

National Academy for Autism and Neuro-Development Disabilities

By

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Declaration

It is hereby declared that

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2. The thesis does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.
3. The thesis does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.
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01: Introduction

1.1. Background of Project

Neurodevelopmental disorders (NDD) are conditions that affect how the brain functions. These conditions include: Autism Spectrum Disorder (ASD), Cerebral Palsy, Down Syndrome and Intellectual disabilities. While these are not diseases, they are conditions that manifest in a person anywhere between infancy to early childhood and remain with the individual, affecting them for the length of their lives. NDDs range from mild impairments, allowing those affected to live fairly normal lives, to severe disorders that require lifelong care. NDDs are not conditions that can be cured. That being said, early intervention is extremely important as this creates major long-term positive effects on symptoms and later skills.

With an early diagnosis, receiving treatment may provide a child with a fair shot at having a well-adjusted life. Globally, 1 in every 132 has ASD. According to a study by Dhaka Shishu Hospital, 7.1% of the population has NDDs of which 19% accounts for Autism. In Bangladesh, it is estimated that 1 in every 500 has ASD amounting to no less than 280,000 people. Every person has a unique gift to offer the world and these gifts may be brought to fruition in a nurturing environment. With early intervention and proper training, people with disabilities can be integrated into society where they may live fulfilling lives and also serve as a contributing member of society.

1.2. Project Introduction

A child with special needs already faces challenges that the general population does not and expecting them to keep up with the “typical” way of being can be thought of as cruel and ignorant. Providing the right kinds of treatment and services can make the process of integration easier for the child with an NDD.

The ratio of special needs school/services to people is negligible in Bangladesh While there are many small institutions that provide specialized services all over Dhaka city, the services are scattered. There are very few institutions that offer all required services all in one place.

Moreover, there are not enough proper training facilities where teachers maybe be trained to care for and work with children with special needs. The Ministry of Education, aims to begin to mend this issue with this project. Facilitating children with special needs in a facility accommodating all kinds of special needs and also training general school level teachers in special education training.

Having said so, in this proposal, I aim to design this institution with all necessary accommodations and provide an environment that is specially tailored to the needs of these children.

1.3. Project Specifications

Project Title: National Academy for Autism and Neurodevelopmental Disabilities (NAAND)

Site: Purbachal, Sector- 08, Road- 216, Plots – 4, 4A and 4B

Total Site Area: 3.55 acres

Project Client: Ministry of Education

1.4. Project Rationale

As mentioned previously, 7.1% of the Bangladeshi population has some Neuro-Developmental Disability. On a grand scale, this amounts to a sizable portion of the population. Yet there is a lack of awareness and as a result, diagnoses and treatment. Research has shown that early intervention and treatment can better the lives of the patient as well as their family in the long run. A misunderstanding is that forcing these children into typical schools and typical behavior will overtime teach them to adjust. That is untrue and only causes massive detriment to the child and their development. In order for a child with an NDD to be integrated into mainstream society, they need to be nurtured in a sensitive environment that slowly and through several stages of exposure, habituates them with the mainstream.

Having said so, this institution will deal with children with 4 major Neuro-developmental Disabilities. They are:

Autism Spectrum Disorder (ASD), Cerebral Palsy (CP), Down Syndrome and intellectual disability. Quite often, these diagnoses also come with visual and/or hearing impairments. Much of the stimuli we consider normal can often be triggering to those with NDDs and therefore, the typical learning environment is not suited to a child with special needs. This institute will provide an enabling learning environment for children with elevated or under responsive sensitivities and accessible to a child with physical limitations. The best environment will not only cater to their environmental sensitivities but also any medical, physiological and psychological treatment alongside education in a holistic approach.

1.5. Project aims and objectives

- Providing a sensorily comfortable space where a child may start to learn essential skills.
- Making autistic children confident and work-oriented through vocational training
- Giving autistic children a chance to grow normally through various therapies like Speech Therapy, Occupational Therapy, Physiotherapy, Psychotherapy, Sensory therapy.
- Provide training-oriented recruitment of teachers who can be attuned to the method, type and mentality of what the special education system should look like.

- To enable general education teachers to provide integrated education to mainstream children with autism and neurodevelopmental disabilities.
- Raise awareness of Autism and Neurodevelopmental Disabilities through training of teachers, service providers / individuals, parents and concerned communities / families.
- Providing integrated education to the mainstream children of Autism and Neurodevelopmental Disabilities.
- To make people of all walks of life socially aware of 'autism'.

1.6. Key Functions

This project aims to provide all functions necessary for the complete physical and mental growth/ development of a child with an NDD so they may receive a treatment program tailored to their specific needs under one roof. The scheme is designed to provide a safe and stimulating environment for the children to learn the skills necessary to integrate into mainstream society as well as train teachers how to provide the best care for any students with exceptional needs.

1. Administration

2. Academic Unit

- Classrooms
- Computer lab
- Sensory Rooms
- Art Classroom
- Music Classroom
- Life Skill Training

3. Medical Unit

- Medical Assessment and care
- Neurological Assessment
- Audiology Assessment
-

4. Therapy Unit

- Physiotherapy
- Occupational Therapy
- Hydrotherapy
- Speech and Language Therapy
- Behavioral Therapy
- Psychological Therapy

5. Cafeteria

6. Community Related Functions

7. **Dormitory**
 - Accommodation for 30 Teachers
 - Temporary accommodation for 20 visitors
8. **Vocational Training**
9. **Sensory Function**
 - Playground
 - Outdoor Physical exercise
 - Sensory Garden

02: Background of Autism and Neuro-Developmental Disorders

2.1. Theoretical background of Neuro-Developmental Disabilities (NDD) and Autism:

Neuro-Developmental Disabilities are a consequence of impairments to growth during the development of the brain. This can affect the functioning of the brain that is the child's cognitive, mental, sensory, emotional, physical, developmental functions or a combination of them. The disorders typically manifest early in development, often before the child enters grade school, and are characterized by developmental deficits that produce impairments of personal, social, academic, or occupational functioning. In any case, these disorders are not a thing to be cured and the person must live with it for their lifetime. The severity of impairments can range from mild impairments, allowing those affected to live fairly normal lives, to severe disorders that require lifelong care.

Neurodevelopmental disabilities is board classification and many disabilities are categorized under it. one of which is Autism Spectrum Disorder. Autism can be termed as a lifelong complex developmental disorder. It is characterized by a triad of qualitative impairments in social communication, social interaction and social imagination. In addition to the triad, sufferers may struggle with sensory sensitivity to visual, auditory, tactile, proprioceptive (sense of self-movement), gustatory (sense of taste), and olfactory (sense of smell) stimuli. The range of the spectrum is such, that while some may be able to live relatively independently, others will require lifelong continuous support.

2.2. Types of Neuro-Developmental Disabilities

Neurodevelopmental disorders are associated primarily with the functioning of the neurological system and brain. These conditions can also cause problems such as behavioral disorders, speech or language difficulties, convulsions, movement disorders and reduced capacity for independent living and economic self-sufficiency. Some of the common neurodevelopmental disabilities include: Autism Spectrum Disorder, Intellectual Disability, Down Syndrome and Cerebral Palsy.

2.2.1. Autism Spectrum Disorder

Autism spectrum disorder (ASD) is a board term for a multifaceted developmental disability that can cause significant social, communication and behavioral challenges Autism is known as a “spectrum” disorder because there is wide variation in the type and severity of symptoms people experience. Although autism can be diagnosed at any point in life, it is said to be a “developmental disorder” because symptoms generally appear in the first two years of life. ASD is a lifelong disorder, and treatments and services can do a great deal to improve a person's symptoms and ability to function.

Often, there is no physical indication in how a person with ASD looks that could indicate this difference, but they may communicate, interact, behave, and learn in ways that are different from most other people.

2.2.2. Cerebral Palsy

Cerebral palsy (CP) is a neurological condition caused by brain damage and it is the most common motor and movement disability of childhood. This group of disorders affects movement and muscle tone,

posture and balance. It's caused by damage that occurs to the developing brain, before, during or immediately after birth. This damage is non-repairable and the disabilities it causes are a life-long condition. However, it is not progressive and training and therapy can help improve overall physical and cognitive functioning of the individual.

While all people with CP have trouble with posture and movement, only a percentage of those with CP also have a level of intellectual disability, seizures, impaired vision or hearing and language and speech problems. Signs and symptoms, such as, flaccidity or rigidity of the limbs and torso area, abnormal posture, trouble swallowing, involuntary movements, unsteady walking or a combination of them, most commonly start to show around age 2.5-4.5 years. The symptoms of CP differ in severity (from mild to severe) and type (there are 4 types) for each person. For example, one person with CP may need special equipment to be able to walk, but still be able to do it on their own, while another may be completely paralyzed and require constant care.

Having said so, a child with CP need more time to move from one point to the next and need to put more effort into concentrating on their movements and therefore tire faster. As a task that may come effortless to most of us requires a great deal of energy for the child with CP. Poor coordination of muscles also include the tongue and mouth and therefore effect speech and create difficulties in communication. Learning disabilities, short attention spans and differences in perception also create obstacles in everyday life.

2.2.3. Down Syndrome

Down syndrome is a genetic condition that results form an error in cell division, that creates an extra chromosome 21. This causes mild to severe physical and developmental problems. This can affect a person's physical features, intellect. cognitive ability and physical growth and overall development. This also increases the likelihood of some health problems (such as, heart defects, immune disorders, respiratory problems, hearing difficulties, childhood leukemia, epilepsy etc.).

Developmental delays in speech, fine motor skills (precise motions e.g. grip, writing, doing buttons), Gross motor skills (e.g. walking, running, throwing), the tendency of poor decision making, attention deficit, and impulsive behavior are common in children with Down Syndrome. Even given the challenges the children have to face, they can become valued and contributing members of society, with the right kind of help and medical and therapeutic intervention.

2.2.4. Intellectual Disability

Intellectual disability (also known as mental retardation) is a significantly reduced ability to understand and learn at an expected level, apply learned skills and function in daily life. Children with this disability have difficulty in communication, social functioning, communicating their needs and wants and independence in taking care of themselves. This usually begins before adulthood and impacts almost all sectors of a person's life. Children with intellectual disabilities may take longer in reaching milestones like speaking, walking and eating and dressing without assistance.

While not known for certain, causes of such a condition may be injury to or an infection or disease in the brain. The most common intellectual disabilities include – Down Syndrome, fetal alcohol syndrome, Fragile X syndrome, birth defects and any infections that happen before birth. In cases where intellectual disabilities appear after the child is a bit older, causes may be head injury, stroke or specific infections. Most children do not show symptoms of this condition before ethe ages of 2.5-4.5 years.

2.3 Causes of Neuro-developmental disorders and Autism

As I discussed before, NDDs are a group of disorders that affect the development of the nervous system and as a result, create impairments, whose consequences last a lifetime. The symptoms most commonly manifest during the early development and the severity of impairments range widely from one person to the next.

To this day, the causes of NDDs are still largely unknown. According to the most recent research, NDDs have multiple complex contributors rather than a single definite cause. Scientists say that a combination of genetic, biological, psychosocial and environmental risk factors contribute to NDDs. E.g. Environmental risk factors include the use of alcohol/drugs/tobacco during pregnancy, premature births, low birth weight and/or trauma or physical injury to the developing brain invitro, during birth, in infancy or in childhood.

In other cases, for example, certain intellectual disabilities, there are specific genes that are associated with it. Down syndrome, is a prominent example of a genetically determined NDD.

In the case of Autism Spectrum Disorder, multiple risk factors are considered. They include but are not limited to: an immediate family member with ASD, being born to older parents, low birth weight, exposure to toxins, a history of viral infections and more. According to the National Institute of Neurological Disorders and Stroke (NINDS), both genetics and environment may determine whether a person develops autism.

2.4 Common Symptoms of Autism

The symptoms of ASD, begin in early childhood. If early intervention is not made, then the impairments that come with the disorder will continue to persist and interfere with regular life. They may go undetected because each child develops at their own pace but there are age-specific developmental criteria that can be used to measure the child's developmental progress within the early years of life.

It is important to seek treatment for Autism as early as possible as it is more likely to be effective. Early signs and symptoms can be spotted if parents look out for the following developmental milestones:

- Smiles by age 6 months
- Imitates facial expressions and sound by 9 months
- Babbles by 12 months
- Starts gesturing and pointing by 14 months
- Starts to speak single words by 16 months and learns 2-word phrases by 2 years
- Starts to play pretend by age 1.5 years

If a baby is delayed in conquering these developmental milestones, it may be cause to visit a pediatrician or a specialized doctor. A portion of children with ASD, show signs within the first few months of birth. In others, the symptoms may not show until they approach 2 years of age. In some cases, the child may develop normally up to 1.5-2 years, but then regress and stop gaining new skills.

As mentioned in subsection - 2.2.2. Autism Spectrum Disorder, Autism has a triad of predominant features i.e. three main areas of difficulty.

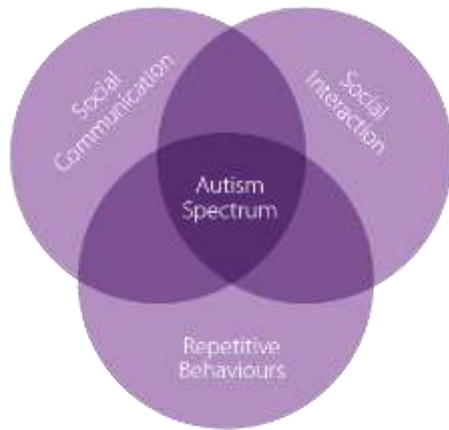


Fig. 2.4.1. Triad of Impairments of Autism

The Triad is made up of impairments the following areas:

- Language and Communication
- Social and Emotional Communication
- Rigid or Repetitive Behavior

It is to be noted that not all people with ASD will show all behaviors, but most will show several.

Language and Communication:

- Delayed speech and language skills
- Flat, monotone speaking voice or a singsong voice
- Echolalia (repeating the same phrase over and over again)
- Repeating words or phrases over and over without any intent to communicate
- Difficulty communicating needs and wants
- Difficulty starting a conversation or keeping it going
- Difficulty taking turns or with back and forth conversation
- Not using or responding to common gestures (e.g. pointing or waving)
- Not recognizing humor or sarcasm / taking things very literally
- Not understanding simple statements or questions
- Giving unrelated answers to questions
- Does not play pretend like
- Problems with pronouns (e.g. saying “I” instead of “You”)
- An estimated 40% of people with Autism are non-verbal. A non-verbal child may not talk at all, may only develop the ability to say a few word but not be able to carry out meaningful conversation or have the ability to speak but lack the ability to use that skill in a meaningful way (e.g. they may parrot sentences they hear on television without knowing what the sentence means to communicate).

Social and Emotional interaction:

Basic social interactions may be difficult for children on the Autism Spectrum. This is a very common sign. Symptoms may include:

- Making little to no eye contact or inconsistent eye contact
- A tendency to not look at or listen to people.
- Being slow to / failing to respond to other’s verbal attempts at gaining their attention. In many cases, during the child’s early years, the child’s lack of response may be perceived as deafness by the parents.

- A tendency to talk about special interests at length without noticing the disinterest of other or giving them a chance to respond.
- Body language that does not match what is being said
- Difficulty or inability to understand another person's point of view
- Rarely showing enjoyment/interest in sharing activities or achievements (e.g. pointing to a bird, showing you a drawing they made)
- Prefers to be alone
- Unlikely to pursue social interaction. This makes them come across as aloof. Many children with Autism may want to cultivate meaningful relationships and friendships but not know how to do it.
- Difficulty interpreting or understanding other people's feeling, reactions or body language.
- Difficulty understanding their own feelings
- Resistance to or dislike of physical touch
- Rejecting being comforted when upset
- Only interacts to achieve a desired goal
- Lack of understanding of personal space

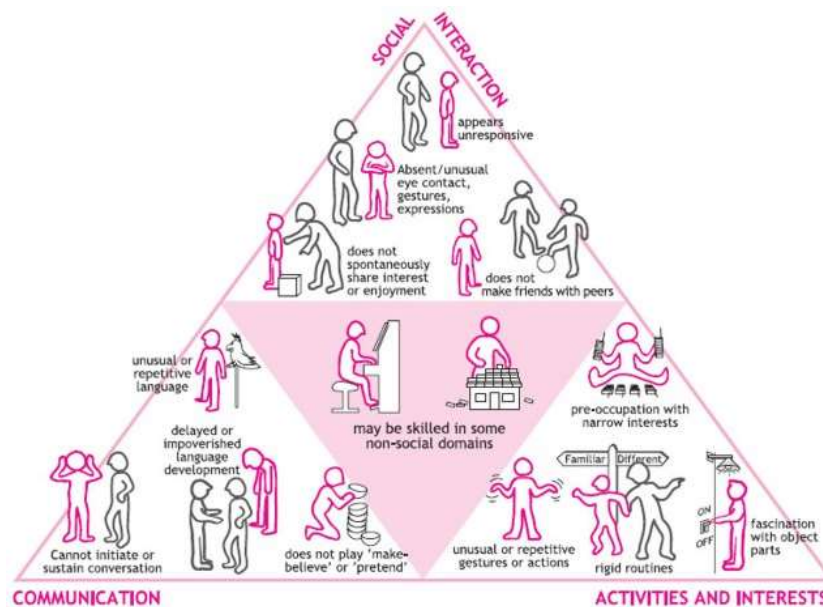


Fig. 2.4.2. Characteristic Behavioral Patterns of ASD

Rigid or Repetitive Behavior:

All children learn from repetition, but children with ASD especially, often thrive on routine. They appreciate the pattern and predictability of routine. A change in the normal pattern of the day can feel like “losing control” and may be quite upsetting and cause a tantrum or break down. a child may become inconsolable and have extreme reactions due to the increased stress and anxiety arising from changes in a familiar routine.

Restrictive and repetitive behaviors can vary largely across the spectrum. They may include:

- Repetitive body movements (e.g. flapping, rocking, spinning etc.)
- Repetitive motions with objects (e.g. shaking handheld objects, spinning wheels etc.)
- Ritualistic behaviors (e.g. lining up objects or toys, touching objects in a set order)

- Narrow range of interests or extreme interest in specific topics. These are also known as “special interests” where the child shows intense and passionate level of focus on a particular topic.
- A need for unchanging routine/ resistance to change
- **Echolalia** – repeating words or phrases
- Playing with the same toys in the same way every time
- An affinity for certain parts of an object rather than the object (e.g. moving parts of a toy, wheels of a toy car)
- Picky or fussy eating habits
- Impulsive or rash behavior i.e. taking action without thinking
- When upset, they may engage in repetitive self-injurious behavior, such as – banging head against a wall, wrist biting, excessive self-scratching

Related Signs and Symptoms of Autism Spectrum Disorder:

The following are some symptoms of ASD which are not part of the official diagnostic criteria:

- Sensory problems- sensory processing issues can give children abnormal responses to sensory information that they perceive. This difference in perception of the world around them. some children may be **hypersensitive** to stimuli or **hyposensitive** to stimuli.

Hypersensitive - when a child is extremely reactive to sensory stimulation. They may find the stimuli overwhelming. E.g. sunlight could seem too bright, noises that may not bother other people may cause them to shield their ears.

Hyposensitive – when a child is under-sensitive or under-responsive to stimuli. (e.g. likes excessively loud tv, music, enjoy various kinds of tactile sensation)

- Emotional difficulties- find difficulty in expressing and/or regulation emotions. (e.g. laughing, yelling, crying for no apparent reason, exhibit aggressive behavior when stressed.)
- Unaware of danger – they may appear unaffected by dangers like moving vehicles, not understanding the dangers of a sharp knife, the dangers of drowning or going near water.

2.5 Diagnosing ASD

Diagnosing autism is a long and elaborate process. As autism is a complex disorder where severity can vary greatly and some symptoms mild and undetectable, a comprehensive, multidisciplinary approach is required. A team of specialists are needed for comprehensive evaluation. This team includes: child psychologists, child psychiatrists, speech pathologists, developmental pediatricians, pediatric neurologists, audiologists, physical therapists and special education teachers.

In order to determine whether a child has autism spectrum disorder, specialists look carefully at the way a child interacts with others, communicates, and behaves. Diagnosis is based on the patterns of behavior that are revealed. In order to diagnose Autism, the clinicians look for a combination of the following:

- Persistent deficits in social communication and interaction
- deficits in emotional reciprocity

- deficits in non-verbal communication
- the child's understanding and maintenance of relationships
- Severity is gauged from social communication impairments and repetitive/ restrictive patterns of behavior
- Repetitive motor movements
- Repetitive use of objects and speech
- Insistence of sameness and regularity
- Ritualized patterns of non/verbal behavior
- Restricted and intense fixations/obsessions
- Sensory sensitivity

To gather this information, several evaluation and tests will be required.

Evaluations may be needed to investigate - Cognitive level or thinking skills, Language abilities, Age-appropriate skills needed to complete daily activities independently (e.g. eating, dressing, and going to the toilet)

As the evaluation process is comprehensive, to identify the cause of the NDD and any other co-existing condition, test such as the following may be required - Blood tests, Hearing test, Medical exam of general physical and neurological exams, lead/ toxin screening and more depending in the need for it.

The parents would also need to be interviewed, through which background information in the child's medical, developmental and behavioral history would be collected.

Observation of the child in a variety of settings is crucial. Developmental specialists can look for any unusual behavior associated with Autism Spectrum Disorder. This may be done so by watching the child play and interact with others.

Depending on the severity of the child's symptoms, speech, intelligence, social, sensory processing and motor skills tests are carried out. These tests can help with the diagnosis as much as it can with determining a treatment plan.

After testing and evaluation, the child may be diagnosed with one of the following:

- **Autism Disorder/ Classic Autism** – usually have significant language delays, social communication challenges, unusual behaviors and interests. Some children even have intellectual disorder.
- **Asperger Syndrome** – have milder symptoms of autism, social challenges, unusual interests but no language or intellectual disability.
- **Pervasive Developmental Disorder – Not Otherwise Specified (PDD-NOS)** - they meet some of the criteria of Autism or Asperger Syndrome. They may have milder symptoms and face challenges in social and communication aspects only.

2.6 The Effects of ASD on the Perception of Environment

Putting aside the deficits a person with ASD has, they also have significant differences in the perception of the senses. This different perception of the senses means that the autistic person experiences and views the world around them differently from a neuro-typical(individuals of typical developmental, intellectual, and cognitive abilities) individual. According to Baumers, S., Heylighen, A (2010), an autistic individual has an acute awareness of the detail and heightened sensory awareness that exceeds the perception of the average person.

“This dialogue hypothesizes that autistic behavior [...] may be a result of a malfunction in sensory perception. This malfunction may take the form of hyper-sensitivity or hyposensitivity, in its various degrees and across the scope of all the senses, leaving individuals with autism with an altered sensitivity to touch, sound, smell, light, color, texture etc. In other words, this leaves them with an altered sense of the world around them.” Said Magda Mostafa(2014) .

2.6.1 Issues of Perception

A child with ASD deals with several challenges in the day to day, and this affects their learning process. Autistic children appreciate regularity and patterns and can be extremely upset by any deviations. Therefore, it is understandable how architecture plays a major role in calibrating sensory information to decrease distractions and reduce stress to create ease and comfort in the learning environment.

Often individuals with ASD perceive space differently than individuals without autism who have a neuro-typical, or “normal”, perception of the world. Someone with autism may be exposed to the same sensory information but interpret the raw material differently, which therefore changes their experience.



Fig. 2.6.1.1. Perception: Neuro-typical Vs. Hypersensitivity

“Many individuals with ASD experience hypersensitivity to their environments. This essentially means that too much information is processed by the brain causing the individual to be acutely aware of information that others simply miss. This can result in very overwhelming feelings and can cause stress or pain in environments where others are comfortable.” Lawson and Olga Bogdashina(2003)

Studies have found that more than 85% of people with ASD perceive colors with higher intensity than normal people. Heavy colors such as red, with high vibrance, similar to fluorescent tones. Approximately 10% perceive colors normally while 5% observe them less intense than normal.



neuro-typical



hyposensitivity

Fig. 2.6.1.2. Perception: Neuro-typical Vs. Hyposensitivity

“Alternatively, individuals with ASD can experience hyposensitivity to sensory stimuli, meaning they process less information than what is typical. Visually, this can mean that specific elements within a space may be interpreted as only outlines. As a response these individuals may enjoy movement or rock back and forth to experience more sensation. Similarly, individuals who experience hypo-hearing may be attracted to crowds or sirens and those who experience hypo-taste or smell may attempt to chew or taste everything.” Lawson and Bogdashina (2003)



neuro-typical



gestalt perception

Fig. 2.6.1.3. Perception: Neuro-typical Vs. Gestalt Perception

“Some autistic individuals find it difficult to distinguish between foreground and background information, known as gestalt perception. Everything in a scene is interpreted without discrimination making it difficult to separate a specific detail. Those who perceive space in this way may process more information than those with neuro-typical perception, however, this can lead to becoming easily overwhelmed. The same can be true with acoustics. In a classroom, for example, it may be difficult for a student to focus on a teacher’s lecture if there are other noises, even those as seemingly unnoticeable as moving air.” Lawson and Bogdashina (2003)



Fig. 2.6.1.1. Perception: Neuro-typical Vs. Fragmented Perception

“Unlike gestalt perception, some individuals perceive the world in fragmented parts rather than a unified whole. If someone is used to identifying a specific place, a classroom for example, by a specific chair and that chair is moved the classroom may become unrecognizable. While those with ASD may perceive space in a range of different ways literature suggests it’s best to design calming, low-sensory environments. It is easier to selectively add sensory information for those who require it than to remove stimuli from a space.” Lawson and Bogdashina (2003)

2.6.2. Play and Autism

Play is extremely important to the development of children. Play helps children develop gross and fine motor skills, language and communication skills, thinking and problem-solving skills, and social skills. Autism spectrum disorder can affect how play develops. Because ASD affects the development of social skills and communication skills, it can also affect the development of important play skills, like the ability to: copy simple actions, explore the environment, share objects and attention with others, imagine what other people are thinking and feeling, respond to others and take turns.

“Children with Autism Spectrum Disorder tend to be less spontaneous than other kids. Unlike a typical curious little kid pointing to things that catch his or her eye, children with ASD often appear disinterested or unaware of what’s going on around them. They also show differences in the way they play. They may have trouble with functional play, or using toys that have a basic intended use, such as toy tools or cooking set. They usually don’t “play make-believe,” engage in group games, imitate others, collaborate, or use their toys in creative ways.” According to Melinda Smith, M.A., Jeanne Segal, Ph.D., and Ted Hutman, Ph.D. (2019). Autism Spectrum Disorders

2.7 Treatment for Children with Autism

Autism is a Neuro-Developmental Disorder, meaning it is related to the development of the nervous system. For a child with Autism Spectrum Disorder, their brain will develop atypically and not in the trend that is typically expected. This causes differences in the structure of the brain and therefore, it is not something that can be cured. That is why the approach to treating autism is one that focuses on skill development, nurturing and improving the skills they already have and manage the symptoms.

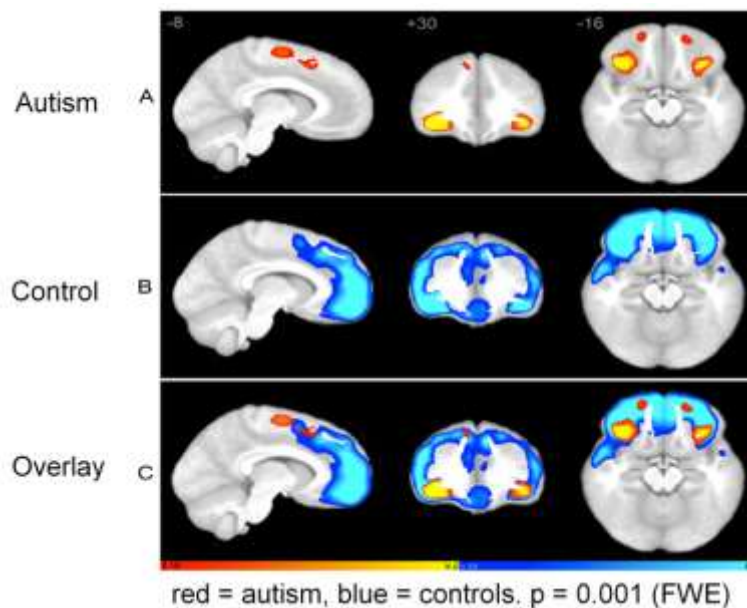


Fig. 2.7.1. Autism vs Control
People with autism show lower brain activity in specific regions as compared to control subjects. Image courtesy of Brandon A. Zielinski, MD, PhD

No single treatment is best for ASD. The ideal treatment plan will target the core symptoms of ASD: Language, Social and Emotional Communication and Rigid or Repetitive Behavior. Each autism intervention should be tailored to address the person's specific needs. A person's treatment plan can include behavioral interventions, other therapies, medicines or a combination of these.

- **Communication and Behavioral Interventions:** Such interventions focus on improving social interaction, communication and challenging behaviors, thereby promoting learning and independence in children. These programs are typically highly structured and intensive and may involve parents, siblings, and other family members. Involving the family members and counselling can help everyone cope with the challenges of living with an autistic child.
- **Medications:** A doctor will prescribe medication to treat common symptoms in ASD. Medications can be beneficial in ways that can ease the core symptoms, because relieving irritability often improves sociability while reducing tantrums, repetitive behaviors, hyperactivity, attention problems, anxiety, aggressive outbursts and self-injurious behaviors.
- **Other therapies:** There are other therapies that incorporate the practices of evidence-based approaches to helping improve symptoms of ASD that can be part of a complete treatment

program for a child with ASD. Autism is a wide-ranging condition that causes a variety of symptoms. A treatment that works for one individual may not work for another. Therefore, working closely with a doctor is important when looking into alternative treatments.

2.8 Rates of Autism Globally

It is estimated that 1% of the world population suffers from Autism Spectrum Disorder. A review of epidemiological studies estimated a global prevalence of 7.6 case of ASD per 100. According to the World Health Organization, as of the year 2019, an estimated 1 in 160 children has ASD worldwide. This estimate represents an average number, and reported prevalence varies across studies. Some well-controlled studies have, however, reported figures that are substantially higher because the prevalence of ASD in many low-income and middle-income countries is still unknown.

ASD averages a 4.3:1 male-to-female ratio in diagnosis. Based on epidemiological studies conducted over the past 50 years, the prevalence of ASD appears to be increasing globally. There are many possible explanations for this apparent increase, including improved awareness, expansion of diagnostic criteria, better diagnostic tools and improved reporting.

The countries with the highest rates of Autism currently are as follows, continuing in a descending order:

- India (851,000)
- China (422,000)
- Nigeria (207,000)s
- Pakistan (172,000)
- Indonesia (159,000).

Because of the high cost, and partially due to a lack of awareness, a large portion of the Autistic population may not even get a diagnosis. Without a diagnosis, treatment is difficult to obtain. A prevalence rate of 2.64% was found in a study done in South Korea, where the researchers found two thirds of the people on the autism spectrum were in the mainstream school population, and had never been diagnosed before. (Kim et al, 2011).

2.9 The condition of ASD in Bangladesh

In Bangladesh, disabled people are the most marginalized in terms of education, medical and social support, and the number of people with disabilities is high enough to merit special attention. Over the last decade, quite a few notable surveys have been conducted which help shed some light on the condition of ASD and its pattern of growth in Bangladesh.

A 2013 study, found the prevalence of NDDs to be 7.1% of the population, of which 0.15% was ASD . As of 2013, 47,500 people were documented to be living with ASD. The actual figure for ASD prevalence is expected to be much higher when compensating for the cases of ASD that are not even diagnosed. The prevalence of Autism has been found to be higher in boys compared to girls. A survey from 2017, found the rate to be increasing, 17 out of every 10,000 children and this rate was found to be higher in urban areas than rural.

In Bangladesh, there is a growing realization that the main constraint faced by children with disabilities is not the child's impairment, but widespread prejudice and discrimination. In the Bangla language, there exists no word that indicates Autism Spectrum disorder and no concept of this existed before a Dhaka based conference in 2011 raised nationwide awareness. Up until then, these children were simply labeled as "pagol". Children could not receive proper diagnosis and therefore, no treatment as well.

Only 11% of children with disabilities receive some form of education but most children drop out due to unfriendly attitudes of people or lose confidence from inability to perform well. This is an extremely disheartening occurrence. People with disabilities too, wish to receive education but they are among the most marginalized when it comes to education. Primary school enrolment rate in Bangladesh is 97 per cent while only 11 per cent of children with disabilities received any form of education. Mothers of children with NDDS were interviewed about their children who were enrolled in specialized schools. The women reported significant improvement in terms of behavior (65%), socialization (43%), Activities of Daily Living (38%).

Many special education facilities have been developed all over Dhaka city, but the provisions are still inadequate. A large number of the Autism organizations were formed by parents to provide for their children. There are not many institutions that were dedicatedly built to serve and provide for the children with disabilities, but there is a dire need for it.

2.10 Design Considerations and Guidelines:

Access and Circulation:

When designing for children with lower sense of danger, issues with mobility and wheelchair access, convenient and short travel distances make the experience much easier and safer. Design must take into consideration, students arriving on foot, by bike, by car and also the factor that the child may be a wheelchair user or mobility aids. The designer will need to find out the potential number of vehicles and process of handover to the school. In a special school particularly, there may be several vehicles arriving to drop children off at the same time.

Arrival and departures take time and resources when transferring children in wheelchairs. This has the possibility of slowing down traffic flow of the vehicles behind them.

The approach from gate to entrance doors should have:

- Vehicular circulation that accommodates public and private transport for stoppage and drop-off, ensuring back-log or congestion is avoided.
- Provisions for emergency access will be needed.
- Designated pedestrian routes for children with no awareness of traffic and danger, needs to be taken into account.
- Easily accessible, level or ramped slip-resistant and well-drained surfaces along the route, without trip hazards and with an accessible stepped route nearby to give a choice
- Suitable car parking, with accessible parking bays near the entrance.
- Good quality external lighting for routes, clear legible signage, visual contrast and sensory way finding to help independence.

Outdoor Circulation:

Children at an early age, and especially to children learning independence skills, movement and maneuvering through their immediate environment is a crucial part of the learning process. Therefore, it is important to create a surrounding where it is safe for the children to learn and be able to move along side their peers. To create such an environment, short routes and minimized traffic is the goal. Further details to pay attention to are:

- Abundant circulation space for mobility aids and wheelchair users
- Handrails for support where possible
- A variety of straightforward marker, signs, tactile cues to guide and act as references to navigate their environment
- Minimize gradient and level changes for easy access of all outdoor functions
- Shelter along pathways where there is exposure to danger like traffic
- Both ramp and stairs should be available where there is a change in level
- Especially for outdoor areas, boundaries and security measures need to be put in place so that no upset child may run off premises.
- Noisy and quiet routes should be separated so children may choose the path that is most comfortable for them.
- All paths should have defined edges and be wide.
- Any and all gates should be wide enough for wheelchair access and assistance

Internal circulation:

Children with autism have a lower tolerance for close proximity to an unfamiliar people and prefer farther interpersonal distance. Children in wheel chairs or using mobility aids need higher clearance space to maneuver with their equipment. Therefore –

- circulation spaces must be wide enough to allow the passage of a wheelchair plus two people.
- Indoor circulation should be lines with affixed handrails for those that need assistance while walking.
- The ambience of circulation spaces should feel light, airy and uplifting.
- Visual cues and easy to understand signage, Picture Exchange System (PEC) style symbols and clues should be used.

Vertical circulation:

All stairs, ramps, steps and lifts should follow current regulations and be suited to the needs of autistic and disabled people.

- The choice of using lifts, stairs and ramps should be available
- Clear signage should mark the location and guide the direction of functions
- Signage should be at an appropriate height for kids.
- Provide even lighting and avoid glares

- The placement of lifts should take into account the functions around it, doors and opening and foot traffic.
- The experience of waiting for the lift should not be agitating to a child with autism. Crowds should be avoided and enough vertical circulation should be planned for so not to create undue strain at any one point of vertical circulation.

Way-Finding, Navigation and Circulation:

A lack of comprehensive organization and anticipated logic behind organization of spaces can cause confusion and distress when users lose their spatial orientation. Coupled with sensory zoning (discussed in subsection - Spatial Sequencing) designing for conducive wayfinding can assist special needs users gain the skills needed for independent navigation while also freeing up staff.

- Employing pictorial signs supports active learning of communication. Over time, students who struggle with the written word may start to associate the writings with the pictorial images and learn to generalize the meaning and this can prove useful even outside school premises.
- Individuals with autism lack the capacity for abstract thinking and have difficulties in identifying similar space's that possess the same function. Creating straightforward markers and signs help autistic people gain confidence for interaction with that space.
- It is wise to steer away from corridors but rather develop a well-designed circulation space that affords opportunities for socialization and a range of other activities.
- Grouping functions of each age group in their own zones will promote generalization as they move through their routines progressively on the daily.
- Introduce visual aids, discreetly, such as color and patterns in circulation area to assist wayfinding.

Zoning and Compartmentalization:

The clear organization of functions with respect to one another is of the utmost importance. This as a great impact on the comfort of the user, adds an encouraging quality to the learning environment as this promotes independence and easier wayfinding and navigation within the premises.

- The sensory environment should be defined and limited so that the activity at hand or the purpose of a space is compartmentalized and legible.
- The different functions should be visually and spatially separate so that the function and consequent sensory quality is clearly defined.

Spatial Sequencing:

A routine and predictability are comforting and conducive to learning for autistic people. This should be considered when organizing spaces, to create a logical order and include the sensorial compatible functions.

- Ideally, spatial sequence should be based on typical schedules and allow for seamless transition from one activity to the next.
- Transitioning from one activity to the next would work best through one-way circulation as this eliminates confusion and acts as a clear instruction. This can also alleviate distractions throughout the day.
- “High Stimulus Functions”, ones requiring high levels of alertness (e.g. music, art, psychomotor therapy, kitchen, administration), can be grouped together.
- “Low Stimulus”, functions requiring high levels of focus and concentration (e.g. speech therapy, classrooms, one on one instructions), can be grouped together.
- When moving from High focus zones to High Stimulus zones, it is important for there to be a transition space in between. This signals to the child that they are moving into a different area with a different function and goal. This space can also act as a preparatory space and the child can adjust their senses as they move from one level of stimulus to another.
- Buffer areas can be gardens, free-play areas, an open space or a place for casual social interaction, if a student wants to engage in it.

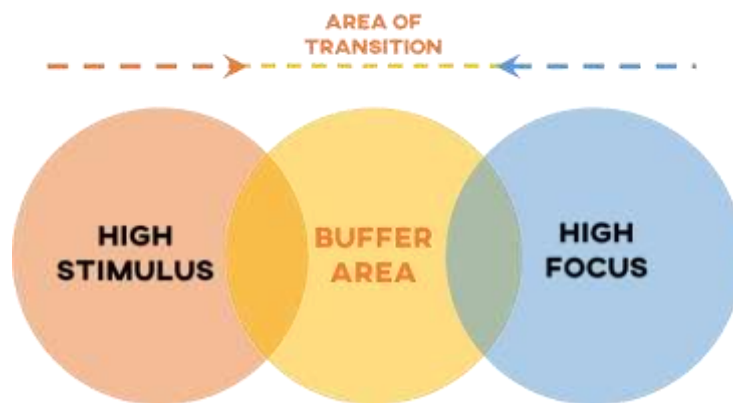


Fig. 1.10.1 Transition Area

Thresholds:

Much like the transition zone, the separation between functional areas (be it from High stimulus to low stimulus, a classroom and a corridor or even micro compartments within a class, individual work-station and group work area), need not be abrupt. More fluid yet still clear transitions are preferable. This can be done so by-

- Altering ceiling heights
- Switching floor coverings
- Furniture arrangement indicating separate functional areas

This provides the children with sensory clues as to what to expect from each space while minimizing ambiguity. Ambiguity causes stress.

Safety:

Safety is the biggest concern with children with Autism who may have an altered sense of their environment with little to no awareness of danger.

- An upset autistic child has the tendency to run away or escape. Warning systems and obstacles (low/high gates with controlled locks) should be put in places that separate the institution from the outside.
- No blind spots or tight small spaces should be in the design, where the child could potentially hurt themselves or hide in.
- When designing for children with autism, the layout and organization of the facilities should be such that allows the greatest possible freedom for all users, but also allow a clear line of view, so that teachers, assistants, supervisors etc. may keep an eye on the children while still allowing them to independently practice their tasks.
- Means of unobstructed view to the outside should also be provided reasons of supervision.
- Use of non-slippery floor surfaces can negate accidents
- It is good to be wary of level changes as they may pose risks for some children, so suitable safeguards such as gates and lower level handrails and guarding should be provided.
- There should be no sort of exposed or sharp edge that a child ay hurt themselves on.

Social Opportunities:

Providing community-linked services to afford students the opportunity to interact with society should be considered. Including such services create interaction between people on the spectrum and within neighborhoods helps develop social and vocational skills in students. this also promotes a positive and productive image of autism and disabilities to the community.

Early Childhood Development:

- Health and safety considerations are particularly important for very young children with autism and disabilities (for example hygienic sand and water play facilities).
- Ground floor accommodation allows safe, level, easy access to the outdoors, preferably reached directly from indoor play areas.
- While children in early year's settings often eat their meals in the main play area, some children need a more sheltered place and support.
- Signage, vision panels and door handles (where appropriate) need to be low enough for young children to reach.

- Ramps should have very shallow gradients to suit very young children using wheelchairs or mobility aids.
- Changes of level may pose risks for some children, so suitable safeguards such as gates, lower level handrails and guarding should be provided.

Supporting Facilities-

- A sensory space
- A soft play space
- An additional quiet room or semi enclosed space for support or therapy
- Storage for mobility equipment
- Battery charging for wheelchairs
- A medical room

Primary School:

Transition from early years to primary is a time of considerable change, especially for those with autism and disabilities, who often need additional support. Facilities needed at this level of development/ stage in learnings -

- Classrooms (or bases with shared areas) for whole group work
- Separate areas for practical activities, such as cooking (although these activities may take place in a class base if large enough and suitably equipped)
- Small rooms for individual and small group work
- Library/resources space
- Larger spaces (likely to be used by the school and wider community out of school hours)
- for activities such as drama and movement and physical education, dining and assemblies
- A range of easily accessible outdoor spaces (a useful learning and teaching environment and invaluable for recreational, social, extended school and community use)

These should be supported by-

- Staff rooms
- Storage
- Toilet and changing rooms
- Kitchen facilities being able to separate noisy and quiet,
- Wet and dry activities easily will help to meet children's diverse needs.

Floorplan for special education classrooms

Typical room layouts of accessible class bases have -

- Space at the entrance and to access key facilities including the whiteboard, resource and practical zones. This let's an autistic child gauge and prepare themselves for upcoming class activities.
- Direct access to the outdoors, providing an alternative learning environment.
- Space for a teacher using a wheelchair

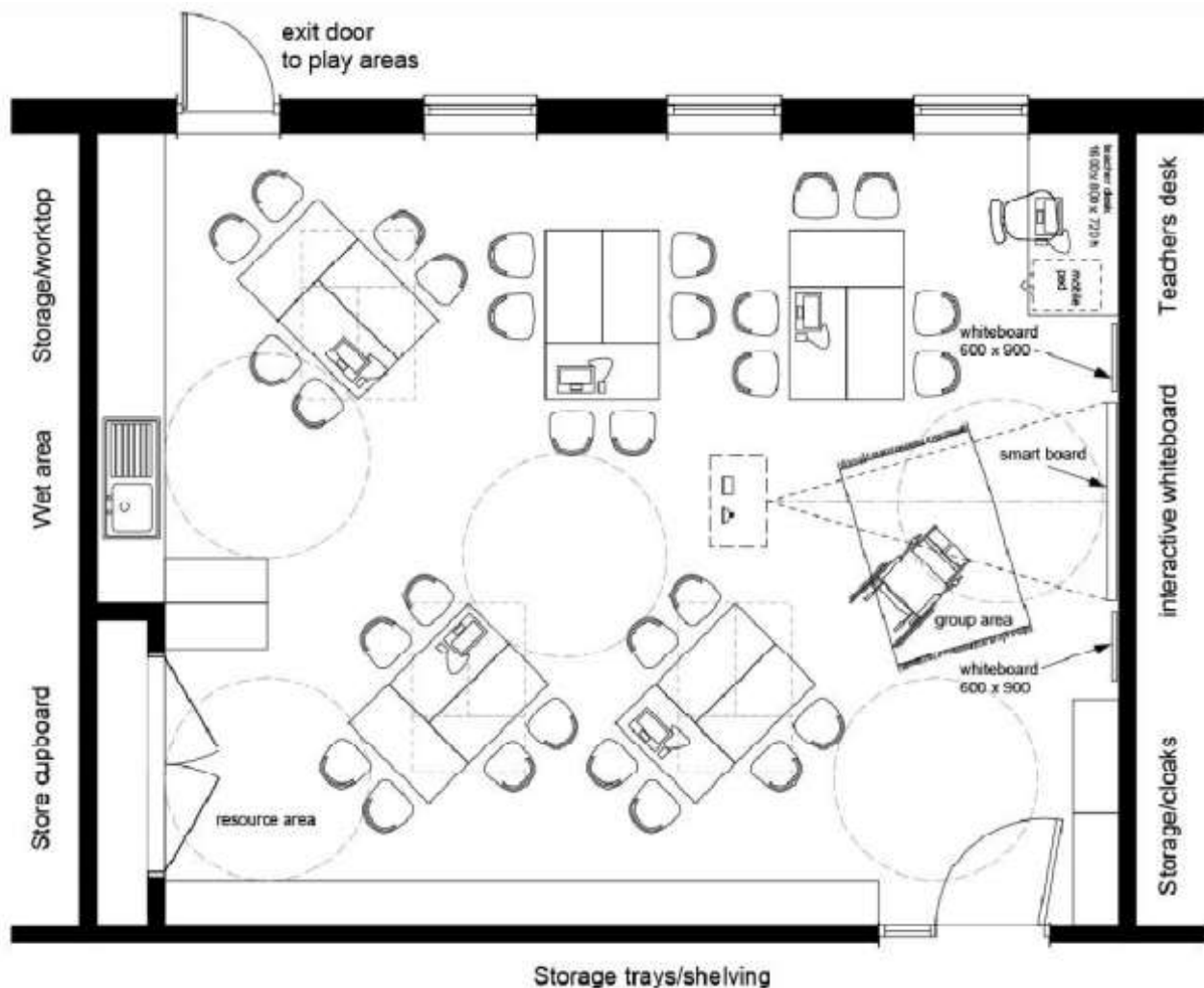


Fig. 2.10.2 Floor plan for Special Education Classroom

Primary School Design Considerations:

- Classrooms that allows flexibility in learning and teaching. They may open upto to a shared space with another classroom of similar grade level.

- Easy access to quiet small-group rooms, not accessed from other classrooms to reduce probability of distractions
- The ability for large open plan areas to revert easily to compartmentalized spaces, if need be.
- Access from circulation spaces, not other classrooms to reduce disturbance.
- The potential for arranging different groupings and activities.e.g. sitting in a circle, around a table, individual work
- Zoning activities and separating noisy and quiet
- Links to a variety of outdoor spaces such as calming spaces or active spaces.
- Storage space for students' belongings

General Classroom Design:

- A clustered organization in classrooms creates an internal, contained and intimate scale that can fulfill various function. Those with delayed social skills can interact with a smaller group of children in a familiar environment.
- Courtyard design has many benefits including temperature regulation and a connection to outdoor learning,

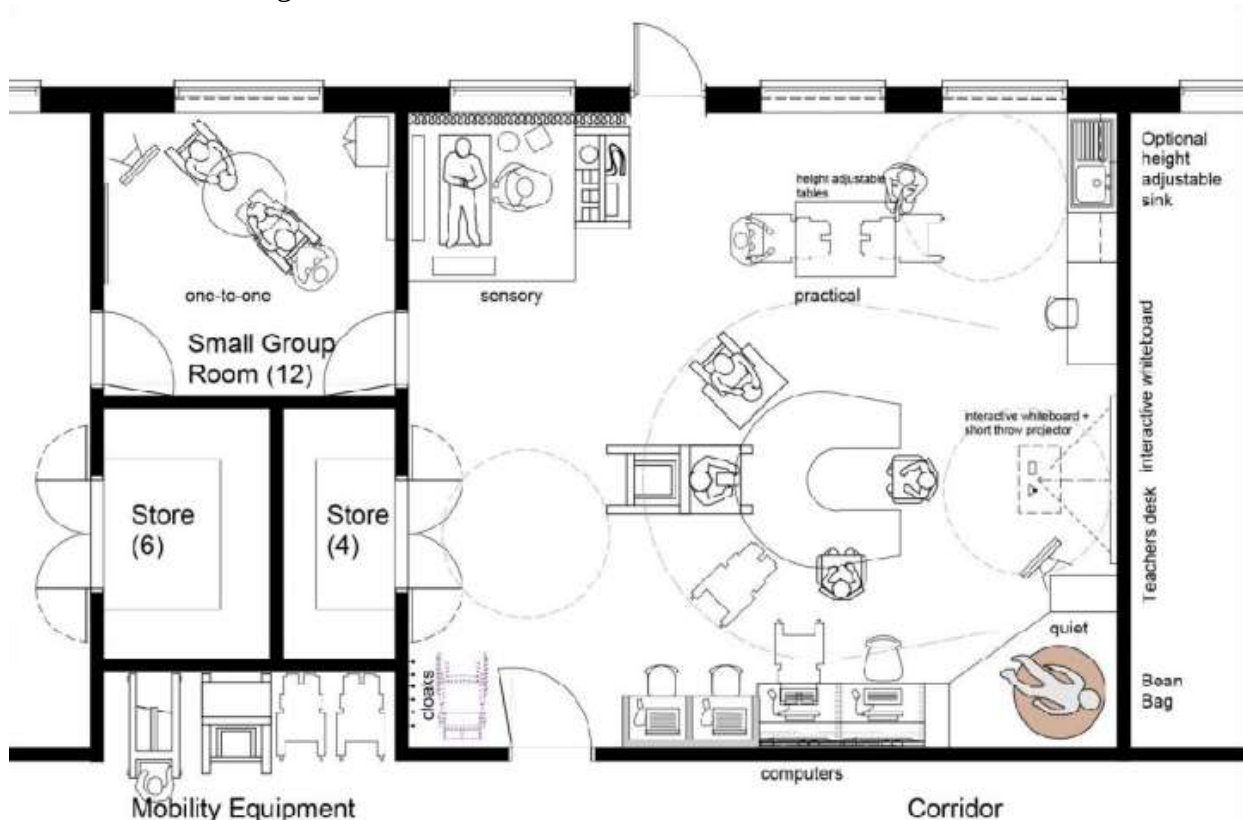
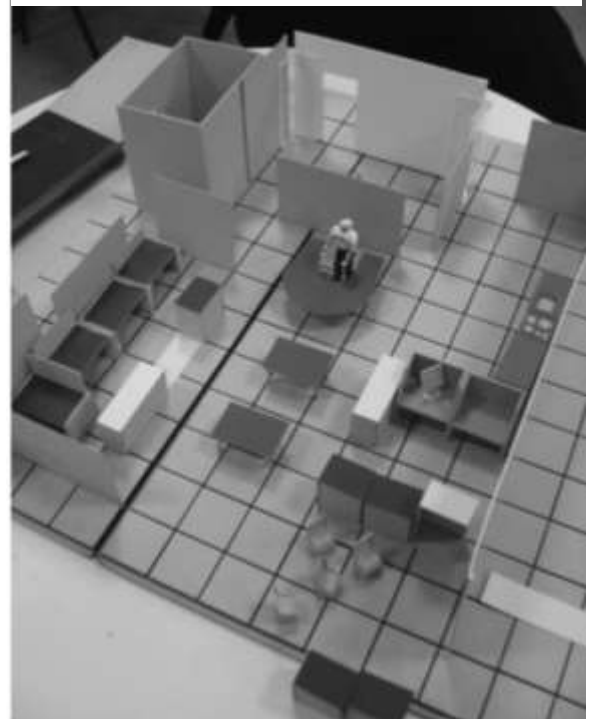


Fig. 3.10.3 Floor plan for Special Education Classroom

- Classrooms can have compartmentalized design. Meaning, each function/activity has its own designated area/station(which can be visually separated) to minimize distractions.
- Stations should be organized according to their sensory requirements.
- High focus tasks should be located in a well-lit area to promote alertness but reduce distractions.
- Certain activities are best performed with certain layouts. For each activity, an optimum and distinct furniture should be used consistently, to act as visual cues for the student to learn to generalize the skill over time.
- Open floor space should be considered for provision for group work.
- Closed storage cupboards and open shelves with neutral boxes should be used to put away any item when not in use to minimize visual distractions.
- Resource nodes should be places centrally between 1 or more classes in a small teacher preparation room for efficiency.
- An essential escape space should be located in a quiet corner of the class (optimally a partitioned space) for an overstimulated child to seek refuge.
- For the education of both child and parent, joint observation rooms may be arranged for, directly adjacent to classrooms. This will allow not only parents but also specialists, teacher and people under training, to observe through a one-way mirrored window.
- Arranging and grouping classrooms into “neighborhoods” accesses through the circulation area allows the choice to pause and decide what to do next. Children with ASD often associate 1 activity with one particular place. Therefore, this opportunity to pause, wait and decide is very valuable.
- Classrooms should have direct access to secure external play spaces.



Figure 2.10.4. Compartmentalization or Creation of "work-stations"



Specialized Therapy Spaces:

Apart for speech therapy, occupational therapy, physiotherapy, hydro therapy etc. are all high stimulus functions and should be grouped according to the sensory zoning guideline.

- Psychomotor therapy rooms need to be more linear in proportion to allow directional movement along its length.
- Preparatory or storage cupboards should be located at one end of the room where the students begin their activity.
- Occupational and physiotherapy space may share a storage space to economize and share expensive equipment.
- Location of art therapy studios should be close to outlets to allow for easy transportation of materials with minimal distraction
- The hydrotherapy unit and swimming pool should be located at the furthest possible distance from the classrooms and must be enclosed. The enclosure will minimize acoustical disturbances while also being safer and more hygienic.
- Hydrotherapy unit is to have a sensory pool with various jets that activate at various parts of the body to provide tactical stimulation.
- Speech therapy rooms should have various levels of soundproofing to allow the student to “graduate” through levels of sound proofing, so not to only condition a child to be able to use their skills in a completely sound proofed space.

Diagnostic Center:

- Will need rooms for- parents, waiting, assessment and diagnosis, specialists, intake and conferencing.
- This area should be accessible from visitor’s and parking entrance.
- Psychiatric office should provide easy access from both diagnostic area and public interface. This function will serve as a means of evaluating the progress of patients already included in the treatment process as well as provide counselling and diagnosis for oncoming patients/ students or extracurricular support⁴ for special needs students enrolled elsewhere.

Medical rooms:

All schools must have a designated space for visiting medical staff and the treatment and care of its students. There also needs to be somewhere for first aid emergencies and where a sick person can be closely supervised by member of staff. There need to be:

- Window and door security (to protect medicines and confidential records)
- Non-abrasive wall surfaces and slip resistant floor surfaces that is easy to clean and maintain for good standards of hygiene
- appropriate furniture and equipment, such as a desk and chairs, an adjustable couch, a treatment trolley, a filing cabinet and lockable cupboard and/or fridge for drugs, clinical Wash-hand basin, some soft furnishings and shelves
- Visual privacy for general medical examination, with portable screens, blinds or curtains
- Good sound insulation for privacy (with specialist acoustic treatment for hearing testing, if necessary)
- Enough length for vision testing
- a suitable place for resting or recovery after a seizure (if required)

Physiotherapy:

- A multi-purpose support space (250-320 sqft) (if suitably fitted out, e.g. with couch, a clinical wash hand basin, and a curtained or screened changing space)
- A large medical room (200-250 sqft) with an adjustable height couch
- A fully equipped physiotherapy room (250-320 sqft)– where there is a higher need, may also be used by other therapists.
- Storage space (50-100 sqft) will be needed to support any of these spaces, for inflatables, physical aids and equipment. It should be directly accessible from the space, with outward opening doors. A physiotherapy room should be flexible and functional.

9h AUDIO



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considered at the very early stages of the design and room locations.

- Ideally an audiometric test room should have a minimum internal space of 90 sqft for clinical testing and assessment. This size is often increased, often up to as much as 260 sqft (space permitting) for pediatric assessment and free field audiology. The size of the room can also play a part in optimizing the acoustics. The larger the room, the smaller the impact of furniture, equipment and people will have on the free-field environment.
- Furniture and equipment should be considered and ideally placed in fixed positions to ensure acoustic measurements are not affected, resulting in consistent testing results.

Informal social and recreational activities

There should be a variety of areas for different types of play and to enable children to make choices and engage in different activities. Such as-

- For running around in
- For imaginative or adventure play
- Social spaces to sit and talk
- Quiet places to be alone

There should be a combination of hard and soft areas with play equipment. It can be helpful to divide active and rowdy areas from their more calm and quiet counterparts with low gates and fences to shelter more vulnerable children.

Sensory rooms:

A sensory room help teach children with autism and other behavioral health challenges to regulate their bodies in a way that allows them to achieve success in the classroom. For example, using a sensory rewards (by getting their frustration or excitement out via obstacle courses or physical movement) can help students to achieve a calming sensory effect. Improved focus and information processing can make a significant impact on their ability not only to learn, but in how they engage with their teachers and peers. Sensory rooms

- Sensory rooms should contain light, sound and other equipment formulate-sensory work
- for one-to-one and small group work, are highly resourced spaces, often entirely white or black, which use a range of equipment to create different light, sound and other stimuli for multisensory work. Mirrors and mirror balls, bubble tubes, fiber optics and interactive switch equipment are often used (but too many stimuli may confuse or limit effective use.
- Should be designed for flexibility. Use of a plain or neutral background to which teachers and assistants can add stimuli as they feel fit.
- Provisions will vary depending on if a school wants one large white room of 250-350 sqft or two small rooms of 130 or 170 sqft to provide separate light and dark rooms.
- Some schools may choose to create a temporary sensory environment in the corner of a learning space.

- There should be a clear area upon entry to transfer the child from wheelchair to main cushioned area.
- There should be cupboards upon entry and a place to take off and store their shoes and outerwear.
- Plastic covered cushioned linings to walls, to half or full height (fire-rated foam products should be checked for health, safety and fire prevention with the supplier).

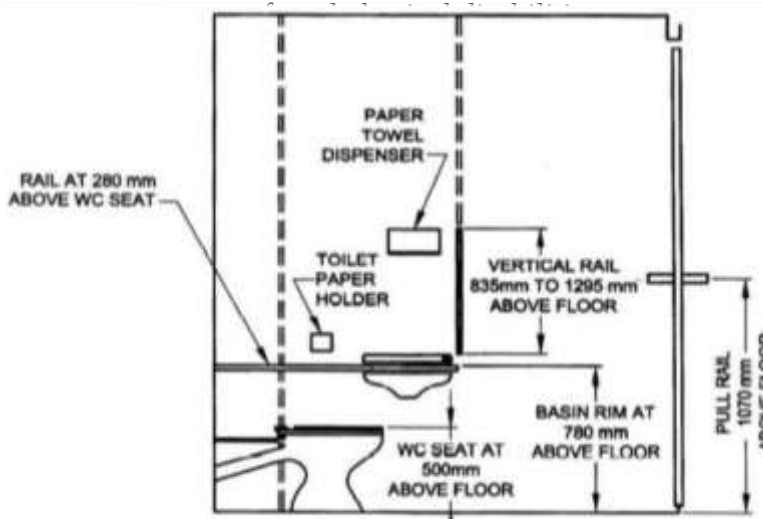
Escape spaces:

Secluded retreats are an important feature to include in educational facilities that can expect to enroll autistic children. Escape spaces function to provide a calm and separate space where an autistic child can find relief from overstimulation from the environment to recoup. These spaces should provide a neutral sensory environment with minimal stimulation that can be customized by the user to provide the necessary sensory input.

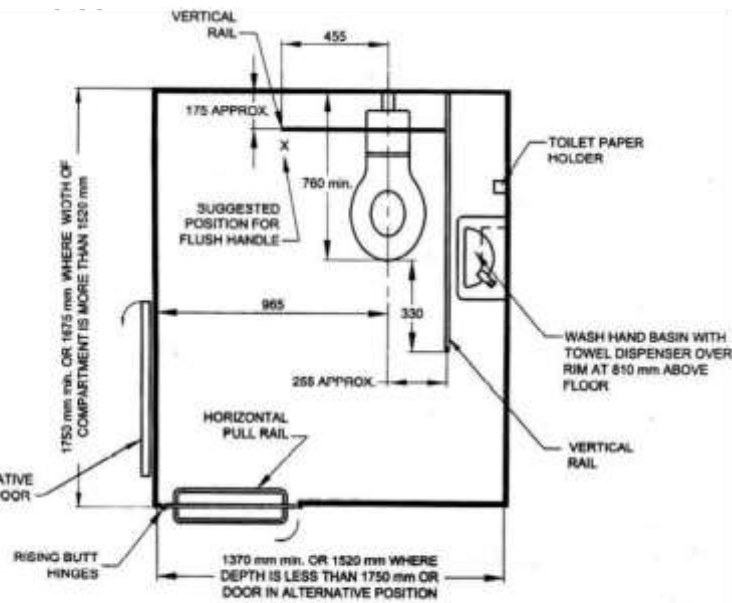
- If no separate rooms are available to dedicate to escape zones, small partitioned areas and corners throughout the building can provide these quiet escapes.
- Provisions must be distraction-free and sensory-neutral.
- When unoccupied, these rooms may serve as a space for leisure facilities but provide minimal stimulation and can be equipped as needed.

Toilets and Changing Facilities and its Ergonomics:

- Wheelchair accessible and wheelchair user friendly toilet stalls
- Large toilet stalls for children who need more space to move around.
- Smaller toilet fixtures for younger children
- Layout and fixture placement should reflect the age of the child and help them develop personal care skills
- Toilet fixtures affixed at lower height for young children
- Specially equipped hygiene rooms for children



TYPICAL WASHROOM SECTION



TYPICAL WASHROOM PLAN

Fig. 5.10.6 Accessible Toilet

Ceilings:

- Pool areas may need to allow for air movement above the ceiling to avoid mold growth.
- Sound-absorbent surfaces are required in certain space, to ensure good sound quality e.g. audiology testing.

Walls:

- While sliding or folding doors increase flexibility of space, the cost is the loss of acoustic control and insulation.
- Sharp corners can be stressing for autistic children. In high focus areas, rounded corners can create a calm environment and cause less distraction.
- In certain functions, the maintenance of hygiene is very important (e.g. kitchen, bathrooms). Full tiling of walls may be needed in such places.
- Walls may need to support heavy equipment in certain spaces (e.g. physiotherapy room, toilets with handrails etc.). If lightweight construction is used, additional framing supports may be needed.
- Abrasive materials should be avoided as it can hurt a child if they brush against the wall.

Ventilation:

Proper ventilation is important for a few reasons –

- Children with autism can be highly sensitive to smells and odors can be distracting and in cases upsetting
- Stale air and high concentrations of carbon dioxide can cause drowsiness and hamper concentration, an effect that is more pronounced in children with special needs and higher sensitivities.
- Some children are likely to have complex health needs. In such cases, a lack of ventilation can become a source of contamination.

Acoustics:

Sound is among the most influential factor on autistic behavior. For children with short attention spans, sudden noises can be distracting. Sudden noises (e.g. sirens of a passing ambulance) to a constant low noise (e.g. humming of the a.c) can also agitate and set off an episode in an autistic child. When designing for autism with acoustics in mind, the approach should be to –

- Reduce noise levels and echoes with the use of carpeting, acoustic panels, thick curtain etc.
- Soundproofing isn't necessary everywhere. High focus zones like speech therapy room, classrooms, library etc.
- Factors to consider when identifying the spaces to acoustically solve are level of focus required for the activity, skill level of child and severity of autism.
- Introduce levels of acoustical control to allow the children to “graduate” from one level of acoustical control to the next.

Lighting:

Both natural and artificial lighting are needed to create a usable educational facility. Visual stimuli and adjusted lighting levels can create both active and calm zones, according to the activity. Considerations for lighting decisions-

- Avoid reflections, glares and shadow patterns.
- Spaces should be designed to be flexible in terms of light. This can be done through installing adjustable lights, install curtains to manage light entering into space or design and indirect light source.
- Fluorescent lights can be extremely harsh and prone to flickering and can set off fits in an autistic child. Flexible LED lighting is favorable. Uplighters, diffusers and colored filters are additional strategies for establishing a more comfortable environment.
- Minimize direct lighting

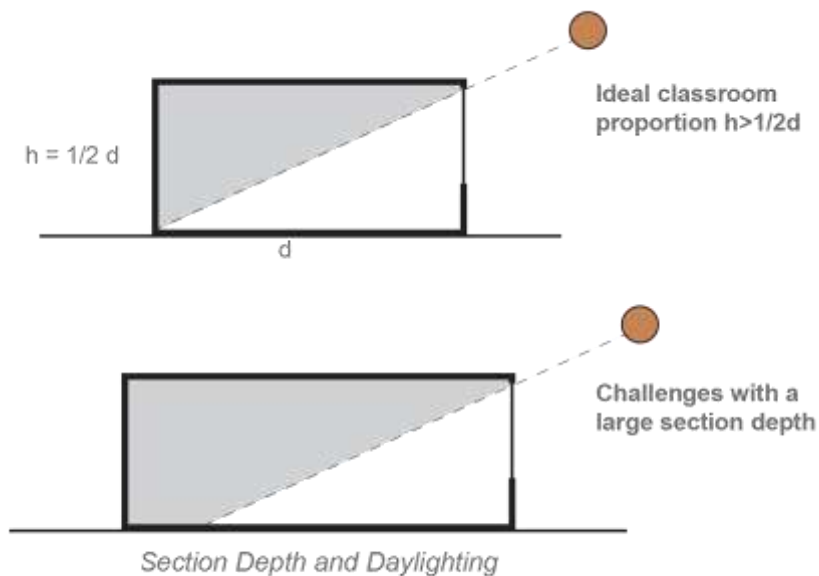


Fig. 6.10.7 Daylight Strategy for classrooms

- Ensure even and uniform lighting and avoid dark corners.
- Reduce overhead lighting whenever possible and use tabletop or desk lamps with full-spectrum light bulbs
- Keep computer screens away from windows where glare can become a problem
- Natural light should be introduced above eye level to allow indirect sunlight in without causing visual distractions.
- North facing windows is a strategy that is optimal as it provides no glare or visual distractions.
- Such a space should be available in each classroom
- An intimate environment with various items close at hand as needed.

Color:

Colors have psychological effects on people, and more so on autistic children with high sensitivity. Colors should be considered in relation to levels of light, visibility and maintenance.

- Neutral and subdued colors and the use of natural materials are best suited for autism-friendly learning environments.
- Overly stimulating colors, bright colors should be avoided.
- Patterns with high visual complexity can cause stress and can be very distracting. These should be avoided.
- Bright surfaces against a dark background (e.g., a window/opening to the outside on a black wall) can create glares.
- Colors on architectural features can be used to indicate a change in activity
- Tonal contrast can be used to identify objects (e.g. light switches, utensils on a wall, notice board etc.) against a wall.
- Sharp variations in visual textures are to be avoided.

Steps and stairs

- The minimum clear width permitted by Approved Document M is 48 inches but this is only advisable in schools for little used stairs. Standard Specifications, Layouts and Dimensions (SSLD) 6 recommends a clear width of 62 inches, which enables two adults to pass each other with ease and permits three people to safely carry down wheelchair.
- The nosing of the stair must be visibly different from the treads and risers.
- External stairs, should have tactile information at the top and the bottom of the steps.
- Low handrails should be affixed for children younger than 12 years old.

Room Layouts and Furniture:

Classrooms spaces should be according to the needs of its user. For example, classrooms for autistic users will need compartmentalized functions to minimize distraction, but a child with visual impairments would not. for user comfort, the following should be considered –

- Age appropriate furniture
- Sufficient space to maneuver wheelchair and mobility aids.
- Furniture layouts that account for wheelchair users, e.g. a child in a wheelchair should be able to sit at the table along with their peers.
- Work stations must be large enough to fit devices and leave room to use it.
- Sufficient space around furniture and equipment for a wheelchair user to be able to use it.

Ramps and Gradients:

- Gradients should be no less than 1:10 or more than 1:12. Steeper gradients make it difficult for those with less strength to push themselves up the slope or slow down/ stop on the way down.
- Ramp landings should be level and wide enough to allow the user to rest for a bit if they need to and to turn their chairs.
- Ramp width must be a minimum of 70 inches.

Evacuation and Fire Safety:

- The lobby should be pressurized by mechanical means, creating a positive air pressure in the lobby. by means of ventilating fans, the system should ensure that the air pressure in the lobby is always higher than in adjoining areas, thereby deterring smoke from getting in , or finding its way out through cracks or cervices.
- In low rise, 2-3 storey building, external ramps can be a practicable means of escape.
- Ramps which serve as a means of escape, should have a gradient of no more than 1:10.
- If there is a Fire protected lift installed in the building, it can be used as a means of escape by disabled people only. In such cases, a lift should be marked with the international symbol, 654.
- Horizontal compartmentation is more feasible in a multi-storey building for disabled people. One possibility, something applied in hospital buildings, whereby people can be moved from an area where fire occurs to a protected area at the same level which affords temporary safety until the fire brigade deals with the fire.
- Alternatively, it may be possible for people to be moved horizontally by the means of a connecting link to an adjoining but separate building.
- There should be designated locations for an area of refuge. Refuge should be secure and located away from the evacuation flow. In the event of a need for evacuation from an upper floor, wheelchair users should make their way, either accompanied or on their own, to a designated area of refuge or other place of safety on the same floor. An appointed staff member or faculty will assist the individual at this assigned refuge and proceed to evacuate them.

03: Context Analysis

3.1. Site location and Surroundings:

The site is located in Purbachal New town, a planned township that is situated in Rupgonj thana of Narayanganj district and Kaligonj thana of Gazipur district, cupped between river Balu on the east and Shitalakhya at the west.

The Purbachal New Town Project (PNTTP) is to occupy a total of 6077 acres. Out of 6077.36 acres, 4577.36 are in Rupganj Thana under Narayanganj and 1500 in Kaligaj Thana under Gazipur. Purbachal is to house 1 million people with 26,00 residential plots, 62,000 apartments with necessary urban facilities and urban infrastructure. PNTTP will be connected to the main city by Purbachal express-way/ 300 feet road on the south. A road which is only 10 minutes from the site, thereby ensuring connectivity with the remainder of the city.

Area: 3.3 Acres (143748 sft)

Location: Sector-08, Purbachal New Town, Bangladesh

Coordinates: 23°50'43.624"N, 90°30'55.871"E

3.2 Historical Development of Site:

The project area was initiated as Yousufganj New Town after the name of Yousufganj which was later renamed as the present Purbachal New Town and is being implemented under the same name. The area comprises of comparatively high, flat and low-lying lands with undulations ranging from -2.95 to + 16.60 mPWD of elevation giving a unique topographic perspective. The hillocks are interspersed with flat lands where two crops a year were produced before the acquisition. The slopes of the hillocks were used for growing vegetables. Unlike elsewhere, dwelling units were less dense in the area and were mostly located atop the high grounds.

In the past, there was no direct road communication with the area despite being within the immediate vicinity of Dhaka. At present a number of communication links with the area are being established under a number of road projects.

The urban population of the country is projected to be somewhere between 80 to 100 million by the year 2026. Being the administrative and commercial hub of the country, Dhaka is expected to take on the brunt of this massive urban growth. PNTTP is an endeavor in the timely preparation for accommodation of the incoming urban population influx.

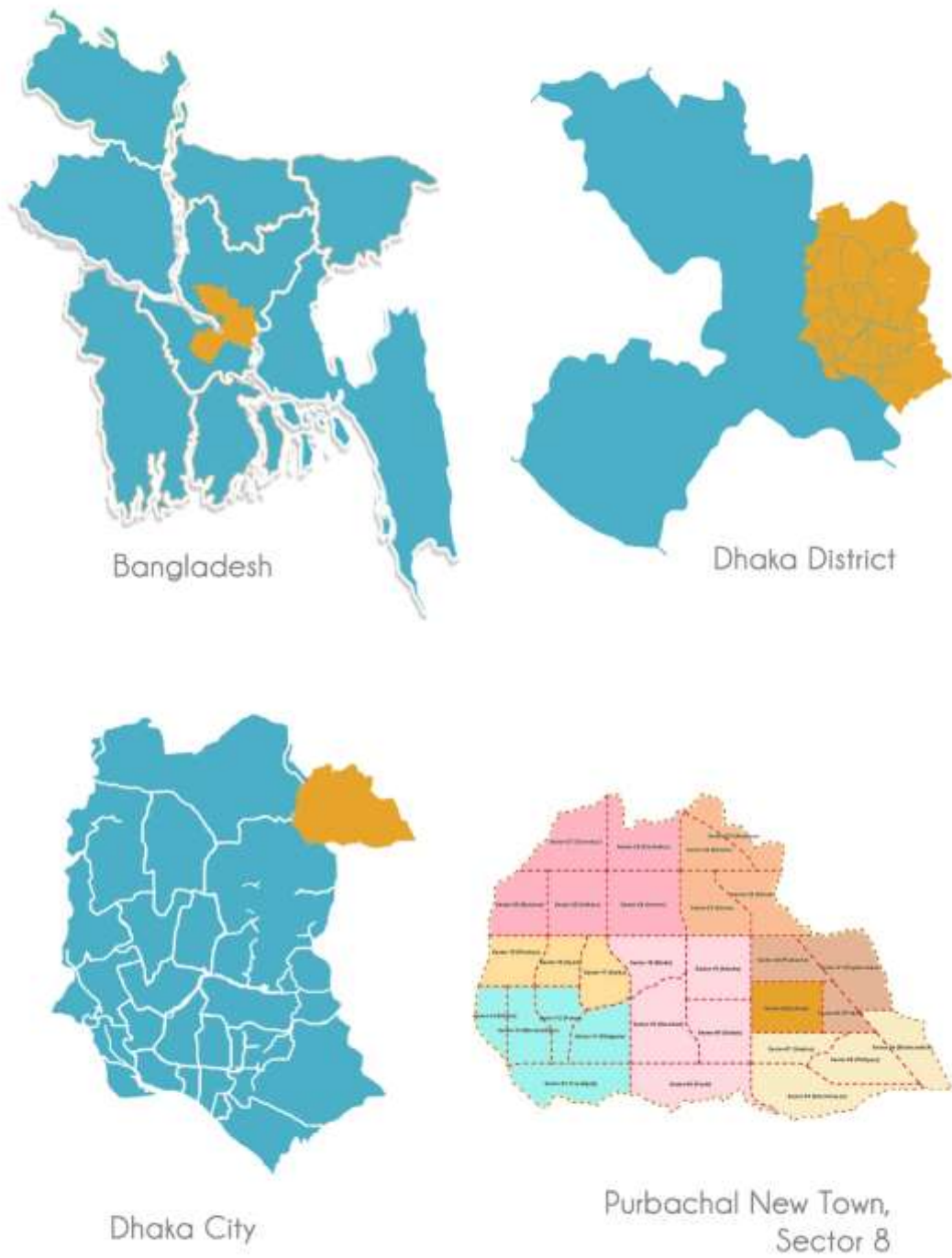


Fig. 3.1.1 Locating the Site

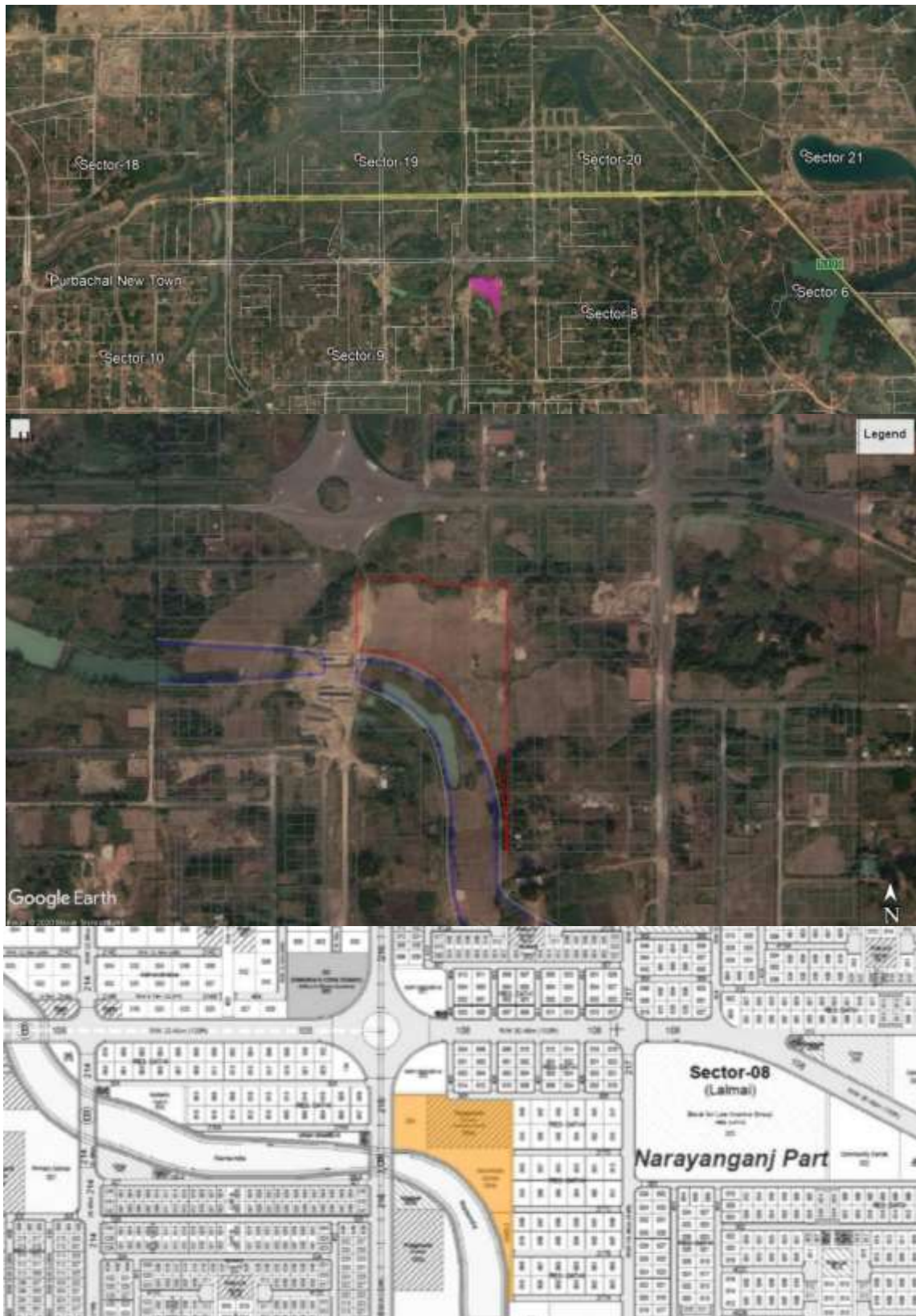


Fig. 3.1.2 Locating the Site

3.3 Figure Ground Map:

According to RAJUK's Detailed Masterplan for the development of Purbachal, the site is to be in a densely populated and trafficked area, being positioned adjacent to a major primary road connection. Future development plans show much permanent structures but with the consideration and allocation of open space and greenery. The site itself is while shielded on the north and east from natural forces by residential developments. On the west, the site is open to a main arterial road but is open to a large undulating water channel on the south.

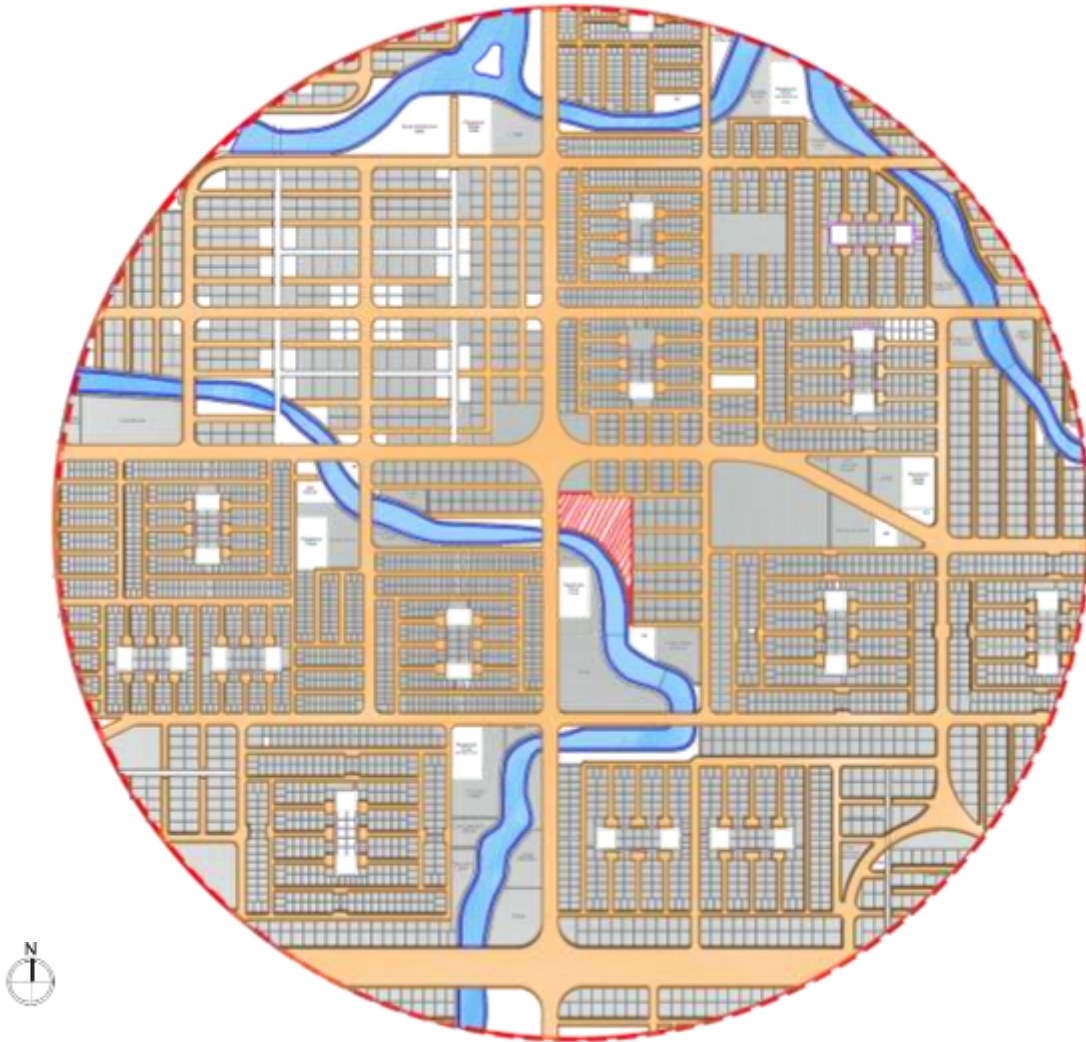


Fig. 3.3.1 Figure-Ground Map

3.4 Land Use Pattern of Surroundings:



Fig 3.4.1. Land Use Map

The site is surrounded by areas of mostly residential use, except for one administrative function. Opposite the site, on the other side of the water channel, are a mosque, playing field and an educational institution. While the site is located mostly within a residential area, it is likely to follow the development pattern of its neighbor, Uttara. Much like Uttara, it can be predicted that the line of residential buildings bordering the primary road (adjacent to the site) will over time adopt commercial use (as illustrated in fig.3.4.2.)

Fig. 3.4.1. shows facilities and services available within a walkable 1km radius from the site. The site is surrounded mostly by residences and schools, convention centers, clinics, playing fields and mosques on a neighborhood level. On the furthest corner in the south-east, there will be a wet-market or “kacha bazaar”. Crossing the site, making way towards the north, lies the Central Business District (CBD). The combined pull of the college (to the south of the site), its location on the fringe of an entry into Purbachal, the development of a commercial belt and the CBD, a great deal of vehicular passage and traffic is to be expected.

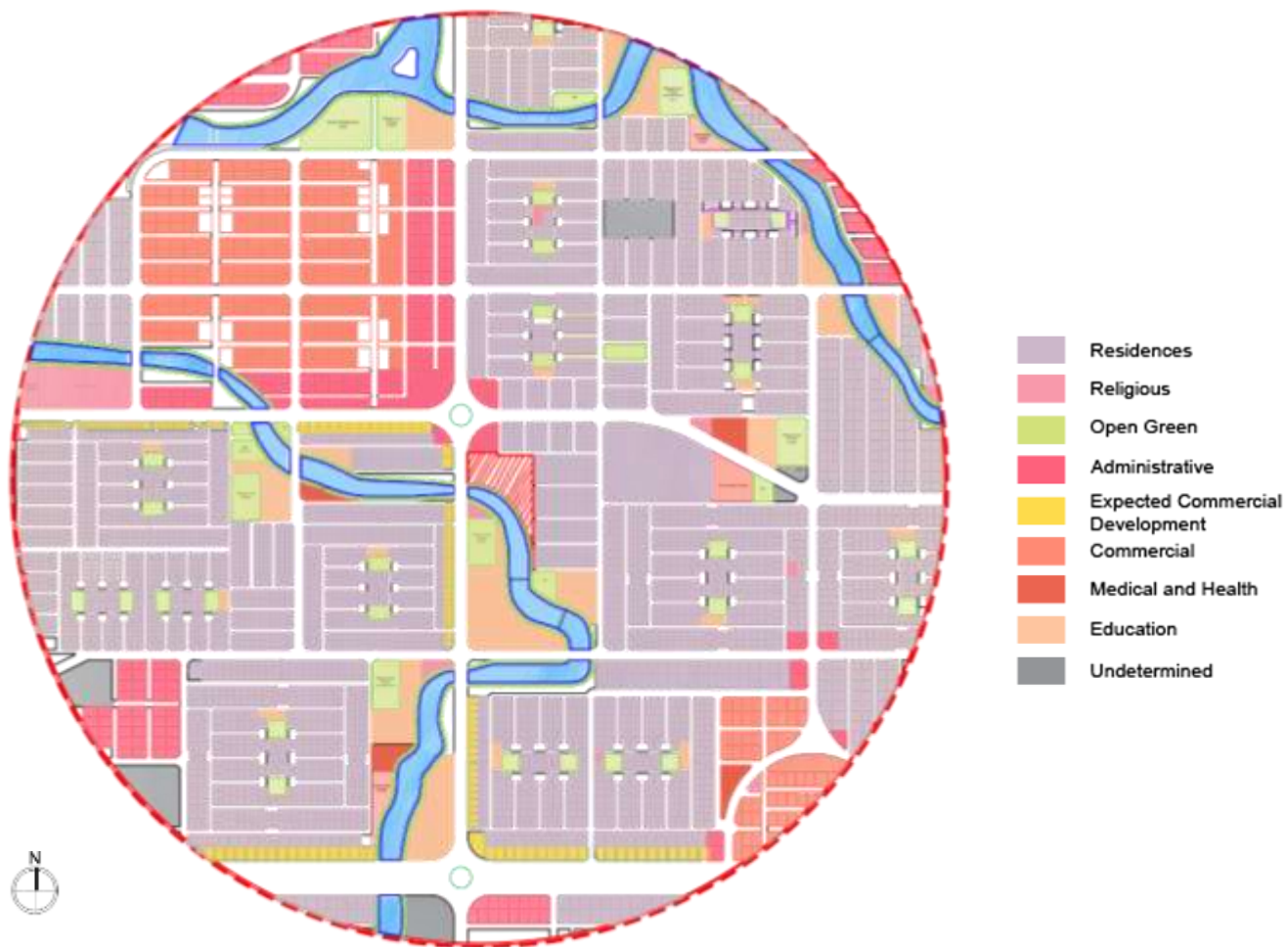


Fig.3.4.2 Land-use Development Prediction



Fig 3.4.3. Educational Facilities within a 1km radius



Fig 3.4.4. Green and Open spaces within a 1km radius

3.5 Height of Surrounding Structures:

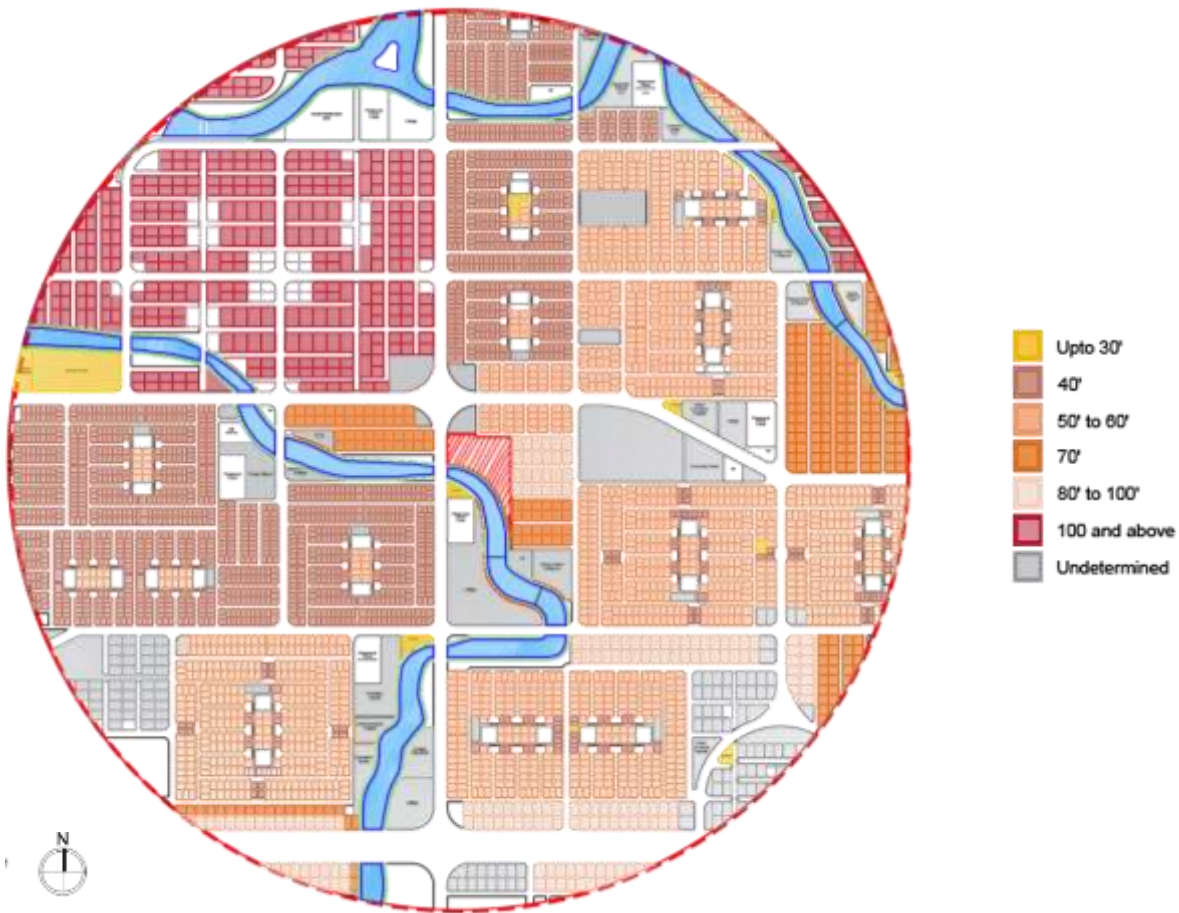


Fig. 3.5.1. Height Map

The site is connected to its surroundings by a primary road to its west and a narrow tertiary road to the north-east. Apart from these two vehicular roads, it is connected to the neighborhood by pedestrian paths, which make pedestrian access safe and easy. The site is bordered by 60' to 100' residences, which provide some shade, shield from noise and provide a bit of privacy. The south of the site has access to the water channel and a bordering pedestrian promenade.

3.6 Accessibility and Connectivity:

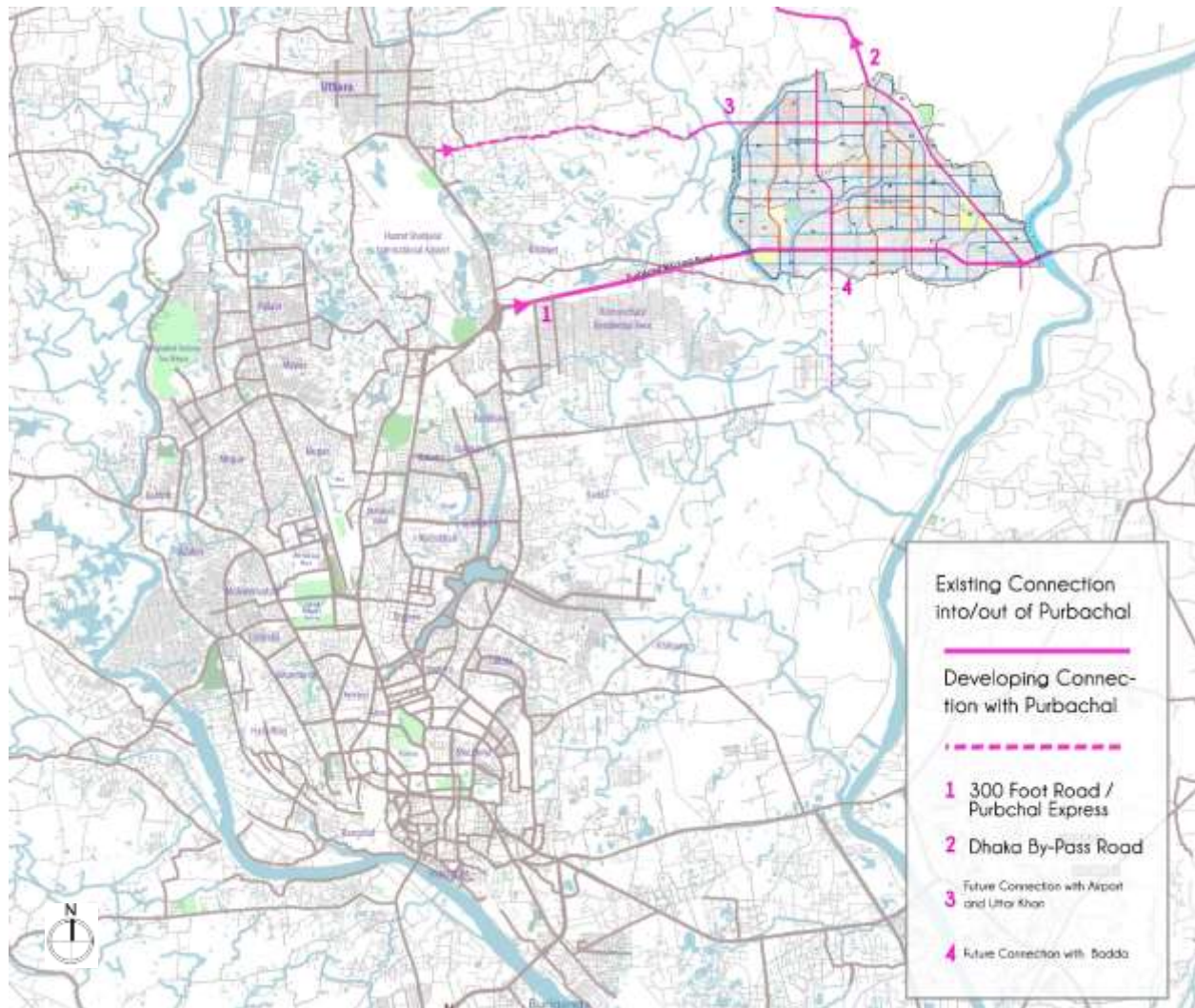


Fig. 3.6.1. Accessibility map of Purbachal

At present, there exists no major infrastructure in Purbachal except for 300 feet road/Purbachal Express and the recently developed Dhaka By-pass road.. The Kanchon Bridge on the Lakhya and the bridge over the Balu are in development.

While the Dhaka bypass road will connect Purbachal with regions outside the main city, more road infrastructure and connections are planned for to connect purbachal with Dhaka city. From the western edge of Purbachal, there is to be a connection established with Hazarat Shahjalal Airport and Uttara. Areas like Bashundhara, khilket, Gulshan, cantonment, banani etc. will be able to reach Purbachal by way of the 300 Feet road. Future plans for a connection with Badda is also in the works and will open up connections with regions more towards the south of Dhaka.

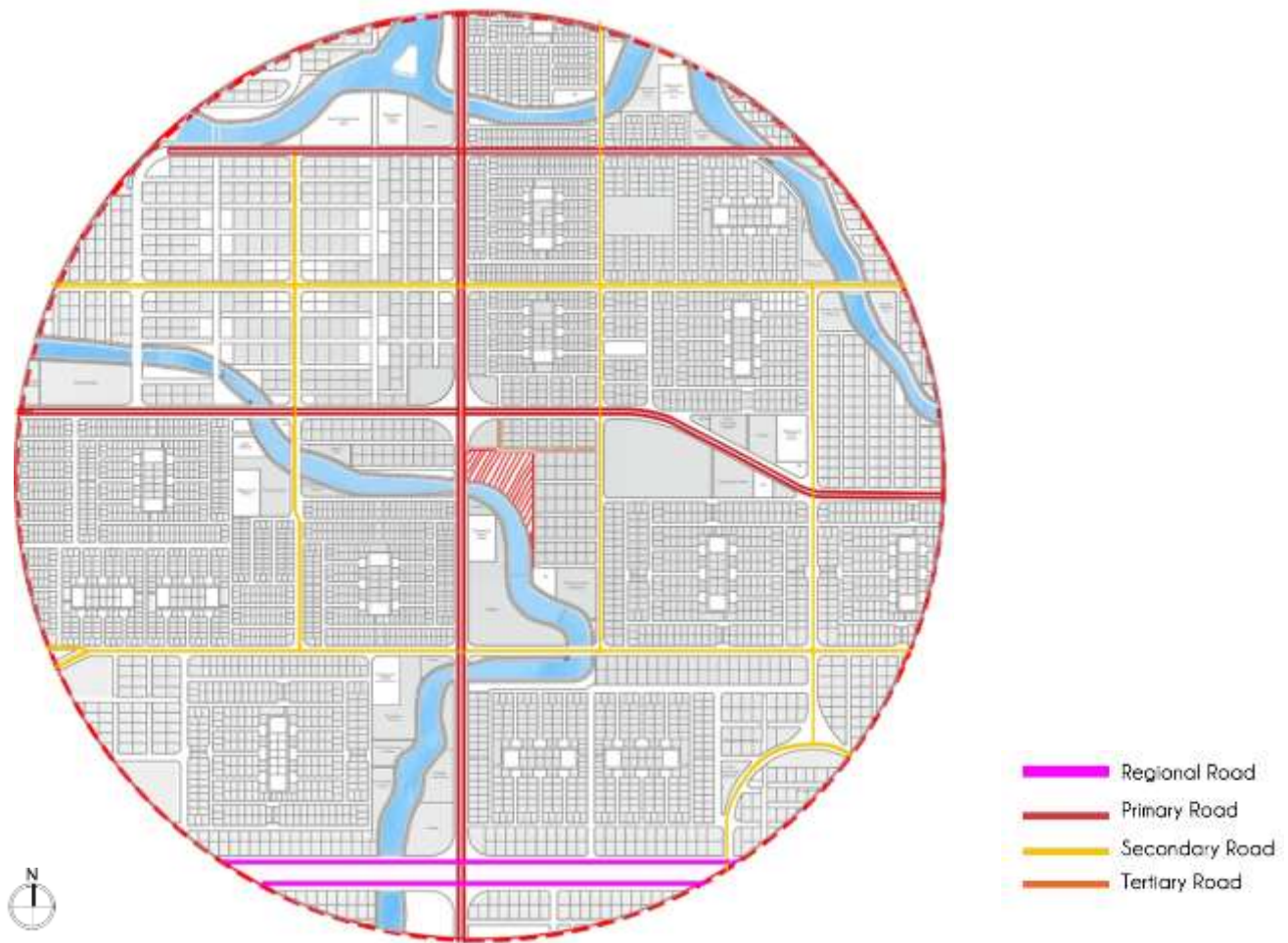


Fig. 3.6.2 Accessibility Map of Site

Running adjacent to the site is a primary road which branches of the main regional Purbachal Express highway. The site is a mere 10 minute drive from 300 feet road and there is expected to face traffic and a good deal of vehicular passage. Furthermore, the site sits very close to the intersection of primary roads, which also occurs at the foot of Purbachal's CBD.

Considering that the block the site is located on also houses two other educational institutions, there is likely to be traffic immerging from those function. On the east of the site, four tertiary roads end in at a pedestrian path in cul-de-sac like fashion. These dead end roads originate from a secondary road.

The major congestion points will be the junctions where two primary roads meet and the primary and secondary road intersection. Pedestrian access is available along the major roads but safe pedestrian crossings need to be introduced due to the numbers of educational institutes, commercial facilities and social facilities in the area.

3.7 Geographical Characteristics of the Site:

Topography :

This part of Bangladesh is dominated by the rivers Ganges, the Jamuna and the Meghna, which drain large quantities of water from the Himalayan Mountains into the Bay of Bengal, through a complex delta system. Known as a composite of the Brahmaputra-Jamuna Floodplain and the Madhupur Sal Tract, this region is composed of flat and low-lying land, which floods extensively in the rainy season and red textured highlands. Much of Bangladesh lies on the Gangetic-Bengal Plain, and is flat and low lying particularly around the delta, which floods extensively in the rainy season. North of Dhaka the land gradually begins to rise, towards the foothills of the Himalayas in the north.

The site happens to be upon the more elevated areas. The soils are well drained, coarse and loamy. Before the development of the PNTP, the area of the site was used to cultivate one-crop a year. During the rest of the year, this area remained dry except narrow furrows which act as surface drains during rains. In the high lands and hilly areas, there are scattered homesteads and small villages. The ground levels varies from +11.8 to + 14.72m PWD, which happen to be above normal flood level.

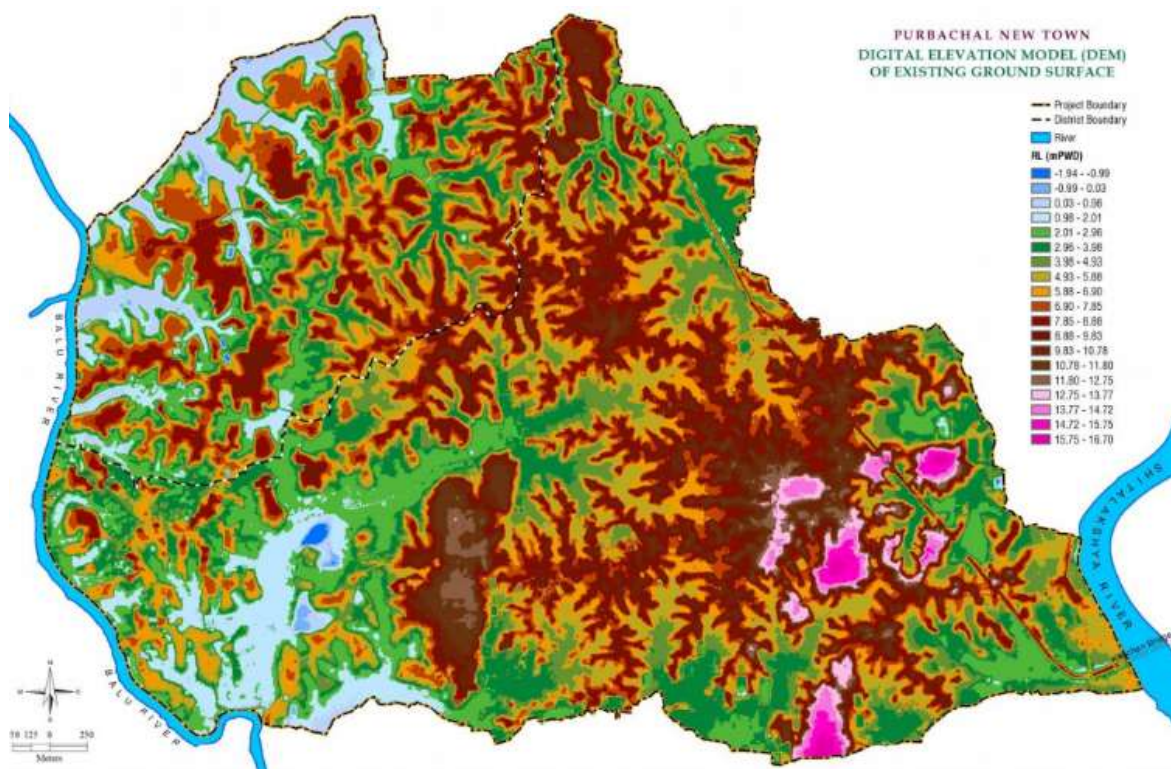


Fig 3.7.1 Digital Elevation Model (DEM) of Existing(Pre-Project) Topography of PNTP Area

renovation works as are being done in lake/canal design. Therefore, there is no fear of further

deterioration in the environment.

3.8 Climatic Consideration:

The climate in the project area is humid and sub-tropical, with a typical three season pattern- a prolonged summer, an erratic monsoon and a very short winter. During the winter season (November - February), cool winds blow from the north-east. The weather is cool and dry.

The average temperature in Dhaka is 25.9 °C. In a year, the average rainfall is 2022 mm. The driest month is January. There is 6 mm of precipitation in January. Temperatures start to rise in March and reach the annual maximum of around 39.9°C in April-May, when daytime temperatures can reach up to 40°C.

Most of the precipitation here falls in July, averaging 377 mm, when rainfall increases. This period is characterized by unstable weather. The monsoon begins in May-June as hot air rises over the Indian subcontinent, creating low pressure areas into which rush the cooler moisture-laden winds from the Indian Ocean and the Bay of Bengal. Around 70-80% of the annual rain falls during this time. The rain is often accompanied by strong winds, sometimes exceeding 100 km/h. Temperature and rainfall both decline post-monsoon, returning rapidly to the winter lows.

Wind data from the Bangladesh Meteorological Department Climate Division suggests that wind directions vary month-to-month in Dhaka, though predominantly in the NW, S, and NE directions. With more surface area (about 25%, the standard for planned cities) provisioned for thoroughfares, it is expected that Purbachal will be more windy and cooler than Dhaka proper happens to be.

Although weather patterns are broadly similar throughout the country, differences in topography, winds and other factors produce some quite marked local variations. Relative humidity, average dry bulb temperature, maximum and minimum temperatures and rainfall patterns are represented below.

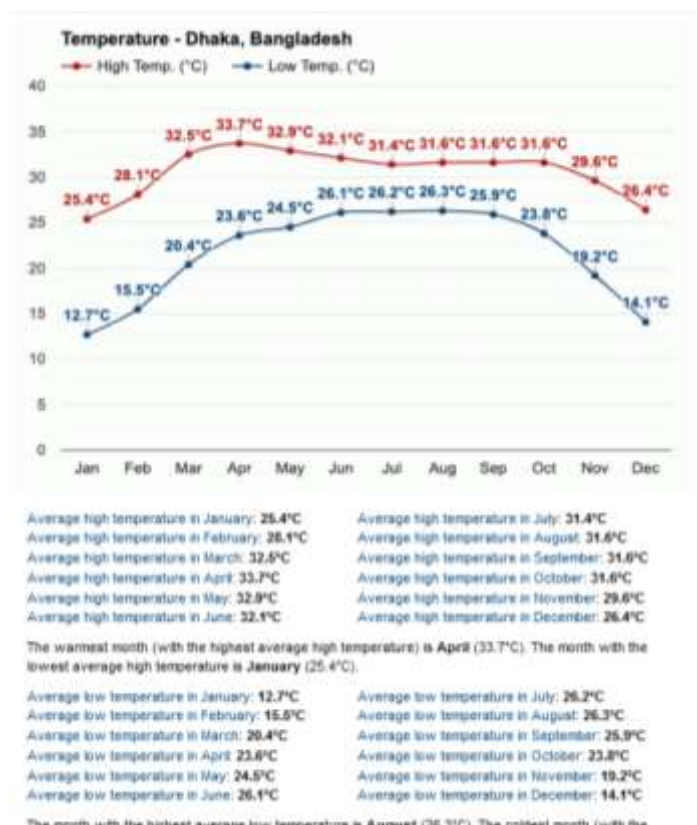


Fig.3.8.1. Yearly Temperature (source: Weather-atlas :Bangladesh)

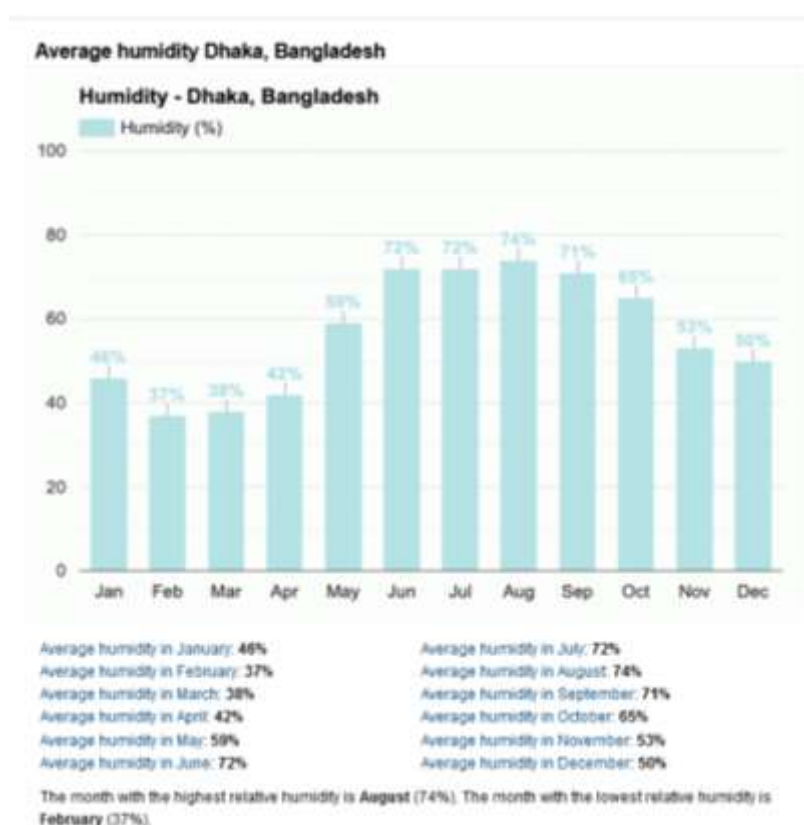


Fig.3.8.2. Dhaka Humidity Data (source: Weather-atlas :Bangladesh)

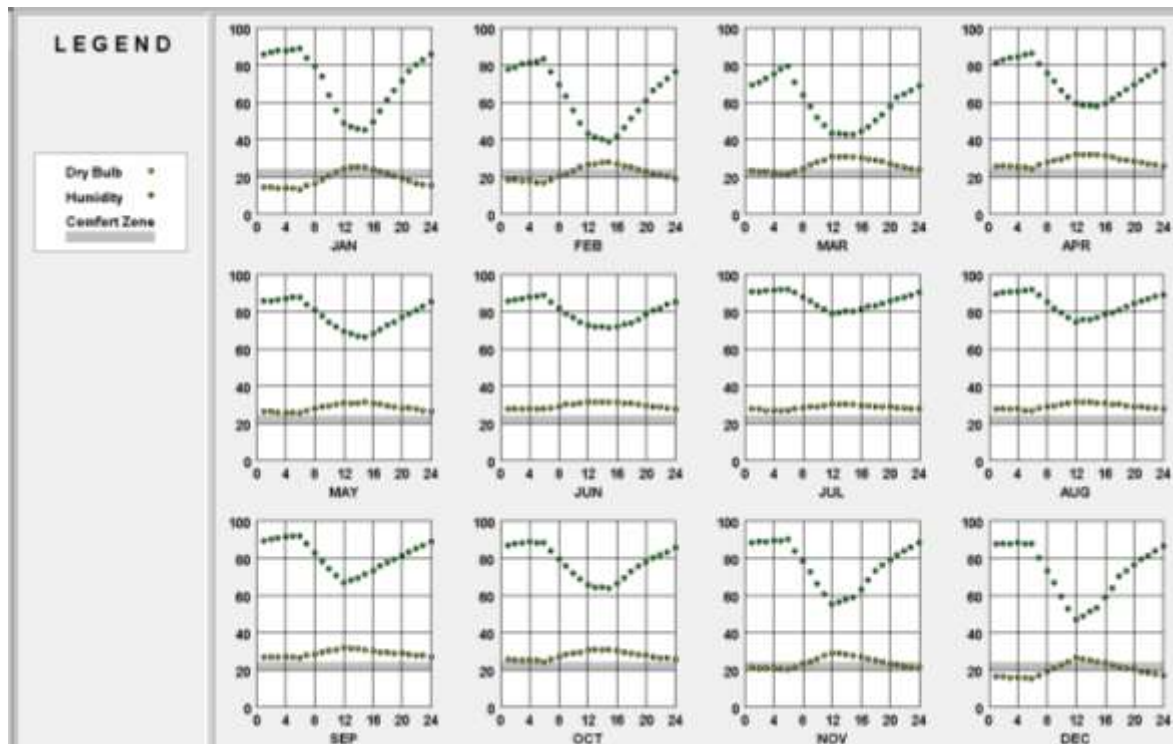


Fig 3.8.3. Dry-Bulb and Relative Humidity (Source: Climate Consultant)

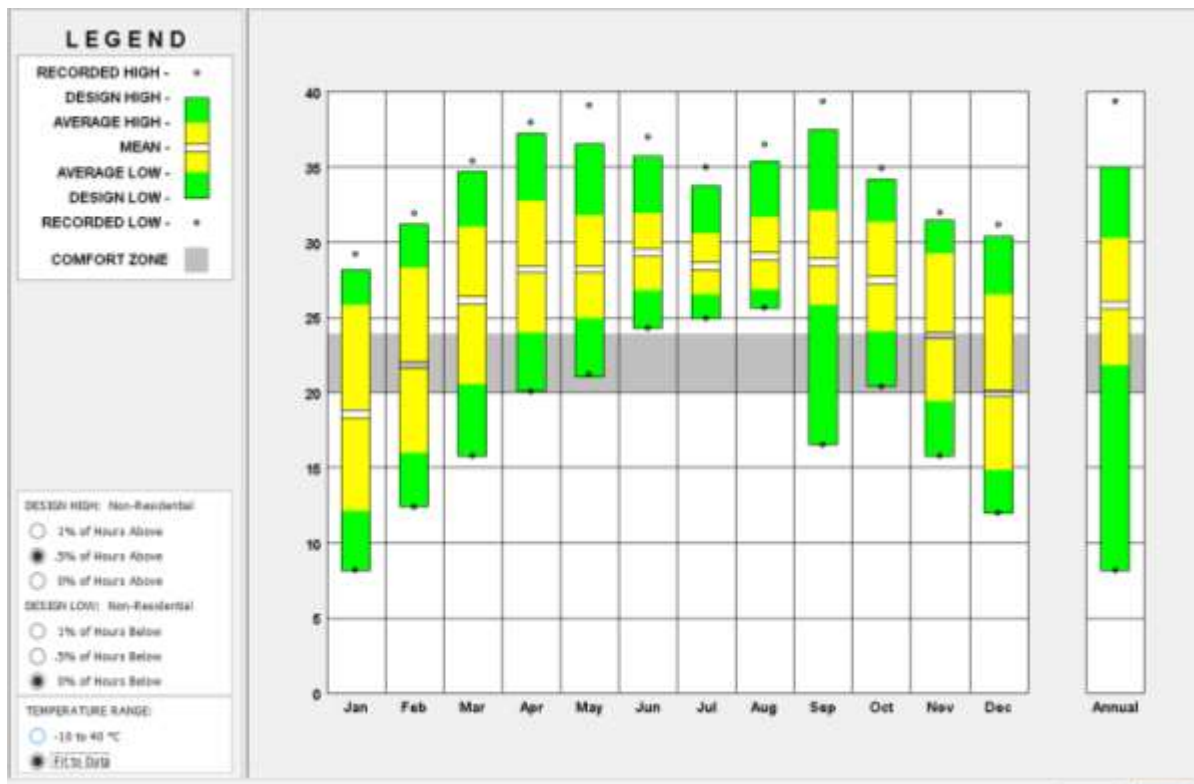


Fig 3.8.4. Temperature Range (Source: Climate Consultant)

Average daylight / Average sunshine Dhaka, Bangladesh

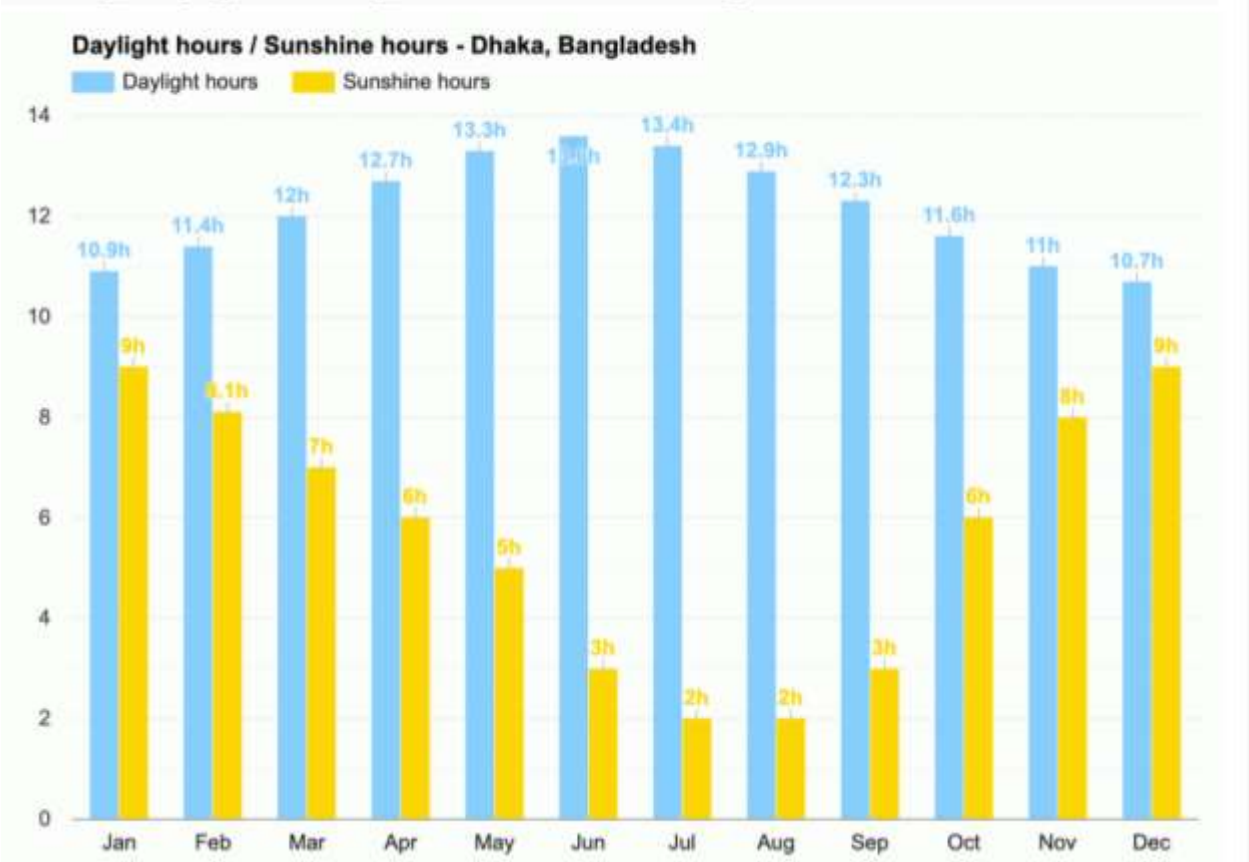


Fig 3.8.5. Daylight Hours (Source: Weather-Atlas)

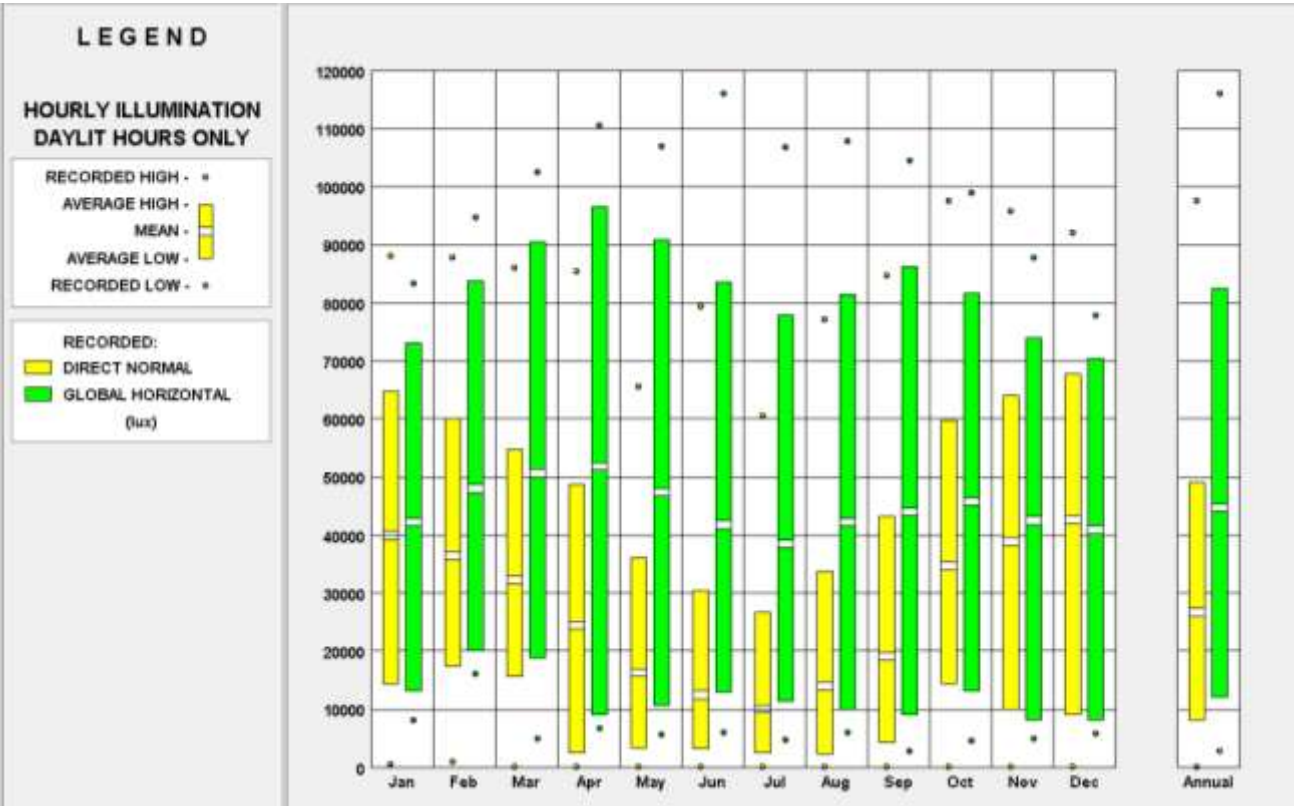


Fig.3.8.6. Illumination Range (Source: Climate Consultant)

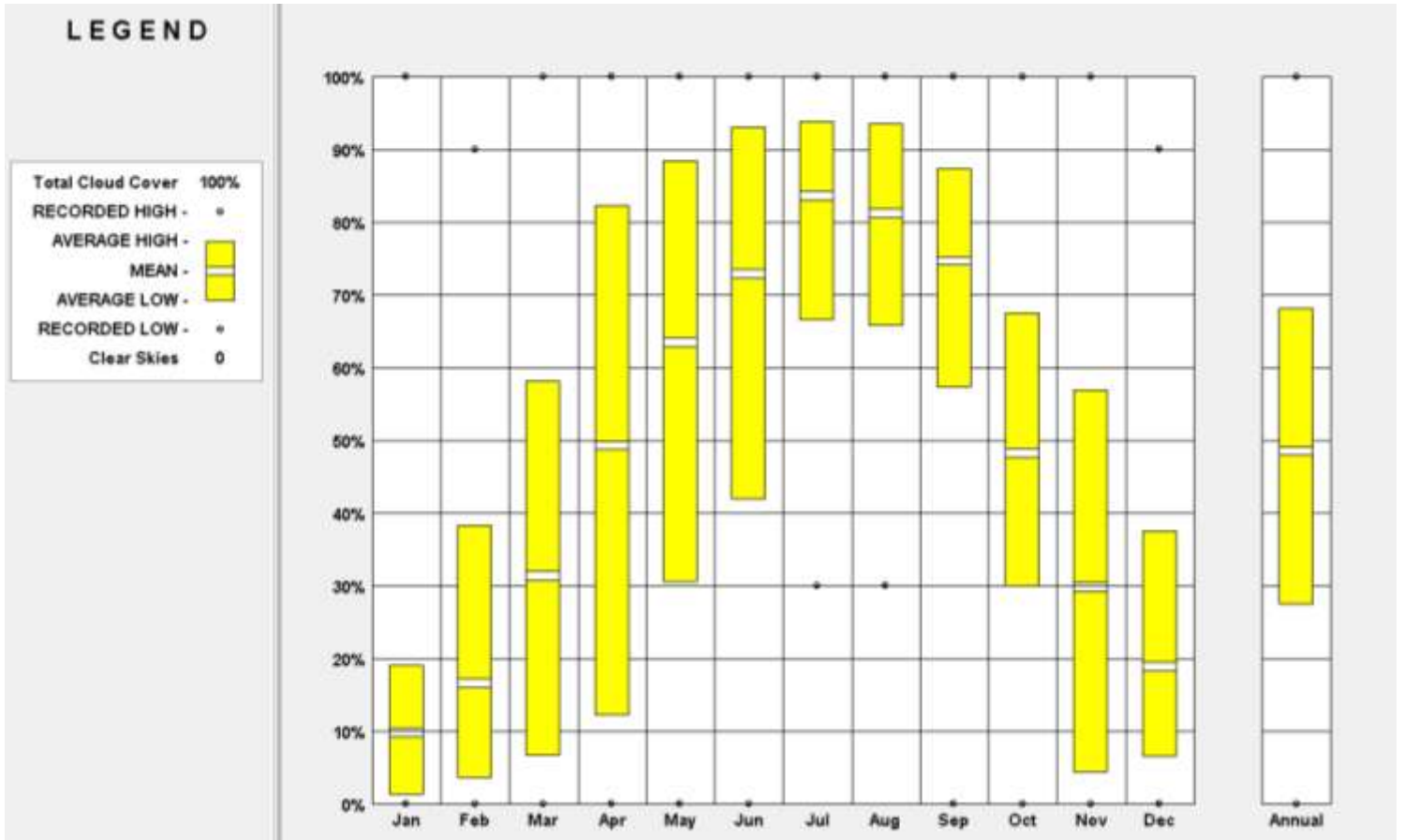


Fig. 3.8.7. Sky Cover Range (Source: Climate Consultant)

04: Program Development

4.1. Program Provided by the Client:

This project aims to provide an enabling and nurturing environment for the complete physical and mental growth of children with NDDs with a multidisciplinary and collaborative approach to address all the major developmental issues the child has. The program is designed to provide a safe and stimulating environment that will allow children with special needs to smoothly transition into mainstream society as people with valuable contributions.

The given program is as follows:

1. 15 storied Academic building
 - **Academic Unit** for 400 Students
 - Administrative Unit
 - **Training Unit** : vocational training, IT training, easy activities, laundry services, bakery, toy making, packaging , tailoring
 - **Mini-Clinic Unit** : Routine Check-up, emergency services, speech and language therapy, physiotherapy, occupational therapy, psychotherapy.
 - **External Services Unit** : problem identification, assessment, physical therapy, psychological therapy.
 - **Counselling Unit** : family counselling, counselling for child
2. 10 Storied Residential building for Staff and Employees
3. 6 storied hostel for 100 male students
4. 6 storied hostel for 100 female students
5. Auditorium (Seating 500)
6. Playing field
7. Swimming Pool

4.2. Program Analysis:

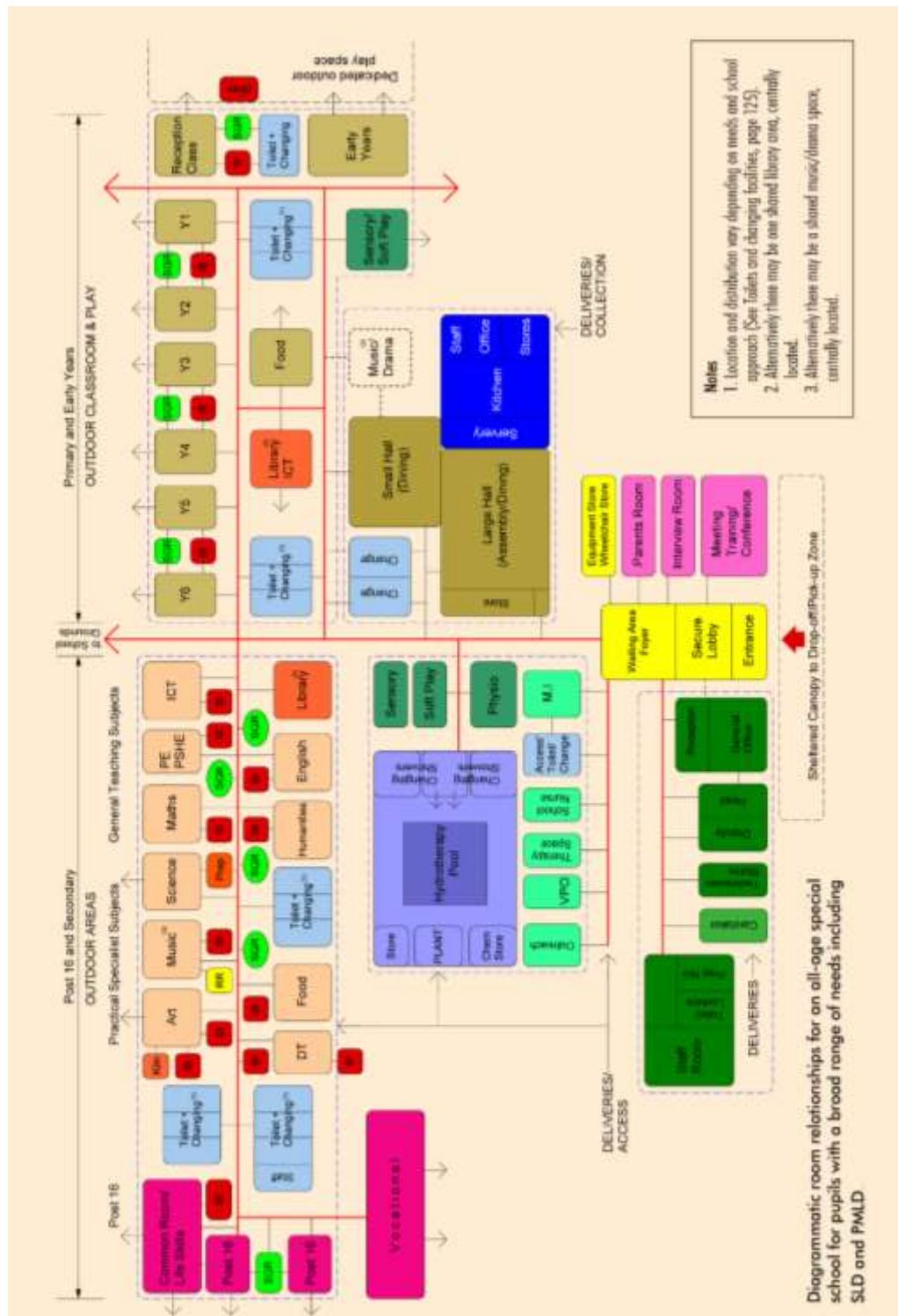


Fig. 4.2.1. Guidance for Zoning and Functional Allocation Framework (Source : Designing for children with special educational needs)

4.3 Tentative Functional Analysis of Program:

Functional Space			No. of Users	Area per Unit /sqft	No. of Units	Total Area / sqft
A	Administrative Facilities					
No.	Function	Activities				
1	Lobby + Waiting area			500	1	500
2	Accounts Office			150	1	150
3	Admissions			300	1	300
4	Office			200	3	600
5	Reception + Information Desk			400	1	400
6	School Director + P.A.+ Toilet + Waiting			500	1	700
7	Vice Principal's Office			300	1	300
8	Faculty Lounge + Workstation			1000	1	1000
9	Conference			700	1	700
10	General Staff Room			300	1	300
11	Toilets			1300	-	1300
12	Storage			500	-	500
13	Security			150	2	300
						6850

Functional Space			No. of Users	Area per Unit /sqft	No. of Units	Total Area / sqft
A	Assessment and Diagnostic Facilities					
No.	Function	Activities				
1	Clinic Director			300	1	300
2	Reception + Waiting			200	1	200
3	Diagnostic Room			120	3	360
4	Diagnostic Waiting Area			150	1	150
5	Audio Visual Booth			200	1	200
6	Observation Room			120	1	120
7	Doctors' Lounge			200	1	200
8	Clinical Support Space					
	- Laundry			100	1	100
	- Clean Utility			60	1	60
	- Soiled Holding Room			60	1	60
	- Equipment Storage			30	1	30
	- Service Storage			40	1	40
9	Nurses' Station			150	1	150
10	Toilets			50	6	300

11	Storage			100	2	200
12	Emergency Room			250	1	250
13	Emergency Doctor's Chamber			100	1	100
14	Toilet			40	1	40
15	Emergency Equipment Storage			80	1	80
16	Daycare			600	1	600
						3540

Functional Space			No. of Users	Area per Unit /sqft	No. of Units	Total Area / sqft
A	Therapy Facilities					
No.	Function	Activities				
1	Speech and Language Therapy + Adjacent observation room			200	-	200
2	Physiotherapy and Psychomotor Therapy			1100	1	1100
	Physiotherapy (single chamber)			100	2	200
3	Shared Storage			200	1	200
4	Occupational Therapy			800	-	800
5	Counselling Unit			120	3	360
6	Shared Offices	Preparation for therapy		1500	1	1500
7	Hydro Therapy			700	1	700
8	Natatorium/ Indoor Swimming Pool			2200	1	2200
9	Drama, Music and Movement Therapy Studio			600	1	600
10	Arts, Crafts and painting			500	1	500
11	Toilets + Shower Area			1000	-	1000
12	Changing Space + Lockers			500	-	500
13	Storage			100	4	400
14	Pump Room			200	1	200
						10460

Functional Space			No. of Users	Area per Unit /sqft	No. of Units	Total Area / sqft
A	Early Childhood Development Center (for 50 children)					
No.	Function	Activities				
1	Lobby + Waiting Area			200	1	200
2	Classroom			800	5	4000
3	Play Space			1200	1	1200

4	Library			1000	1	1000
5	Storage			100	-	100
6	Toilet			200	-	200
						6700

Functional Space			No. of Users	Area per Unit /sqft	No. of Units	Total Area / sqft
A	Special Education Facilities (for 300 children)					
No.	Function	Activities				
1	Class Base		20	1000	15	15000
2	Relative Equipment and preparation room			200	5	1000
3	Storage			200	-	200
4	Life Skills Room			800	1	800
5	Teacher's common Room			1000	1	1000
6	Teacher's training room			800	1	800
7	Exhibition Space			1500	1	1500
8	Toilets			1000	-	1000
						21300

Functional Space			No. of Users	Area per Unit /sqft	No. of Units	Total Area / sqft
A	Community Related Facilities					
No.	Function	Activities				
	Commercial					
1	Bakery Outlet			500	1	500
2	Tailoring Outlet			300	1	300
3	Toy Outlet			300	1	300
4	Orthopedic Equipment Store			300	1	300
	Community Participation					
5	Multi-Purpose Hall			6000	1	6000
						7400

Functional Space			No. of Users	Area per Unit /sqft	No. of Units	Total Area / sqft
A	Vocational Training Facilities					
No.	Function	Activities				
1	Lobby			200	1	200
2	Workshop			500	4	2000
3	IT Training			300	1	300
4	Tailoring / Sewing Training			500	1	500

5	Packaging			500	1	500
6	Cooking			500	1	500
7	Toy Making			500	1	500
8	Gardening			800	1	800
						5300

Functional Space			No. of Users	Area per Unit /sqft	No. of Units	Total Area / sqft
A	Food and Recreational Facilities					
No.	Function	Activities				
1	Cafeteria			2000	1	2000
2	Kitchen			1100	1	1100
3	Pantry			300	1	300
4	Indoor Games			1000	1	1000
						4400

Functional Space			No. of Users	Area per Unit /sqft	No. of Units	Total Area / sqft
A	Temporary Accommodation (for 50 people)					
No.	Function	Activities				
1	Lobby and Reception			200	1	200
2	Rooms			13000	-	13000
3	Toilets			2000	-	2000
4	Recreation Space			1000	1	1000
5	Lounge			300	1	300
6	Dining Space			750	1	750
7	Communal Kitchen			225	1	225
						17475

Functional Space			No. of Users	Area per Unit /sqft	No. of Units	Total Area / sqft
A	Outdoor Sensory Facilities					
No.	Function	Activities				
1	Sensory Garden			5000		
2	Bird Sanctuary			3000		
3	Outdoor Class spaces			3000		
						11000

Area – 3.3 acres or 154947 sqft

Total Built Area = 94425 sqft

Circulation = 28740 sqft
(30% of built area)

In total = 124775 sqft

05: Case Study

5.1. International Case Studies

5.1.1. Bay Tree Community Special School

Owner: North Somerset Council

Architect: David Morley Architects

User Group: Young people with Severe Learning Disabilities (SDL) and Profound and multiple learning disabilities (PMLD)

Age Range: 3-19

Student Capacity: 67

No. of Stores: 2

Location: Highlands Ln, Weston-super-Mare BS24 7DX, United Kingdom



Fig. 5.1.1.1 Location of Bay Tree Community Special School (Source Google Maps)

Site Location:

Bay Tree is located on a quiet edge of a residential area, surrounded by empty land on south and west, a pharmacy and super market towards the north east and residences towards the north. The location meets the school's need for privacy, calm and retreat while also having exposure to moderate populous.

Site Plan :

The external space is designed to allow easy access by the children as well as the community. The building has two main entrances – one for the community facilities and one for school use. The roof over-sails a long entrance wall to give a sheltered drop-off for the eight specially equipped mini-buses

Baytree Community Special School - Ground and first floor plans



Key – first floor

1. Primary school class base (KS2)
2. Store
3. Toilets
4. Special school class base
5. Calming room
6. Hygiene
7. Life skills
8. ICT room
9. Art and design
10. Office/admin
11. Staff room
12. Meeting room
13. Adult education
14. Community rooms
15. Plant
16. Void



Key – ground floor

1. Primary school class base (foundation stage)
2. Primary school class base (KS1)
3. Store
4. Medical room
5. Toilets
6. Shower and changing
7. Music
8. Special school class base
9. Calming room
10. Hygiene and changing
11. SEN resource base (PMLD)
12. Multi-purpose room
13. Language and special needs
14. Food technology
15. Speech therapy
16. Schools' reception
17. Soft play
18. Hydrotherapy pool
19. Kitchen
20. Servery
21. Dining
22. Hall
23. Meeting
24. Police office
25. Interview
26. Library and resource centre
27. Library and community reception

Key colours

- Community facilities
- Shared school and community
- Shared support
- Primary school
- Special school



Fig. 5.1.1.2 Floor Plans of Bay Tree Community Special School

that bring the special school's students. Outside there are multi-use games areas, a skate park, bike track, nature garden, adventure area and playing fields.

Context:

Bay Tree was built as an integrated part of The Campus, incorporating Herons Moor Primary School and community facilities including a library, Council one-stop-shop and adult education rooms

Environment:

The design is focused on natural light and ventilation, making the environment conducive to learning. The two-storey high roof envelope is engineered to allow north light and fresh air to penetrate the spaces below, with reflective shafts allowing light penetration to the back of the lower level classrooms. All classroom windows face south, with projecting canopies and louvres that help control summer sun and allow some free heat from the low winter sun.

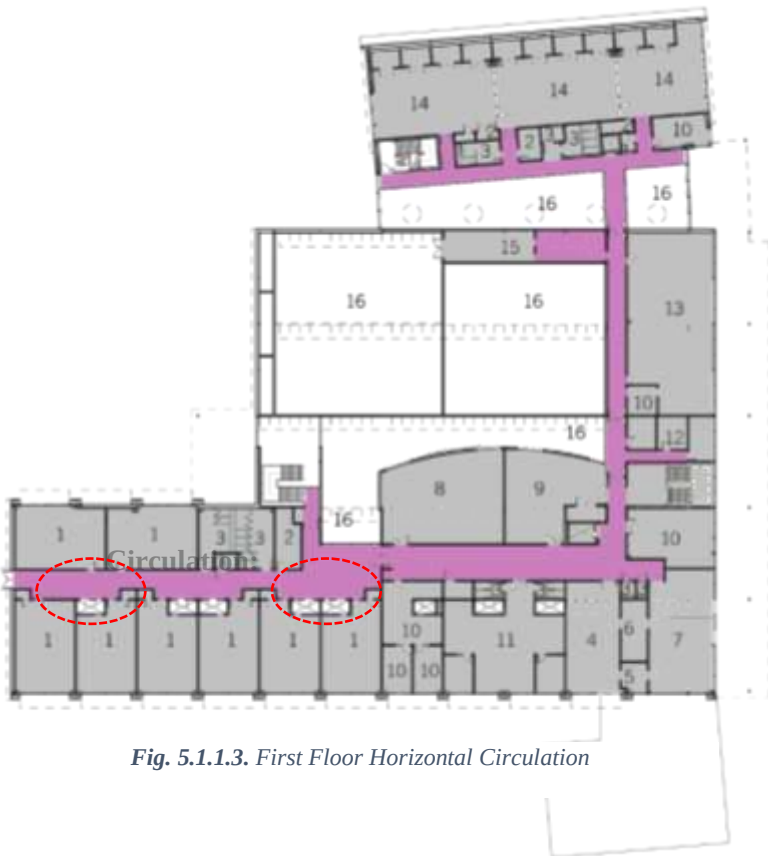


Fig. 5.1.1.3. First Floor Horizontal Circulation

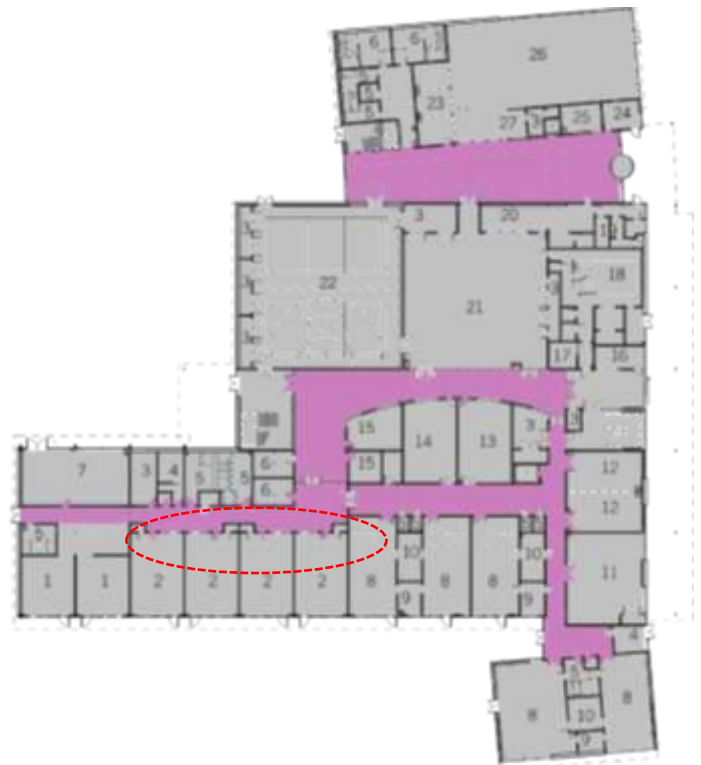


Fig. 5.1.1.4. Ground Floor Horizontal Circulation

Horizontal circulation:

Horizontal circulation is fluid and has little niches that create space and opportunity for socialization if a student may wish to do so. Niches also provide nearby spaces to withdraw from active movement and take respite in a low stimulus niche.

a child with special needs may also take this space as an indication of transition of spaces/ functions. And may prepare and compose themselves accordingly.

Vertical circulation:

Means of vertical circulation are mostly through stairs and one elevator. While the elevator is located at a distance from the class bases, stairs are located at equidistant points from each major cluster (i.e. Special school, primary school, shared support and community functions.)



Fig. 5.1.1.5. Ground Floor Vertical Circulation



Fig. 5.1.1.6. First Floor Vertical Circulation

Zoning:

Zoning progresses from public functions (on the main street side/ public side/ busy side) to semi-private then private functions towards the rear end of the property with higher privacy , safety and quiet.

The community function and administrative functions are located towards the face of the institution and allow all public activity to be completed in that designated area ensuring privacy and safety of students in the private inner chambers.

Upon entry into the premises, there is a large circulation area which can be multi-functional and used for activities or gatherings if needed.

After crossing the threshold of the community functions, one steps into the therapy area. All therapy functions are well within reach of the special need classes and may be accessed with ease or without having to travel large distances. This therapy cluster also acts as a buffer for both noise and foot traffic. This buffer does a great job at separating the low stimulus zone from the high stimulus zone.

This project has a few layers or membranes, which need to be crossed in order to access an different function. The transition is seamless, yet the change in atmosphere and function of space become very apparent, which is a key aspect when designing for children with autism and intellectual disabilities.

All classrooms have direct accesses to outdoor playing areas. As classrooms line the south façade of the institute, they all have direct access, outside, to the playing area, straight from their classes.

In the SEN cluster, any functions that could require frequent use, are all located very close to the class bases.

Toilets are also either adjoined to the classrooms, or very close to the classroom. This provides the child with a sense of independence as they may independently go the toilet by themselves without needing a teacher to assist or guide them to it. If the need arises, the teacher may rush to the student from the class quite quickly.

Any functions, such as speech therapy, that may require frequent use. Are located close to the SEN class bases.



The school has a capacity of 51 car parkings, 4 van or larger vehicle parking and 7 handicap parking.

North Somerset Council had a vision that ‘a school should be a community building that just happens to be used for education’. This inspired both the brief and the building design. The Campus facilities are designed to maximize shared use by the school children and the wider community. Shared areas form the link between the special school and the primary school and between the schools and the community facilities in a way that allows the school and community facilities to expand and contract according to the time of day/week. The building is conceived as three related wings of accommodation. A top-lit open plan dining hall lies at the heart of the building and can be shared by both the schools and the community, with careful timetabling to ensure the schools have priority. This flexible space has moveable walls so that it can be used not just for dining and assembly but also as a foyer to the main hall for large gatherings or after-school events. The halls and the hydrotherapy pool are positioned for easy access for others visiting the school. The different areas of the school are zoned in a way that retains security and privacy for school pupils. The special school facilities also include a soft play room and sound and light therapy areas. Each pair of special school class bases shares a small group room and a hygiene room.

Fig. 5.1.1.7. Special Education Unit

5.1.2. Hollywater School

Owner: Hampshire County Council

Architect: P, B & R Design Services

User Group: Community Special School for pupils with complex learning disabilities

Area: 3000 m²

Location: Mill Chase Rd, Bordon GU35 0HA, United Kingdom



Fig. 5.1.2.1 Location of Hollywater School (Source Google Maps)

Site Location:

HollyWater School is located in a quiet residential area, surrounded by empty land or farm land on south and East, a playing field to the west and residences towards the north. The school is situated in a quiet residential area with little exposure to general public unless actively looking for such exposure. There is a recreation ground located to the west of the school. That recreation ground may serve as an appropriate interface for interaction with children from the other schools in the area.

Site Plan:

The buildings were positioned to make the greatest use of the site, and form a close relationship with the landscape. The general teaching classrooms at the southern edge have views over farmland, shaded by mature oak trees. The mature boundary landscaping and the new building enclose an external play area divided into hard surfaced and grassed play areas, with a fully accessible adventure playground and sensory gardens.

Environment:

In the development of this project, a sustainable approach was adopted to maximize natural lighting and ventilation, energy efficiency and links to an attractive landscape. High insulation levels and an airtight building, coupled with surfaces that radiate warmth, help to enhance the quality of life for children who are less active.

The walls and floors of the building are traditional heavy-weight construction, using blocks containing recycled aggregate to provide a high thermal mass for temperature consistency. All classroom roofs are insulated using recycled newspaper, light fittings are low energy, and acoustic measures further enhance the learning environment.

Teaching spaces have:

- balanced and controllable natural light and ventilation
- thermal comfort and good acoustics
- low energy and low glare light fittings (to reduce direct glare to sensitive eyes)

Zoning:

The building is divided into two main blocks, linked by the learning resource area. The main entrance block contains the community accessible part of the school, with a hydrotherapy pool and main hall and therapy rooms, including soft play and multi-sensory rooms. The other block houses the teaching spaces, where modules of four classrooms are grouped around a top-lit space, supported by shared small rooms and toilet and changing facilities. The design gives a sense of progression from early years and primary at one end through secondary to a significantly different and separate post-16 base at the other. There are dedicated support bases for children with PMLD (Pervasive and Multiple Learning Disabilities) in both primary and secondary. Colors, carefully chosen to create a calming atmosphere, are used to distinguish different facilities and age groups: warmer, softer colors for reception and infant age children, cooler and more restrained colors for secondary and post 16.

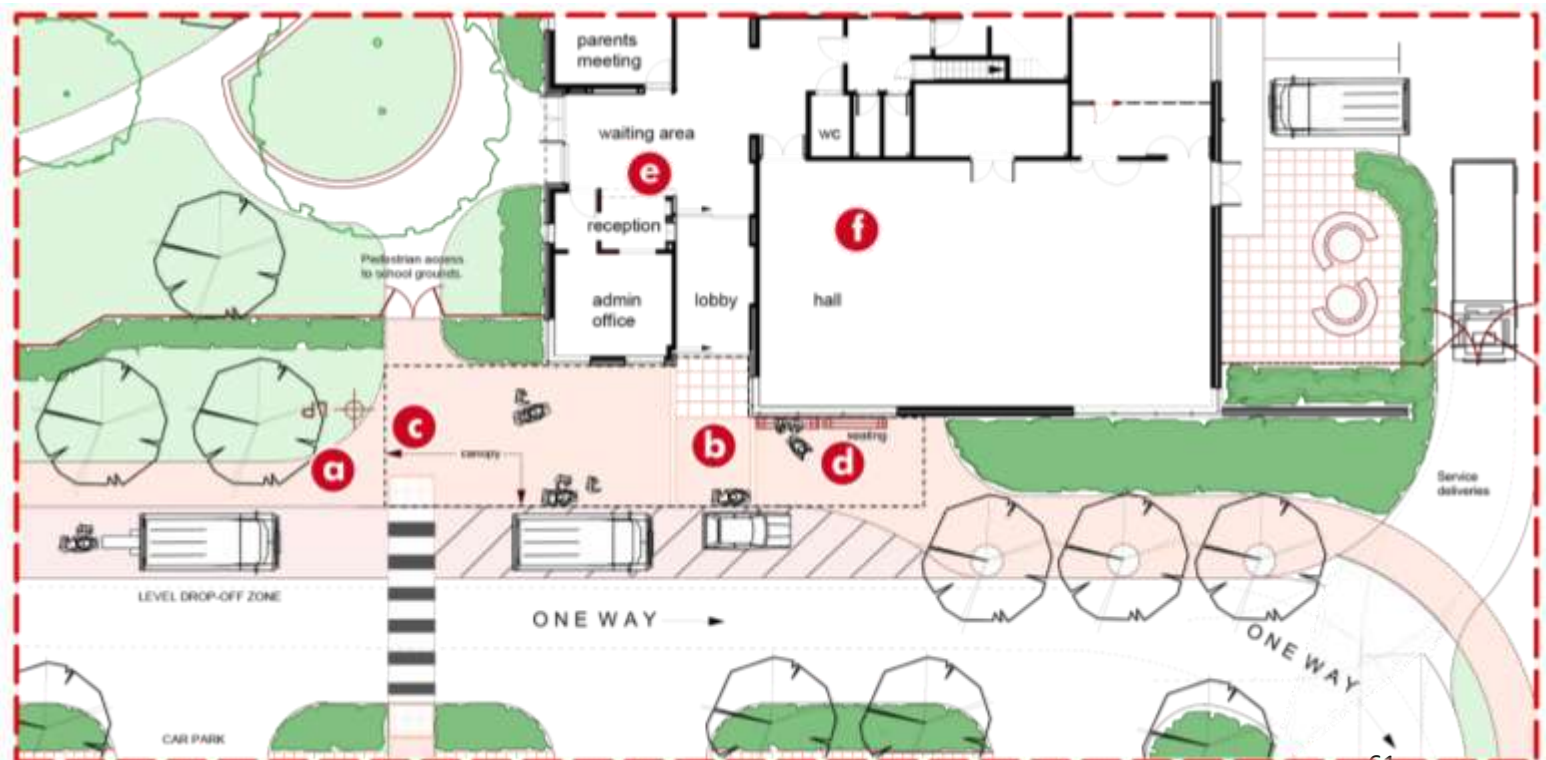


Fig. 5.1.2.2 Hollywater School Drop-off



Fig. 5.1.2.3 Hollywater School Drop-off



Fig. 5.1.2.4. Hollywater School Drop-off and Reception

Access and Circulation:

There is a long drop-off zone for buses and taxis, with a canopy sheltering the entrance. Automatic sliding doors lead via a lobby to a welcoming reception which overlooks the approach. Circulation spaces are well proportioned and routes simple: the building forms a 'T' shape and there are no interrupting fire doors. (The fire safety strategy includes the use of sprinklers, fire shutters and strategically sited fire doors held open on electromagnetic catches).

Circulation:**Horizontal circulation:**

Horizontal circulation is fluid and clear to navigate. The horizontal circulation is direct, with no unnecessary meandering that may confuse a user.

Vertical circulation:

The only means of vertical circulation in this facility exists in the main entrance block and that too are only stairs. The only means of vertical circulation are a single set of stairs, no elevators or mechanical means of vertical circulation. The vertical circulation at Hollywater is therefore not satisfactory.



Fig. 5.1.2.6 Hollywater School

Hollywater School - Floor plan



Key:

- 1 Main entrance lobby
- 2 Reception/admin
- 3 Waiting
- 4 Family/therapists
- 5 Medical
- 6 Store
- 7 Therapists
- 8 A/V room
- 9 Head
- 10 Music
- 11 Music store
- 12 Soft play
- 13 Pool changing
- 14 Hydrotherapy pool
- 15 Caretaker
- 16 Pool chemical store
- 17 Pool plant
- 18 Pool store/changing
- 19 Shower

- 20 Staff changing
- 21 Cleaner
- 22 Kitchen
- 23 Food store
- 24 Kitchen toilet
- 25 Servery/store
- 26 Hall store
- 27 Toilet
- 28 Accessible toilet
- 29 Hall/dining
- 30 Library
- 31 Small group room
- 32 Art store
- 33 Store
- 34 Art
- 35 Calm room
- 36 Services/plant
- 37 Primary PMLD base
- 38 Hygiene

- 39 Kitchenette
- 40 Reception class
- 41 Quiet room
- 42 Class base (primary)
- 43 Staff room
- 44 ICT resource
- 45 General teaching (secondary)
- 46 Leavers' base
- 47 Life skills
- 48 Bathroom
- 49 External store
- 50 Laundry
- 51 Design and technology
- 52 Secondary PMLD base
- 53 Science
- 54 Food technology
- 55 IT server

Colour key:

- Primary
- Secondary
- Specialist teaching/resource
- Admin/staff
- Toilets/changing
- Storage/prep
- Ancillary/plant/cdnr/kitchen
- Dining/hall
- Medical/therapy/other support

Fig. 5.1.2.7 Hollywater School Plan

5.2. National Case Studies

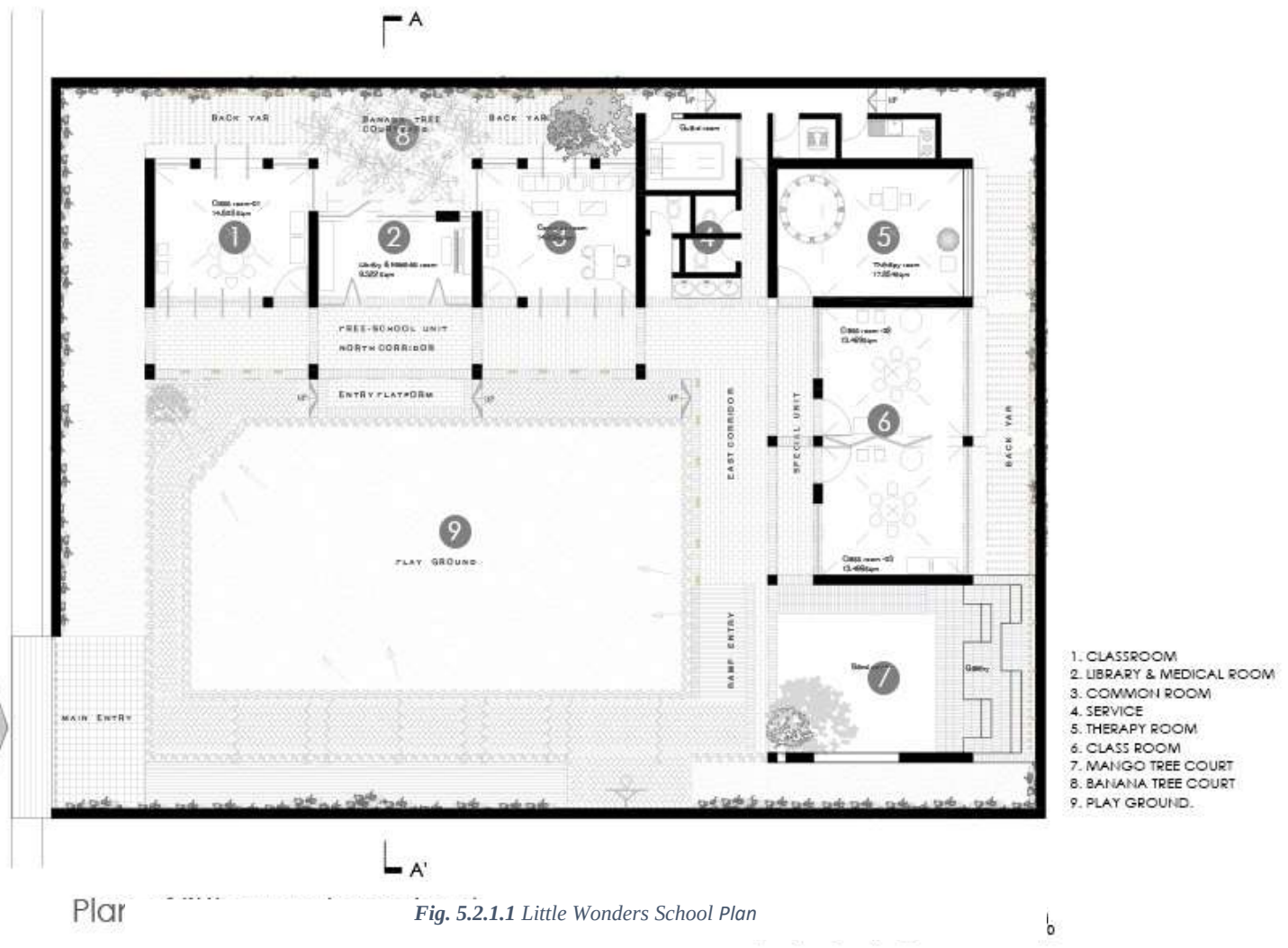
5.2.1. Little Wonder School

Owner: Little Wonder School

Location: Sector-04, Uttara, Dhaka, Bangladesh

Site Area: 5872 sft

Structure and Scale: Composite structure of exposed brick, bamboo and tin sheets.



Site Location and Plan:

The site for Little Wonders School is located inside a residential area in Uttara, sector-04. It is a corner plot, with the north and west edges of the site having access to tertiary roads, while the south and east are bordered by 9 storied residential buildings.

Context:

This project aimed to provide enough space for children (with ASD) with classrooms and playground in the presence of nature while also fostering the sense of safety for all of their parents and nursing staff.

The design was developed to bring in all the aspects of the site like existing structures and trees under consideration.

The aim with this project was to create a sense of belonging among residents and to inspire a process of continuing work in its environment. The project, due to its contextual and local specificities, was developed through a participatory process with the community.



Fig. 5.2.1.2 Little Wonders School Playground

Zoning:

The zoning of this school's program, took into account – climate, surrounding structures, trees, existing structures and trees on site and the need for an open field for play.

The approach to this project was like a pavilion. Classrooms arranged such that the interior spaces may be utilized as an open field. Removable doors were used on both sides of the room instead of walls. That way, they are easily operable and connect with the outer spaces as well. In terms of light and ventilation, the classrooms become self-sufficient.

The built area of the school is an "L" shape that prominently cups the playground, a key aspect of this project. The south west quarter of the site is used for entrance walkway, and the remainder part is for classrooms and playground. Placing classrooms, teacher's common room, library, therapy room, services and security in north-west and east corner, with simplicity, achieves the security and contextual demands of the site.

Environment:

The classrooms require ample light. So, the roof was designed to bring the natural diffused light into the classroom. No bare wall was constructed, so not to interfere with wind flow channels. Folding doors, designed for this very purpose, allow air to pass naturally. In addition to that the openness gives the impression of a bigger classroom. The most important consideration, according to the architects, was the incorporation of the sustainable aspect of Reuse, Reduce and Recycle.



Fig. 5.2.1.3. Use of Material and Diffused light

Noting the next-door plot, a 9 storied apartment building to the north of the site, the roof was designed considering the building as a backdrop. Therefore, the roof was designed pitched rather than flat so that the diffused sunlight which is reflecting from the adjacent building could easily enter the classrooms.



Fig. 5.2.1.4. Sand Pit

Construction/Material:

When it came to the choice of material, each and every material's embodied energy is low and locally found, and therefore economical. The structure was considered for economic sustainability. Planting creepers along the outer edge of boundary wall to give a sense of privacy, keeping existing trees, and north and east corridor along the circle between them. Covering the semi outdoor circulation with the sloped roof outside, to provide overall comfort to the children.

The walls were designed with exposed brick, doors of wood, circulation floor with exposed brick and the classroom with colored NCF. Ceiling construction is completely made of bamboo with G.I sheet coverings. The windows were done with glass and metal.

The school walls and openings were built with combination of metal, wood and bricks to achieve thermal balance inside its five classrooms. For thorough energy saving, diffused sunlight and the courtyards were introduced to improve ventilation. The rooftop acts as heat insulating component .

The materials selection had two main criteria: proximity and those following bioclimatic building principles and upgrade of traditional techniques. 100% of the materials used were local and can all be found in the city.



Fig. 5.2.1.1 Use of Materials

References

Andrei Pomana (2015) Architecture For Autism. Improving Designs For Autistic Integration

https://www.researchgate.net/profile/Andrei_Pomana/publication/308320281_Architecture_for_Autism_Improving_Designs_for_Autistic_Integration/links/57e0a30c08ae3f2d793eb5cc.pdf

Arathy Gopal1 and Jayaprakash Raghavan (2018, January) Design interventions for Sensory comfort of Autistic children

<https://www.longdom.org/open-access/design-for-sensory-comfort-of-autistic-children-2165-7890-1000227.pdf>

Bangladesh Bureau of Statistics, B.C. (2011), Population and Housing Census. Dhaka,

Bangladesh Bureau of Statistics

Bangladesh Bureau of Statistics, B.H. (2010) Household Income and Expenditure Survey

(HIES) Bangladesh Bureau of Statistics

Bangladesh Bureau of Statistics, S.I.D. (2015, November), Population Monograph:

Volume-5, Disability in Bangladesh: Prevalence and Pattern. Bangladesh Bureau of Statistics. <https://cutt.ly/FjtHSb8>

Department for Children, Schools and Families (2008) Building Bulletin 102 Designing for disabled children and children with special educational needs

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/276698/Building_Bulletin_102_designing_for_disabled_children_and_children_with_SEN.pdf

Hadeer Abd-El-Razak, Barakat Ali Bakr, Zeyad El-Sayad (2018, March) Nature as a healer for autistic children

<https://doi.org/10.1016/j.aej.2018.10.014>

Mostafa, M. (2008) An Architecture for Autism: Concepts of Design Intervention for the Autistic User. International Journal of Architectural Research iJAR. Vol. 2 (1) 189-211.

https://www.researchgate.net/publication/26503573_An_An_Architecture_for_Autism_Concepts_of_Design_Intervention_for_the_Autistic_User

Mostafa, M. (2014) Architecture for autism: Autism aspectsTM in school design

https://www.researchgate.net/publication/285345281_Architecture_for_autism_Autism_a_spectss_in_school_design

Md Rasheduzzaman Mondol, Muhammad Tanvir Faysol, Md Shaheen Sikder (2016)
Developmental disabilities of children and their health outcomes

https://www.researchgate.net/publication/308704786_Developmental_disabilities_of_children_and_their_health_outcomes

Neil Deochand, Alissa Anne Conway, Richard Wayne Fuqua (2015, November) Design
Considerations for an Intensive Autism Treatment Centre

https://www.researchgate.net/publication/288074324_Design_Considerations_for_an_Intensive_Autism_Treatment_Centre

Ulrike Altenmüller-Lewis (2017) Designing Schools for Students on the Spectrum, The Design
Journal, 20:sup1, S2215-S2229, DOI: 10.1080/14606925.2017.1352738

<https://doi.org/10.1080/14606925.2017.1352738>

