campuses such as the proposed enclave. Autistic children may not be able to read the signage and interpret them. Thus, it is necessary to visually guide them to their destination. This can be done internally by giving curved corridors , however, outdoors this can be achieved by providing landscape features like- special footpaths, feature walls, level differences, etc.

6. Dim Lit corridors and Rooms with minimum external windows :

The building layout shall be in such a way that the corridors have diffused lighting. Too much light can be over stimulating to the hyper sensitive children and too dark can cause visual hinderance. Thus the corridors must be dim lighted with natural light as much as possible.

The therapy rooms and classrooms must also be lighted to a minimum. The number of openings must be less in places where the child is expected to have more high levels of attention.

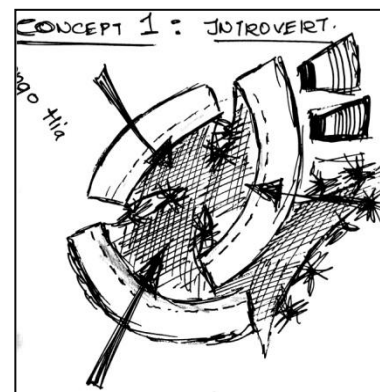


Figure (x): Introvert Design For minimum distractions

The entire campus would be a combination of 3 types of buildings:

- A Therapy Block or Clinical Block
- An inclusive School
- Residential Group Housing.

The circulation and zoning of these buildings should be in such a way that all the above characteristics are inculcated in the proposal.

8 DESIGN GUIDELINES AND DESIGN PROPOSAL

The following are some of the design guidelines formulated based on the findings conducted from the literature review:

- 1) Therapy units must resemble their classrooms, with activity spaces as well as one on one cubicle.
- 2) The corridors must be dim lit with natural lighting as much as possible.
- 3) Sensory Gardens can be introduced for sensory stimulation and to break spaces continuity.
- 4) Therapies can be compartmentalized and sequenced as per the requirements of the children.
- 5) The children must be introduced to the third axis of Height. However, no level differences are preferred in circulation spaces.
- 6) Autistic children are often vulnerable to disease like Cerebral palsy and Down syndrome. Sometimes are even physically challenged. Therefore, provision of lifts and ramps must be given wherever required.
- 7) The dimensions of the lift shall not be less than 1.8mx1.8m. Must be sufficient to accommodate a wheelchair.
- 8) The width of the ramp shall not be more than 2.5m and not less than 1.8m with a gradual slope of 1:10.
- 9) The door of any room shall not open in the corridor.
- 10) Handicap toilets must be provided wherever necessary. Minimum dimensions must be 1.75mx1.8m.
- 11) The door of the handicap toilet must open on the outer side.
- 12) A toilet must be provided in every therapy room in case of an emergency.

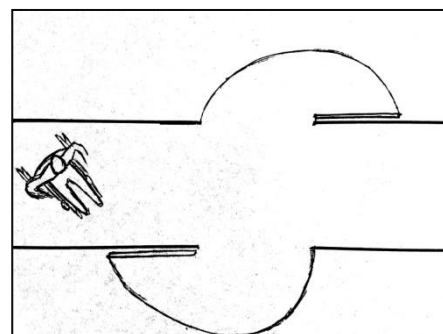


Figure (y) Doors shall not open in a corridor

- 13) Toilets resembling public toilets must be provided. For the children to get used to them.
- 14) The number of openings must be less in therapy rooms and classrooms for minimum distractions.
- 15) However, good views must be provided for the therapists and public.
- 16) Certain rooms must be acoustically treated. Like speech therapy rooms , audiometry room and music room.
- 17) Activity spaces like gardening, music and play area must be provided.
- 18) Relaxing space must be provided.
- 19) Sensory room must be provided with little or no openings. It must be dim lit and have textures.
- 20) Textures and patterns can be inculcated in spaces which do not require high levels of concentration. (i.e. in corridors and walkways)
- 21) The teacher to student ration must be 1: 5. Therefore the area of the classrooms must not be more than 30sqm for the given ratio.
- 22) Every classroom shall have the ability to accommodate group activities and also have the ability to form one to one guidance.
- 23) The classrooms shall have subtle interiors, since loud colours may distract the children. Colour coding of spaces can be done.
- 24) Canteen provided must have self service as well as a la carte system.
- 25) Residential group housing must be able to accommodate 2 or more families together. This increases social activities.
- 26) The houses shall have a room for the helper.
- 27) Handicap bathroom must be provided which are not less than 1.8m x 1.8m.
- 28) Zoning of residential spaces must be different , such that they remain non disturbed by the public flow.
- 29) A vehicular free zone must be provided , for safety precautions.
- 30) Sensory gardens must be equipped with flowers with natural fragrances and colours, textures, etc.
- 31) An emergency medical ward must be provided since the children tend to self harm and may have psychological breakdowns.
- 32) Handrails must be provided throughout the corridors, stairs and ramps.

33) Training rooms can be provided in form of mock up rooms in case of occupational therapy.

8.1 SPACE REQUIREMENTS:

The space requirements have been finalised according to the comparative case studies of centres and clinics. The following spaces must be provided:

1. THERAPY/CLINICAL BLOCK :

- Reception Area
- Waiting Area
- Toilets
- Superintendent's Room
- Assistance Superintendent's Room
- Accountants Room
- Administration Office
- Conference Room
- Therapist Work Stations
- Dining area for staff
- Meeting Room for Therapist
- Staff Toilet
- Maintenance Room
- Surveillance Room
- Medical/ Diagnostic Room
- Physiotherapy Room
- Occupational Therapy Room
- Behavioural Therapy Room
- Speech Therapy Room
- Sensory Integration Room
- Audiology Room
- Kitchen

- Dietician office
- Music Room
- Training centre for children (Mock up rooms)
- Filing Room
- Medical Ward Room
- Nurses Station
- Pharmacy
- Equipment Room
- Auditorium seater for 200 capacity

2. INCLUSIVE SCHOOL

- Reception Area
- Waiting Area
- Toilets
- Principal's Cabin
- Vice Principal's Cabin
- Accountant's Room
- Staff Room
- Staff room dining space
- Conference room
- Classrooms
- Library
- Activity Room
- Relaxation Room
- Store Room
- Kitchen
- Canteen
- Toilet

3. GROUP HOUSING

- Living Room
- Kitchen+Dining
- Bedroom with single beds

- Bedroom with double bedroom
- Helper Room
- Handicap Toilet

9 BYE- LAW COMPARISON

Universal design (close relation to inclusive design) refers to broad-spectrum ideas meant to produce buildings, products and environments that are inherently accessible to older people, people without disabilities, and people with disabilities. Universal design emerged from earlier barrier-free concepts, the broader accessibility movement, and adaptive and assistive technology and also seeks to blend aesthetics into these core considerations. However, this disability was limited to people who are physically handicapped. Therefore the bylaws that came into picture were limited to the physically disabled. Therefore the bylaws referred to, for this particular project were limited. Comparative analysis of the National Building Code and the Madhya Pradesh bhumika Vikas gave us the final design by laws to follow.

PARAMETER	NATIONAL BUILDING CODE	MADHYA PRADESH BHUMIKA VIKAS	BY LAWS USED IN DESIGN
1. Toilets :			
• Minimum size for handicap toilet	1750 x 1350	1750x1500	1750x1500
• Toilet Door Size	900mm to 1m	900mm	900mm
2. Parking:			
• Dimension of car park	5m x 2.5m minimum	Open : 25 sqm Basement : 35 sqm	5mx3m
3. Habitable room height	2.75m • Educational building in cold region : 3m	2.6m Kitchen : 2.4m Bath/WC : 2.2m	3m
4. Staircase width (Residential)	• Residential – 1m • Assembly – 2m • Educational- 1.5m • Institutional- 2m	• 2 storeyed – 0.60m • More than 3 storeyed- 0.90m	• Residential – 1m • Assembly – 2m • Educational- 1.5m • Institutional- 2m
5. Open Space	Residential Complex 15%	Cluster Complex 10%	Residential Complex – 15%
6. Setbacks as per height	For 10m – 3m For 15m- 5m	For 10m – 3m For 15m- 5m	3M

10 DESIGN PROPOSAL

10.1 CONCEPT SHEET

10.2 SITE ANALYSIS

10.3 SITE PLAN: ROOF PLAN

10.4 SITE PLAN: GROUND FLOOR PLAN

10.5 SITE PLAN: SERVICES

10.6 THERAPY /CLINICAL BUILDING GROUND FLOOR PLAN

10.7 THERAPY /CLINICAL BUILDING FIRST FLOOR PLAN

10.8 THERAPY /CLINICAL BUILDING FRAMING PLANS

10.9 THERAPY/ CLINIC SECTIONS

10.10 THERAPY /CLINIC ELEVATIONS

10.11 INCLUSIVE SCHOOL PLANS

10.12 INCLUSIVE SCHOOL SECTIONS

10.13 INCLUSIVE SCHOOL ELEVATIONS

10.14 RESIDENTIAL GROUP HOUSING PLAN

10.15 RESIDENTIAL GROUP HOUSING SECTIONS

10.16 RESIDENTIAL GROUP HOUSING ELEVATIONS

11 APPENDICES

- I. Approach Procedure for site visit at ANANDA :
 1. Step 1 : Email to _____ with formal permission letter obtained from the respective institute
 2. Step 2: Attach a brief stating aims and objectives of the study
 3. Step 3 : If permission is received , they will give you a contact of the supervisor officer on site
 4. Step 4 : Fix an appointment for site visit.

- II. Procedure for permission to visit Composite Regional Centre at Bhopal :
 1. Step 1 : Email to _____ with formal permission letter obtained from the respective institute
 2. Step 2: Attach a brief stating aims and objectives of the study
 3. Step 3 : A formal letter written by Guide to the authorizing officer stating the aims of the study and requesting permission
 4. Step 4 : If permission granted , fix an appointment for case study visit.

- III. Procedure for permission to visit Chingari Rehabilitation Centre :
 1. Step 1 : Email or Message on Facebook to Bhopal Medical Appeal with attached permission letter stating the aims of the project.
 2. Step 2 : A formal letter written stating an abstract of the research.
 3. Step 3 : If permission granted , fix an appointment for case study visit.

Questionnaire for Therapists:

Q1. How many cases of Autism are observed statistically in Bhopal ?

- a. 1 in 60 births
- b. 1 in 100 births
- c. 1 in 150 births
- d. More than 150

Q2. Is there are a need for a complex which would help parents with special children requirement?

- a. Yes

b. No

Q3. What kind of space will an autistic child prefer ?

- a. Comfortable sensory environment
- b. Indoor spaces which resemble day to day activities

Q4. How often does an Autistic child need medical attention?

- a. Weekly
- b. Once in 15 days
- c. Once a month
- d. Any other

Q5. How many students shall be taken under one therapist?

- a. Less than 5
- b. Less than 10
- c. Less than 15
- d. More than 15

Q6. Compacted or Open spaces are preferred for :

- a. Teaching -
- b. Residence -
- c. Medical therapy –

Q7. What type of environment is preferred for an autistic child?

- a. Outdoor
- b. Indoor
- c. Combination of two

Q8. What is the attention span of a child based on:

- a. Volume of Room
- b. Interior colours and layout.
- c. Number of window openings

Q9. If a child is left at the building entrance , how would he/she find their way. On the basis of:

- a. Colour
- b. Direction of walls / corridors
- c. Pattern of Tiles
- d. Neither of above

Q10. Do autistic children require physical assistance in : (Tick in front of spaces)

- a. Washrooms
- b. Stairs
- c. Outdoor spaces
- d. If any other please mention : _____

Q11. What type of medical assistance does an Autistic child require ? (multiple choice allowed)

- a. Neurological (CT Scans, MRI scans ,etc)
- b. Psychological
- c. Physiotherapist
- d. Calming therapy with medication and prescriptions

Q12. If autistic children live and work together along with their families, will it help them ?

- a. Yes
- b. No

Q13. Do new parents (recently learnt about their child's condition) require therapy?

- a. Yes
- b. No

If yes then what type of therapy and counselling is suggested?

Q14. Apart from the standard activities, do the following activities help an Autistic child?

- a. Gardening
- b. Dancing
- c. Singing
- d. Sport activities
- e. ANY OTHER

Q15. How much do autistic children prefer alone time and how much with others?

- a. Most of time alone
- b. Most of the time with others
- c. 50-50

Q16. What type of courses can be arranged for the parents?

12 BIBLIOGRAPHY

The following Published Papers from Research Gate were referred:

1. An architecture for Autism : Concepts of Design Intervention for the Autistic User by Ar.Magda Mostafa
2. Design Approach for Autism Treatment Centres by Andrei Pomana
3. A study on architectural spaces for psychological perspective emphasizing the autism rehabilitation clinic

The following websites were used :

1. <http://www.newsweek.com/india-after-30-years-bhopal-still-simmering-288144>
2. <http://www.autism-india.org/residence.php>
3. <http://bhopal.org/about-us/sambhavna-clinic/community-healthwork/>
4. https://www.researchgate.net/post/Architecture_for_autism_Who_has_sources_for_empirical_and_or_effect_research
5. <http://www.childneurologyfoundation.org/disorders/autism/>
6. <http://www.hksinc.com/insight/enhancing-the-built-environment-for-individuals-with-autism-spectrum-disorders-asds/>
7. <http://www.archdaily.com/179359/designing-for-autism-spatial-considerations>
8. <http://www.cdc.gov/ncbddd/autism/treatment.html>
9. <http://www.dubaiautismcenter.ae/aboutDAC.htm>
10. https://www.meteoblue.com/en/weather/forecast/modelclimate/bhopal_india_1275841
11. <http://www.gaisma.com/en/location/bhopal.html>
12. <https://en.climate-data.org/location/2833/>
13. <http://www.archdaily.com/435982/an-interview-with-magda-mostafa-pioneer-in-autism-design>
14. <http://www.fritzarchstudio.com/ashrams-for-autism-new/>
15. <https://www.hydroworx.com/research-education/health-treatments/neurological-neuromuscular/>
16. <http://www.autismdesignconsultants.com/>