CHANGING PARADIGM OF INCLUSIVE EDUCATION IN INDIA

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Abstract : Education for differently-abled children has been changed through various approaches from past to present times that is from exclusion to segregation then integration and finally to inclusion. Government is trying to bring change in the educational system by developing special education into inclusive education for a better society and providing equal opportunities to all children. Children with different abilities behave and act in different manner and they do require changes in regular schools for them to adapt. For this, study includes the understanding regarding children with different abilities like physical, visual, mental, learning and speech and language. Analysis have been done to know the requirements which are much needed to them to provide them a sense of belonging and comfort. Case studies of inclusive schools have been done to know the overall functioning and requirements of the built form for children with different abilities. Through comparative studies requirements and recommendations have been framed out for designing of spaces within the built environment for inclusive schools. Areas for various spaces have been obtained in 2D drawing by considering the furniture sizes for different classes and clearance spaces for mobility devices as per Indian standards.

IndexTerms - **Inclusive education, differently abled and abled, built environment, special children**

I. INTRODUCTIOTHE TERM INCLUSION REFERS TO AN APPROACH WHEREIN STUDENTS WITH SPECIAL NEEDS STUDY WITH OTHER STUDENTS. PROVIDING EQUAL OPPORTUNITIES TO PEOPLE REGARDLESS OF THEIR BACKGROUND OR DISABILITY IN EVERY FIELD WILL HELP IN ATTAINMENT OF AN INTEGRATED SOCIETY, AND EDUCATING CHILDREN WITH SPECIAL NEEDS IS AN IMPORTANT STEP IN THIS REGARD. INDIA IS TRYING TO MAKE AN ATTEMPT TO CREATE REGULATIONS THAT PROMOTE INTEGRATION AND, MORE RECENTLY, INCLUSION OF CHILDREN.
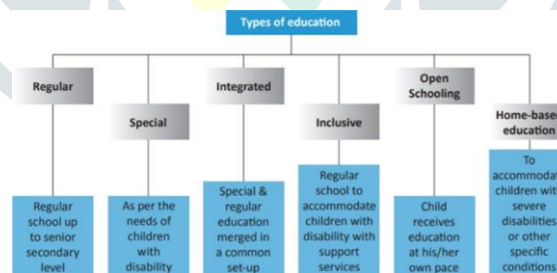

Figure -1 Types of education in schools (Tuli, 2020)

According to the Rights of Persons with Disabilities (RPWD) Act 2016, inclusive education is a "system of education in which students with and without disabilities learn together and the system of teaching and learning is suitably adapted to meet the learning needs of different types of students with disabilities." (The Right of Persons with Disabilities Act, 2016).
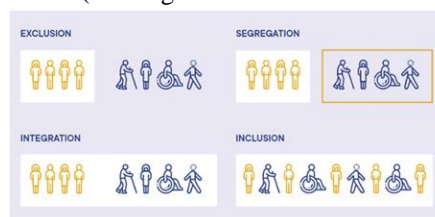

Figure -2 Approaches to placement of children with special needs (unesco.org)

The New Educational Policy of India emphasises the significance of developing enabling mechanisms to provide Children With Special Needs (CWSN) with the same opportunity for excellent education as any other child (National Education Policy , 2020). While the Indian education system and subsequent government policies have made steady progress toward ending gender and social category gaps in all levels of school education, large differences exist - particularly at the secondary level - notably for socioeconomically disadvantaged groups that have traditionally been lacking in education (National Education Policy , 2020). Socio-Economically Disadvantaged Groups (SEDGs) can be broadly categorized based on gender identities, socio-cultural

identities, geographical identities, disabilities (including learning disabilities), and socio-economic conditions (National Education Policy , 2020). One of the fundamental purposes of the educational system must be to guarantee that students enrol in and attend school.

In the near future, schools need to be designed to meet the demand of its distinct user groups, there will be adaptation of flexibility and communication technology in terms of its design, curriculum as well as pedagogy and the scope of learning by the children. The new Pedagogical & Curricular Structure of 5+3+3+4, a strong base of Early Childhood Care and Education (ECCE) from age 3 is also included, which is aimed at promoting better overall learning, development, and well-being (National Education Policy , 2020). The new structure divides the whole learning process into Foundational, Preparatory, Middle and Secondary (National Education Policy , 2020). The goal of education will not only be academic growth, but also character development and the creation of holistic and well-rounded individuals equipped with critical 21st century skills (The Right of Persons with Disabilities Act, 2016). All of these changes will be available to all students, irrespective of their differences through inclusive education (National Education Policy , 2020).
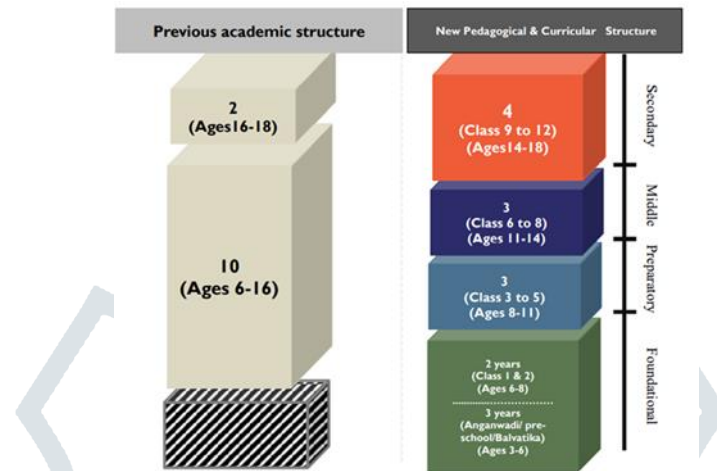

Figure – 3 Educational Framework in schools (National Education Policy , 2020)

Disabilities mentioned in Right of Persons with Disabilities Act 2016 –

1. Physical Disability
   - Locomotor disability
   - Leprosy cured
   - Cerebral Palsy
   - Dwarfism
   - Muscular Dystrophy
   - Acid attack victim

2. Visual Impairment
   - Blindness
   - Low Vision

3. Speech Language Disability
   - Speech language disability

4. Hearing Impairment
   - Deaf and Hard of hearing

5. Intellectual Disability
   - Specific Learning Disability
   - Autism Spectrum Disorder

6. Mental Behaviour, Neurological / Blood Disorder, Multiple Disabilities
   - Mental Illness
   - Chronic Neurological Multiple Sclerosis
   - Parkison Disease
   - Blood Disorder
   - Haemophilia
   - Thalassemia
   - Sickle Cell Disorder
   - Multiple Disabilities
     (The Right of Persons with Disabilities Act, 2016).

Need for Study -

There is a need to study, and analyse the steps taken for upliftment of education of children with special needs in India, specifically for providing physical support as well as learning assistance. For designing an inclusive space, it is required to know

the needs and usability aspect of both differently abled and normal children. Flexibility in architecture is becoming the need of the future as there will be demand of more flexible informal and formal spaces which could meet the needs of abled children as well as children with different abilities and providing them a space where they could learn and interact with each other.

Aim -

The aim of the study is to understand and analyse how inclusive education can meet the requirements of differently-abled children with abled children at one place.

Objectives -

- To study & identify the needs, challenges and scope of Inclusive education at school level.
- To study & analyse the nature and needs of children with varied impairments from age of 6 years to 14 years (Class 1 to Class 8).
- To understand & analyse the Government's role in the upliftment of children with special needs in the past to the 21st century, for providing inclusive education in India.
- To find out the spatial requirements of built environment for Inclusive education
- To evolve design recommendations & determine solutions for obtaining flexibility in built environment for Inclusive education.

Scope of Study -

- The study will be conducted on the parameters of designing spaces for differently – abled children for providing them an inclusive learning environment in schools.
- Study will include disabilities such as Locomotor Disability, Congenital Deformities, Dwarfism, Mild Muscular Dystrophy, Visual Impairment, Speech and Language Disability, Learning Disabilities - dyslexia, dysgraphia, dyscalculia, dyspraxia, Attention Deficit & Hyperactivity Disorder and developmental aphasia; Muscle Disorders, Mental illness such as Phobias, Obsessive – Compulsive disorder and depression.

Limitation -

- Study will be limited to the age group of children from 6 years to 14 years.
- Study will not include disabilities such as Leprosy, Hearing impairment, severe Muscular Dystrophy, Cerebral Palsy, Mental retardation, Multiple Disabilities, chronic Neurological conditions and Autism.

Hypothesis -

Flexibility in spaces in Built environment for Inclusive education should be one of the key aspects of achieving inclusive education in schools.

Research Question –

How the design and functionality of spaces would be, with respect to varied user groups in case of Inclusive education in schools?

Broad Methodology -

Brief Introduction

Introduction and background about inclusive education in India and Introduction to Types of Disabilities mentioned in Rights of Persons with Disabilities Act, need for the study, aim, objectives, scope of study, limitation, hypothesis and research question.

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Literature Review

- Inclusive education in India - Scenario, Constitutional rights, Needs and challenges.
- Impairments and disabilities in children
- Nature and Requirements of differently-abled and special needs children to be adaptable in inclusive schools
- Universal design Principles and Barrier- free environment
- Implementation of Flexibility in educational infrastructure and use of Technology in teaching and learning methods.

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Case Study / Literature Study

- Amar Jyoti School Delhi
- Dr. Shakuntala Mishra National Rehabilitation University Lucknow (D.S.M.N.R.U.)
- AADI : Action for Ability Development and Inclusion(Formely known as School for Spastic Children)
- Hazelwood School at Glasgow, Scotland

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Comparative Analysis between Case / Literature Studies

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Results and Conclusion

II. LITERATURE REVIEW

Inclusive education can be achieved through collaboration of integrated education and special education. It is a way of providing equal participation of all the students in all aspects of the classroom. It requires participation of teachers, parents and other peers for developing better and more inclusive environment. Inclusive educational practices were initiated by some organisations in India years back but this concept is still at an early stage of successful implementation. Even though government had made various approaches for education of children with special needs in regular schools, still there can be seen some barriers of providing inclusive education that is inappropriate/inadequate curriculum, lack of awareness among parents and the community, lack of resources, lack of trained teachers, very few public/government schools are available. With time these barriers are being removed by government and public schools. To specially address the educational needs of under-represented groups, New Educational Policy has brought together gender identities, socio-cultural identities, geographical identities, disabilities, and socio-economic conditions to create a new social group called Socio – Economically Disadvantaged Groups (SEDGs) (National Education Policy , 2020).

Factors leading to good practices of inclusive education are as follows –

- Training teachers for teaching special children.
- Inclusivity in formal and informal spaces and open learning spaces.
- Identification of learning difficulties at an early age.
- Early Learning Skills in Inclusive schools.
- Resource Room (RR) / remedial classroom.
- Majority of secondary school teachers were found under moderate attitude towards inclusive education.
- Curriculum change should take place in combination with effective teacher preparation in terms of inclusiveness and its values.
- peer sensitisation; and introducing relevant alternative activities for differently abled children.

Inclusive education is valuable as it provides Special children to keep up with the rest of their peers and also feels secure and has a sense of belonging. Studies have shown that systems that are truly inclusive reduce drop - out rates and stagnation of students and have higher average levels of achievement as compared to systems that are not inclusive. Different teaching methods like experiential learning, models, audio and visual are needed. Some approaches for providing equality to children for implementing inclusive education are providing Early childhood care and education, use of ICT's, several teaching styles like interactive teaching, alternative teaching, parallel teaching and station teaching and special educators to be treated at along with other teachers.

In India few schools have incorporated successful implementation of Inclusive Education and example of one such school is Ankur Vidya Mandir which aims at starting, promoting and sustaining activities that helps in integration of individuals with varying abilities into 'normal' society (Vaidya, 2015). Approx. $1/4^{th}$ of special needs students study in each classroom (Vaidya, 2015). Models, charts, real-world examples, and field visits are used. Mobility aids such as wheelchairs are provided for assistance. Physiotherapy sessions also take place for students (Vaidya, 2015). Speech therapy sessions are conducted to support children with motor disabilities, apraxia, speech and language difficulties and mental and emotional challenges (Vaidya, 2015). Resource rooms are provided to support students with learning disabilities (Vaidya, 2015). A holistic approach is incorporated along with barrier free environment and assistive support. In a research conducted in private inclusive schools of Mumbai regarding the experiences and challenges faced by differently abled children from age group of 7 – 16 years to analyse the feeling of Self – Concept (Kattumuri). Results of the study showed that mostly remedial classes and counselling sessions were provided at school to help differently abled students, the ratio of resource teachers to students was not appropriate. Students with ADHD require support of resource teachers in classrooms along with other teacher. One of the schools had the ratio of resource teachers to students with disabilities to be 1:4, which the students felt appropriate (Kattumuri).

Inclusive school design needs to be flexible in curriculum, spaces, furniture, fittings and equipments. Classrooms should have extra spaces for varied activities as well as quiet corner or space. physical and medical limitation, environmental limitation and the needs for extra support are few areas of concern / difficulty faced by visually impaired children. Four main elements in design were identified which should be considered for designing multi-sensory architecture of a space in support of special needs students.

A. Nature – acts as a medium between humans and their surroundings.

B. Materials – feeling materials help in recognizing their location.

C. Understanding space – hearing surrounding and architecture of a place can also help in recognising the space. For example - High echo is heard when a place is wide or empty.

D. Characteristics of objects – different shapes, size and scale of objects helps in understanding the surrounding space.

Haptic design parameters - The haptic design parameters are specified by material qualities and spatial features, with the elements distinguishing between foot and hand (Heylighen).
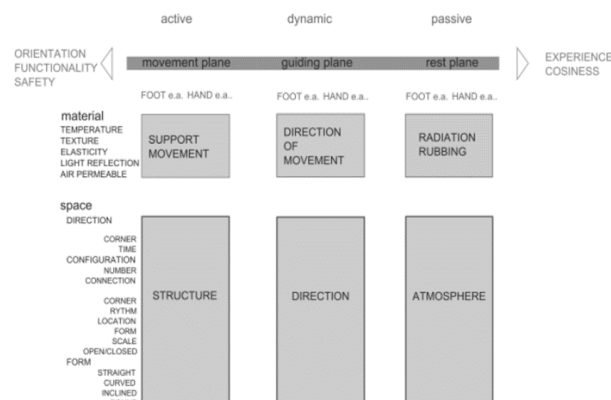

Figure - 4 Haptic design parameters (Heylighen)

Table - 1 Elements of consideration for designing inclusive school

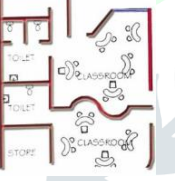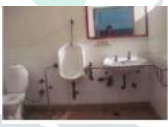| Different special needs		Physical disability	Visual impairment	Intellectual disability (learning disability)	Speech and language disability	Mental illness
Spaces and areas	Extra rooms and circulation spaces	Required	Required	Required	Required	Required
	Assistive therapy rooms	Required	Required	Required	Required	Required
	Flexible and adaptable spaces	Required	Required			Required
	Additional storage areas	Required	Required			
	Toilets & changing rooms	Required				
Movement in a given space & way – finding elements	Movement is easy and safe	Required	Required	Required	Required	Required
	Signages, symbols and visual patterns	Required	Required	Required	Required	
	Identification of different spaces with the help of size, colour, style, smell and noises within the surrounding		Required	Required		
Visual elements	Adequate, adjustable and controllable lighting	Required	Required	Required	Required	Required
Different special needs		Physical disability	Visual impairment	Intellectual disability (learning disability)	Speech and language disability	Mental illness
Use of materials, finishes, fragrance and aural			Required			
Creating perception of shape and proportion of spaces			Required			
Elements for enhancing sensory experiences.			Required	Required	Required	

III. CASE STUDIES AND LITERATURE STUDIES

1. Amar Jyoti School Delhi
2. Dr. Shakuntala Mishra National Rehabilitation University Lucknow (D.S.M.N.R.U.)
3. AADI : Action for Ability Development and Inclusion (Formerly known as School for Spastic Children)
4. Hazelwood School at Glasgow, Scotland

Table - 2 Case Studies / Literature Studies Comparative Analysis

S. No.		Amar Jyoti School Delhi	D.S.M.N.R.U. Lucknow	Aadi Delhi	Hazelwood School Scotland	Cbse Norms / Regular Schools	Handbook Of Inclusive Education Cbse , 2020
I.	**Type of school**	Inclusive	Inclusive	Inclusive	School for Blind and Deaf		
II.	**Site plan**						
III.	**View**						
1.	**Classroom a. special**	4m x 4m – 11 stu. 4m x 5m – 10 stu.	60 Sqm – 40 stu. 60 Sqm – 40 stu.	8m x 8m – 20stu.	Large classrooms with ample storage space and adaptable areas within the classrooms.	(min) 8 m x 6 m (48 Sqm) for 40 students	Special Inclusive (regular) & flexible classrooms
	b. Regular	4m x 5m – 18 stu.					
2.	**Minimum floor space in classroom**	1.5 Sqm per student for age group 0 to 6 years in Blind section. 2 Sqm per student. 1.1 Sqm per student for regular classroom	1. 5 Sqm per student – Inclusive classroom	3.2 Sqm per student – Inclusive classroom	Extra space for storage and different activities.	(min) 1 Sqm per student.	Not Specified

No.	Facility						
3.	**Science labs**	 30 Sqm	75 Sqm			(min) 9 m x 6 m each (54 sqm)	Not Specified
4.	**Library**	 Area - 45 Sqm	 Area -30 – 40 Sqm			14 m x 8 m (112 sqm)	Not Specified
5.	**Computer lab**	 Ratio – 1:20 Area – 45 Sqm each	Departmental library Area – 45 Sqm / each			(min) 9 m x 6 m each (54 sq m)	Not Specified
6.	**Mathematics lab**					8 m x 6 m (48 sq m)	Not Specified
7.	**Rooms for extracurricular activities / one multipurp- ose hall**	Common room	Common Hall	Multipurpose hall	Common room	Adequate Size	
8.	**Drinking water facilities on each floor**			Provided	Provided	Adequate	Accessible on each floor
9.	**Education teachers / physical education teachers**	Also included special educators	Also included special educators	Also included special educators	Also included special educators	Recruited	Also included special educators
10.	**Accessibility for wheel-chair users – toilet**	 Accessible	 Accessible	 Accessible	Accessible	Shall be provided	Shall be provided as per CPWD norms
11.	**Furniture**	Mixed availability of furniture in classroom as per different users.	Different type of furniture in different classes. Wheel-chair adaptable space in classrooms.	 Tables of different height for different users.	Different heights of furniture for different user groups.	Suitable as per the strength of students.	Adaptable and as per varied user groups.
12.	**Recreation activities**	Adequate facilities are provided	Adequate facilities are provided	Adequate facilities are provided	Adequate facilities are provided	Adequate facilities	Adequate facilities
13.	**Physical education**					Adequate facilities	
14.	**Play ground**		Adequate facilities	Accessible and supportive – equipped with harness for	Accessible and supportive	Adequate facilities	Accessible and supportive

		Basket ball court		support and ramps for accessibility.			
15.	Counsellor room	Provided	Provided	Provided	Provided	Should be provided	Must be provided
16.	Orientation and mobility	Provided	Provided				Mentioned
17.	Speech therapy room	Provided	Provided	Provided			For assessment
18.	Physiotherapy room	Provided	Provided	Provided			For physical support
19.	Resource room	Provided	Provided one for visually impaired and other for mentally retarded.				
20.	Teachers training for inclusive learning friendly environment	Provided	Provided	Provided			Must be provided
21.	Psychologist	Provided	Not provided	Provided			For assessment
22.	Braille library / reading room	Not Provided	Provided		Provided		Must be provided
23.	Braille printing room	Provided	Provided	Provided	Provided		Must be provided for providing study material
24.	Visual signage and signage in braille	Provided at some areas.	Provided at some areas.		Provided		Should be placed.
25.	School entrance	Easily identifiable and accessible	Easily identifiable and accessible	Easily identifiable and accessible	Easily identifiable and accessible	Accessible	Should be easily identifiable from a distance by its design, location, signage, and lighting.
26.	Additional safety in wet condition	Not provided	Not provided	Not specified	Not specified		Recessed mat
27.	Space allocation	Not adequate	Adequate	Adequate	Adequate		Additional spaces for users with spatial requirements.

28.	Outdoor spaces	Adequate facilities provided	Not Adequate	Adequate facilities provided	Adequate facilities provided		Access to grassed pitches can be provided using pathways or matting products Equipment should be carefully selected to ensure accessibility for all students.
29.	Toilet	2.4 m x 1.8 m	2.2 m x 2.2 m	4 m x 6 m (for 2wc & 1 wb)	Not specified		Clear floor space - 2000 mm x 1750 mm
30.	Flooring	Cement flooring, Granite flooring and floor tiles	Floor tiles	Floor tiles And vinyl flooring	Different types of flooring		Slip – resistant flooring
31.	Toilet door	Sliding door of iron with vertical bar at 900 mm	1000 mm wide door opening	3 m wide door	Not specified		Should be horizontal pull bar at least 600 mm long inside and 140 mm long on the outside, at a height of 700 mm.
32.	Handrails	900 mm	900 mm	Multiple, 750, 900			Diameter of 40 – 45 mm Height – 850 - 900 mm
33.	Tactile flooring	Provided throughout the campus	Provided in the building	Provided throughout the campus	Instead of it 'wall trails' are provided for support.		Should be provided
34.	Induction loop system (For hearing impaired)	Provided	Not provided	Not provided			Should be provided
35.	Prosthetics and orthotics	Provided					Not mentioned
36.	Sensory integration therapy	Not provided	Provided	Not provided	Provided		Should be provided

Table - 3 Case Studies / Literature Studies Comparative Analysis

S. No.	Design Elements	Amar Jyoti School Delhi	D.S.M.N.R.U. Lucknow	AADI Delhi	Hazelwood School Scotland	Handbook on Barrier Free and Accessibility – CPWD (2014)	Harmonised Guidelines and Space Standards for Barrier Free Built

							Environment for Persons with Disability and Elderly Persons (2016) –Moud – Gov. Of India
1.	**Ramps** a. Slope b. Width c. Handrail d. Landing Width	1:18 & 1:10 1400-1430mm 900mm 1500 & 2100mm	1:12 1800mm 900mm 1500 & 2000mm	1:15 1800mm 750, 900mm 1800mm		1:20 - 1:15 1800mm (min) 900-1100mm 1200mm (min)	1:12 – 1:20 1200 – 1800mm 760 – 900mm 1500mm (min)
2.	**Staircase** a. Width b. Handrail c. Landing width d. No. of steps in single flight	1130mm 900mm 1000mm 8	2000mm 900mm 2000mm 12	1800mm Multiple 1500mm 11		1050mm(min) 900 – 1100mm 1050mm (min) 11 (max)	1500mm (min) 760 – 900mm 1500mm (min) 12 (max)
3.	**Corridor** Width	1400-1700mm	2600, 4200mm	1500, 1800mm	Approx. 2000mm	1500mm (min)	1200mm (min)
4.	**Door** Width	1000mm	1200, 1500, 1800, 2400mm	1000mm	1200mm	900mm (min)	900mm (min)
5.	**Toilet** a.Washbasin Height b.Size of Cubicle c.No. of Grab Rails d.Length of Grab Rail	700mm 1800 x 2300mm 3 830,1100mm	750mm 2200 x 2200mm 2 630, 990mm	700mm 4000 x 6000mm 3		750mm(min) 2200 x 1750mm (min) 2 (min) 600mm (min)	700 – 800mm 2200 x 2000mm 2 (min) 600mm (min)
6.	**Windows** Sill level	450mm	900mm	600, 900,1500mm	Uniform Ht , 1500mm		600mm
7.	**Tactile Guiding Path** At start and end of - a. Staircase b. Ramp c. Corridor	 Yes Yes Yes	 Yes Yes Yes	 Yes Yes Yes	Yes – walls & floors	 Must be provided Must be provided Must be provided	 Must be provided Must be provided Must be provided
8.	**Handrail** Corridor	No	Dia – 40mm , Ht – 900mm	No	No	Dia – 32 – 50mm, Ht – 900mm	Dia – 38 – 45mm, Ht – 760 – 900mm
9.	**Braille and Tactile Information Handrail**	No	No	No	No	May be provided	May be provided

| 10. | Colour Contrast | Yes | Yes | Yes | Yes | Must be provided | Must be provided – from background door fixtures protruding objects tread edges landing |
| 11. | Flooring Material | Tiles | Tiles | Tiles and vinyl flooring | Varied flooring materials | Non slip surface | Non Slip Surface without level difference |

IV. RESULTS AND DISCUSSIONS

Classrooms – the basic unit of a school is classroom. The classroom, apart from satisfying the minimum requirements of space, fittings and furniture, shall be designed to meet the adequate functional and environmental requirements. The size of a classroom shall depend on the following :

- Anthropometric dimensions of children and their space requirements;
- Dimensions, arrangements of furniture and equipment and their incidence;
- Number of students to be accommodated
- Types of activities to be carried out; and
- Diverse seating arrangements essential for these activities (Indian Standard recommendations for basic requirements of school buildings).


Figure 20: Detached desk and chair with height adjustable function

Figure 21: Dimensions of accessible furniture

(Making Schools accessible to children with disabilities, 2016)

Figure -5 Detached desk and chair with height adjustable function

Figure -6 Dimensions of accessible furniture
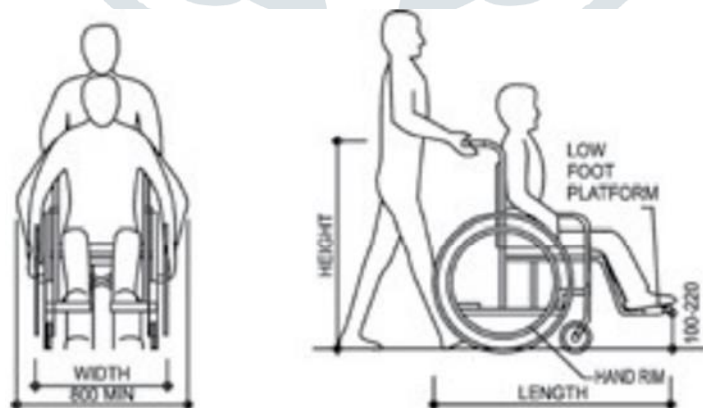
Type of Wheelchair	Width	Length	Height	Weight
Manual Wheelchair	510-725mm	645-1100mm	850-1140mm	10.27 kg
Electric Wheelchair	520-700mm	1060-1200mm	1010-1400mm	36.100kg

(Handbook on Barrier Free and Accessibility, 2014)

Figure -7 Types of Wheelchair
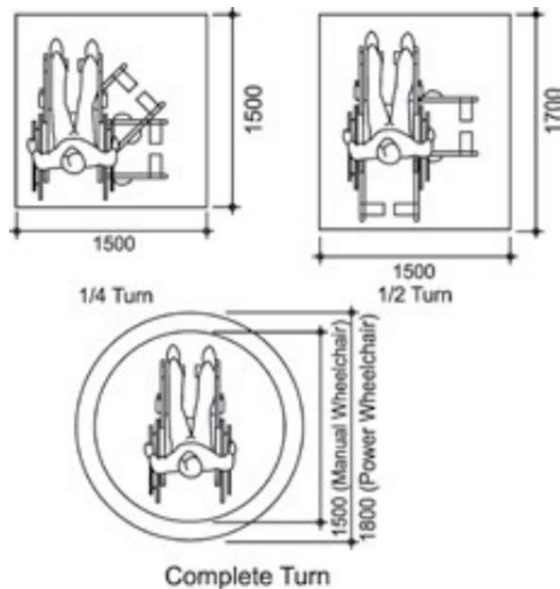
(Handbook on Barrier Free and Accessibility, 2014)
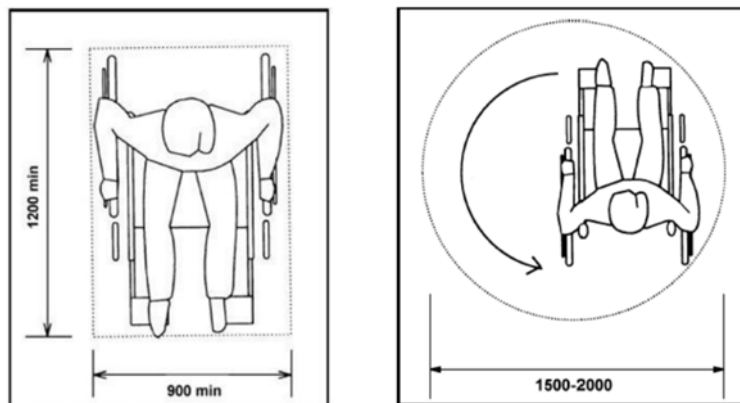Figure -8 Movement spaces for Wheelchair

Figure 3-5: Clear floor space

Figure 3-4: Turning radius

(Harmonised Guidelines and Space Standards for Barrier Free Built Environment for Persons with Disability and Elderly Persons, 2016)
Figure -9 Clear floor space and turning radius for wheelchair

All dimensions are in millimetres unless otherwise shown.

	Sizemark	1	2	3	4
Seat	h_8 Height of seat	260+3	300+3	340+3	380+3
	t_4 Effective depth of seat	250 to 270	280 to 300	320 to 340	350 to 370
	b_3 *Min* width of seat	250	300	320	380
	r_1 Radius of front of seat	30 to 40	30 to 40	30 to 40	30 to 40
	δ *Max* angle of seat	4°	4°	4°	4°
Backrest	β Angle between seat and backrest	95° to 100°	95° to 100°	95° to 100°	95° to 100°
	h_9 Seat plane to bottom of backrest	110 to 120	120 to 130	140 to 150	150 to 160
	h_7 Seat plane to top of backrest	210 to 250	250 to 280	280 to 310	310 to 330
	b_4 *Min* width of backrest	250	250	250	280
Tables	h_1 Height of top	460+3	520+3	580+3	640+3
	t_1 *Min* depth of top	450	450	450	450
	b_1 *Min* 1 place length	450	450	450	450
	of top 2 place	1 050	1 050	1 050	1 050
Leg clearance	t_2 *Min* depth of knee zone	300	300	300	350
	t_3 *Min* depth of tibia zone	400	400	400	450
	h_3 *Min* height of knee zone	400	460	520	580
	h_4 *Min* height of tibia zone	250	250	300	300

(Standards, IS 4837 (1990): School furniture, classroom chairs and tables - Recommendations [CED 35: Furniture], 1996)
Figure -10 Furniture sizes as per Indian standards

DISTRIBUTION OF FURNITURE SIZES

FURNITURE SIZE MARK →	1	2	3	4
AGE OF CHILDREN IN YEARS ↓	STANDING HEIGHT OF CHILDREN IN mm			
	1020-1085	1085-1245	1245-1445	1445-1620
5-6	/////			
6-10		/////		
10-13			/////	
13-17				/////

(Standards, IS 4837 (1990): School furniture, classroom chairs and tables - Recommendations [CED 35: Furniture], 1996)
Figure -11 Distribution of Furniture Sizes
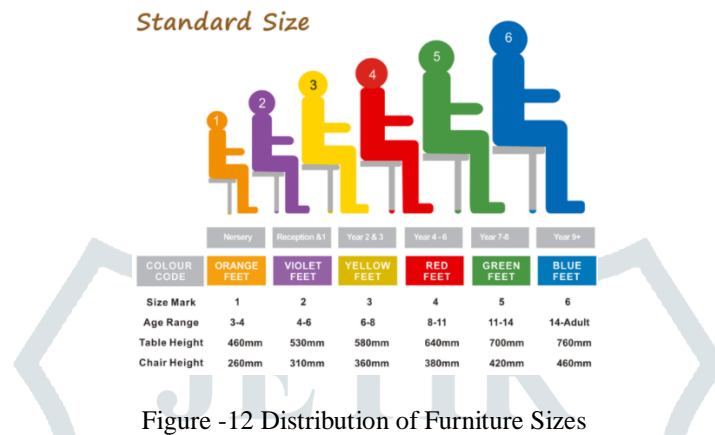
Figure -12 Distribution of Furniture Sizes

Table - 4 Ratios Between Standing Height and Dimension Used in Designing School Furniture and Educational Spaces

| STANDING POSTURE	RATIO		FIXTURES & FITTINGS	RATIO
Standing height	1·00 H		Window pane	
Eye height	0·93 H		—Upper reach	1·20 H
Depth of body-standing	0·17 H		—Lower reach	0·53 H
Width of body-standing	0·30 H		Height of hook	1·00 H
Arms outstretched-length end to end	1·02 H		Height of door knob	0·63 H
One arm outstretched	0·64 H		Height of switch	0·80 H
Height with arm vertically upright	1·23 H		Height of lower edge of mirror	0·75 H
			Height of sink top	0·50 H
CIRCULATION SPACES	**RATIO**		Height of wash-basin top	0·45 H
			Height of urinal top	0·41 H
Width of corridor for 2-children	0·63 H		**SITTING POSTURE**	**RATIO**
Circulation space between			Seated height	0·78 H
2-standing work surfaces	0·65 H		Seated eye height	0·70 H
Circulation space between 2 seats	0·30 H		Elbow height	0·41 H
			Height of seat	0·25 H
WORKING SURFACE STANDING	**RATIO**		Width of seat	0·25 H
			Front of knee to buttock	0·34 H
Height of work surface			Height of stool	0·37 H
—Central work	0·52 H		Width of stool	0·20 H
—Ironing/Planning	0·50 H		Depth of stool	0·16 H
—Cooking	0·48 H		Height of footrest	0·11 H
—Filing metal	0·56 H		Depth of seat	0·24 H
Height of lectern	0·75 H		Floor to top of thigh	0·38 H
Forward reach-maximum	0·60 H		Comfortable zone for leg movement	0·35 H
			Top of backrest to floor	0·44 H
WORKING SURFACE SEATED	**RATIO**		**OTHER POSTURES**	**RATIO**
			Sitting lotus	
Height of desk/table	0·41 H		Sitting lotus height	0·50 H
Width of desk/table	0·40 H		Sitting lotus eye-height	0·42 H
Reach-maximum	0·50 H		Sitting on knee eye-height	0·58 H
Reach-optimum	0·39 H		Knee to knee width	0·40 H
			Sitting lotus depth	0·31 H
VERTICAL SURFACE	**RATIO**		Sitting lotus forward reach	0·60 H
			Work surface top from floor-sitting lotus	0·20 H
Chalk-board			Shoulder width	0·25 H
—Upper reach	1·15 H		*Sitting sideways*	**RATIO**
—Lower reach	0·44 H		Maximum width	0·41 H
Storage reach-maximum	1·20 H		Maximum depth	0·33 H
—Optimum height-convenient	1·10 H		**SQUATTING**	**RATIO**
—Lower height-convenient	0·23 H		Squatting	0·61 H
—Upper height-convenient	0·84 H		Squatting depth	0·33 H
—Convenient depth	0·23 H		Squatting forward reach	0·49 H

(Standards, IS 4838 (1990): Anthropometric dimensions for school children age group 5-17 years [CED 35: Furniture], 1990)

Table – 5 Standing Height of boys and girls age 6 – 17 years

POSTURES	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11	Age 12	Age 13	Age 14	Age 15	Age 16	Age 17
Standing height	1079	1134	1187	1233	1284	1334	1396	1442	1504	1557	1596	1615
Width of corridor for 2-children	679.4	714.42	747.81	776.79	808.92	840.42	879.48	908.46	947.52	980.91	1004.85	1017.45
Space between 2-standing work surfaces	700.7	737.1	771.55	801.45	834.6	867.1	907.4	937.3	977.6	1012.05	1036.75	1045.79
Space between 2-seats	323.4	340.2	356.1	369.9	385.2	400.2	418.8	432.6	451.2	467.1	478.5	484.5
Height of desk/table	441.98	464.94	486.67	505.53	526.44	546.94	572.36	591.22	616.64	638.37	653.95	662.15
Width of desk/table	431.2	453.6	474.8	493.2	513.6	533.6	558.4	576.8	601.6	622.8	638	646
Reach-maximum	539	567	593.5	616.5	642	667	698	721	752	778.5	797.5	807.5
Reach - optimum	420.42	442.26	462.93	480.87	500.76	520.26	544.44	562.38	586.56	607.23	622.05	629.85

POSTURES	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11	Age 12	Age 13	Age 14	Age 15	Age 16	Age 17
Height of seat	269.5	283.5	296.75	308.25	321	333.5	349	360.5	376	389.25	398.75	403.75
Width of seat	269.5	283.5	296.75	308.25	321	333.5	349	360.5	376	389.25	398.75	403.75
Front of knee to buttock	323.4	340.2	403.58	419.22	436.56	453.56	474.64	490.28	511.36	529.38	542.3	549.1
Depth of seat	258.72	272.16	284.88	295.92	308.16	320.16	335.04	346.08	360.96	373.68	382.8	387.6

(Standards, IS 4838 (1990): Anthropometric dimensions for school children age group 5-17 years [CED 35: Furniture], 1990)

Table – 6 Standing Height of boys and girls age 6 – 17 years

Age in years	Mean height of boys	Mean height of girls	Height of students (H)
6	1075	1079	1079
7	1134	1134	1134
8	1187	1187	1187
9	1233	1233	1233
10	1284	1284	1284
11	1334	1334	1334
12	1396	1386	1396
13	1442	1442	1442
14	1504	1474	1504
15	1557	1496	1557
16	1595	1510	1595
17	1615	1515	1615

SL. No.	CATEGORY	AGE GROUP	LEVEL
(1)	(2)	(3)	(4)
		years	
i)	Pre-school	3-5	Pre-Nursery, Nursery
ii)	Primary/Junior	5-10	I to IV/V
iii)	Secondary/Middle	10-13	V to VII or VIII
iv)	Higher Secondary (Old)	13-16	VIII/IX to XI
v)	Higher Secondary (New) (Ten plus two)		
	Level (i)	13-15	IX and X
	Level (ii)	15-17	XI and XII

TABLE 1 GROUPING OF CLASS LEVELS
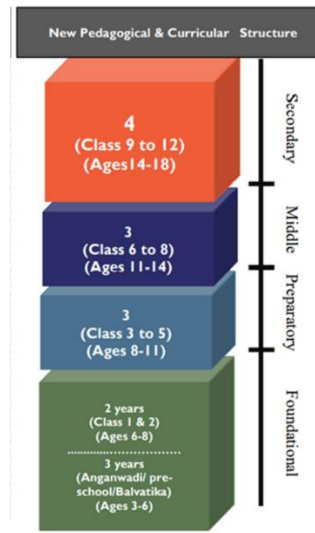
(Indian Standard recommendations for basic requirements of school buildings)

(National Education Policy , 2020)

Figure -13 Old pedagogical & curricular structure   Figure -14 New pedagogical & curricular structure

Regular schools – Regular Classroom

Inclusive schools –
- Inclusive / Mainstream classrooms
- Special classrooms – For visually impaired, Intellectual disabilities.

Inclusive Classroom –

An inclusive classroom should be designed in a manner that provides overall access to children using mobility aids.

Comparison of areas of a regular school as per Indian Standards and the proposed areas for inclusive school are shown in figures below -

1.

Class 1 to 5 (Age group – 5 to 10)
Total no. of students – 40
Classroom area – 45 sqm
Area per student – 1.11 sqm
Figure -15 Class 1 to 5 (Age group – 5 to 10) as per old structure
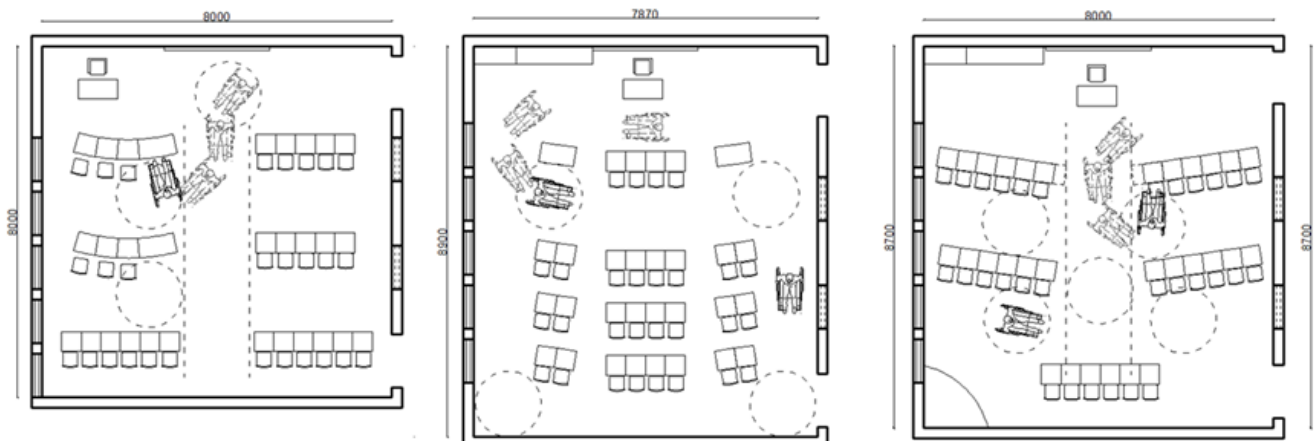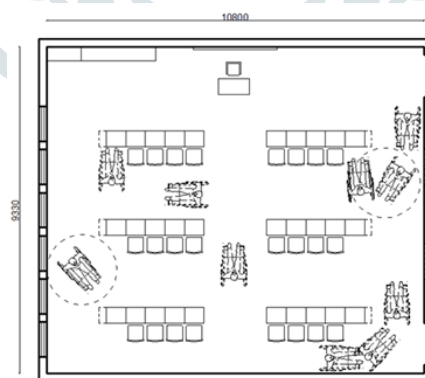

Class 1 & 2 (Age group – 6 to 8)
Total no. of students – 30
Classroom area – 64 sqm & 70 sqm
Area per student – 2.1 sqm & 2.3 sqm
Figure -16 Class 1 & 2 (Age group – 6 to 8) as per new structure

2.
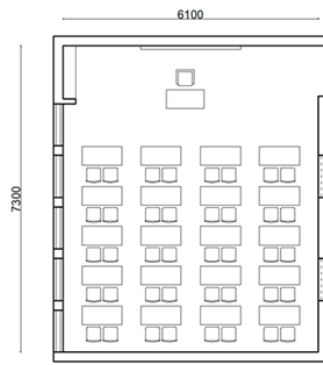
Class 1 to 5 (Age group – 5 to 10)
Total no. of students – 40
Classroom area – 45 sqm
Area per student – 1.11 sqm
Figure -15 Class 1 to 5 (Age group – 5 to 10) as per old structure
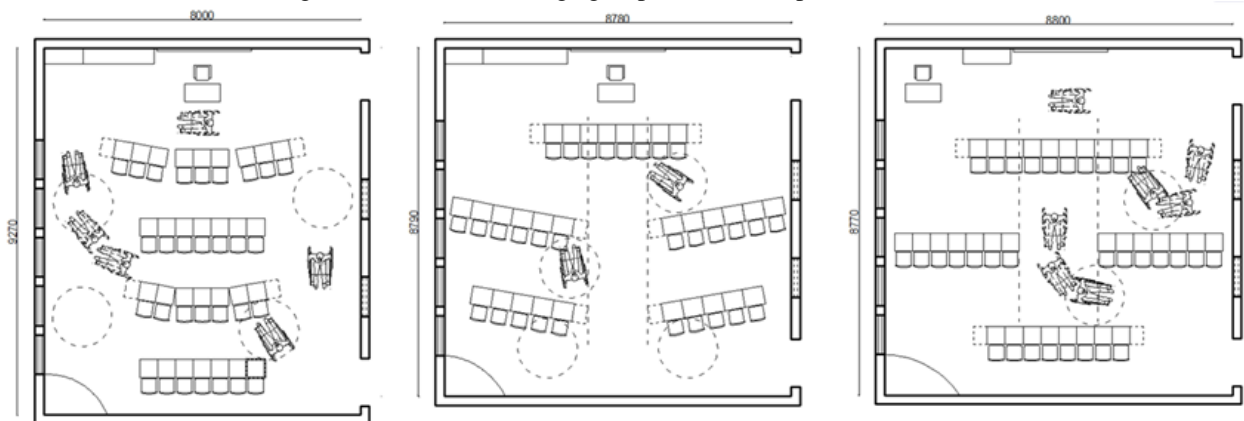
Class 3 to 5 (Age group – 8 to 11)
Total no. of students – 30
Classroom area – 74 sqm & 77 sqm
Area per student – 2.5 sqm & 2.6 sqm
Figure -17 Class 3 to 5 (Age group – 8 to 11) as per new structure

3.

Class 6 to 12 (Age group – 10 to 17)
Total no. of students – 40
Classroom area – 50 sqm
Area per student – 1.26 sqm
Figure -18 Class 6 to 12 (Age group – 10 to 17) as per old structure
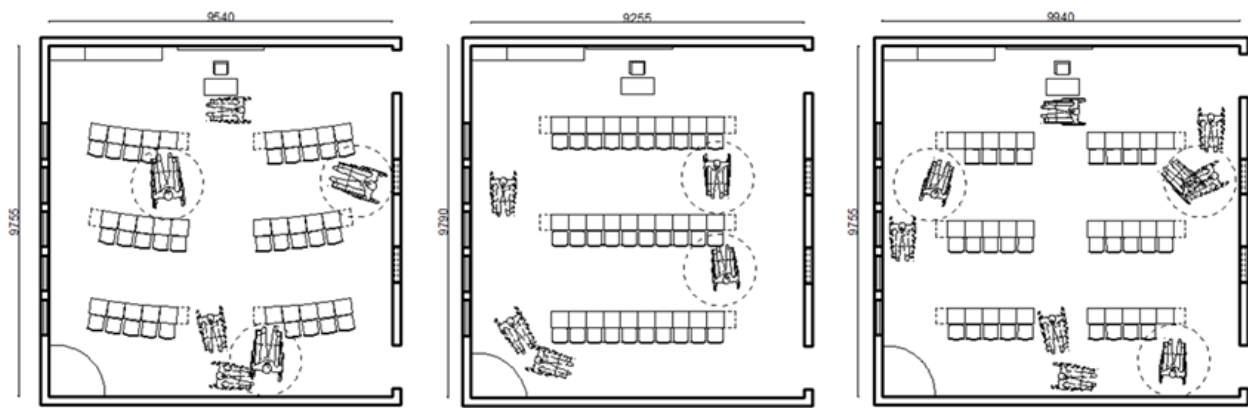
Class 6 to 8 (Age group – 11 to 14)
Total no. of students – 30
Classroom area – 90 sqm, 93 sqm & 96 sqm
Area per student – 3 sqm, 3.1 sqm & 3.2 sqm
Figure -19 Class 6 to 8 (Age group – 11 to 14) as per new structure

4.
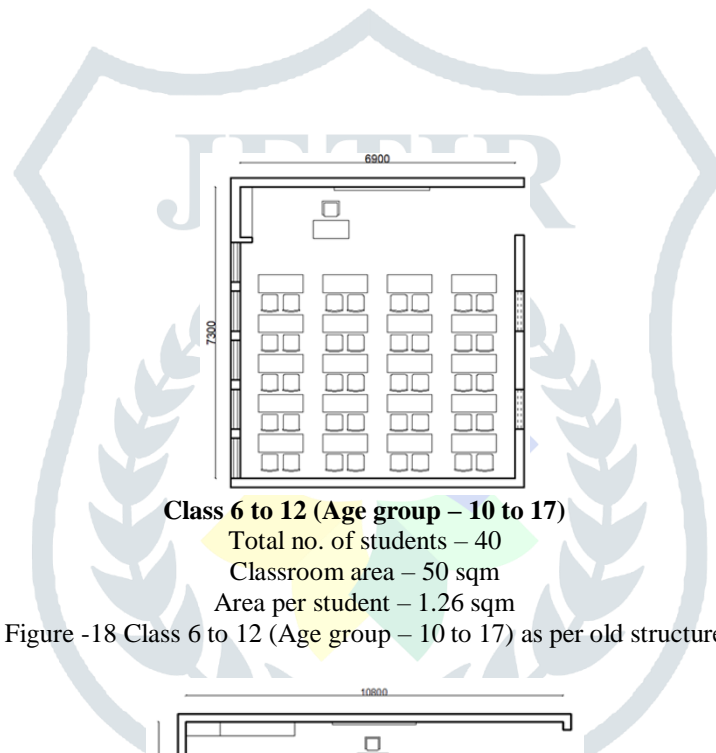
Class 6 to 12 (Age group – 10 to 17)
Total no. of students – 40
Classroom area – 50 sqm
Area per student – 1.26 sqm
Figure -18 Class 6 to 12 (Age group – 10 to 17) as per old structure

Class 9 to 12 (Age group – 14 to 18)
Total no. of students – 30
Classroom area – 100 sqm
Area per student – 3.3 sqm
Figure -20 Class 9 to 12 (Age group – 14 to 18) as per new structure

Inclusive Schools
Special Needs Classroom –
Separate classrooms are provided for children with special needs such as learning difficulties, ADHD, visual impairments for early intervention programme for such students from age 6 to 14 to provide them assistance and preparing them to adapt themselves in inclusive/mainstream classrooms. Such classrooms work in small groups. Possible layouts for special classrooms can be seen in the figure below.

5.
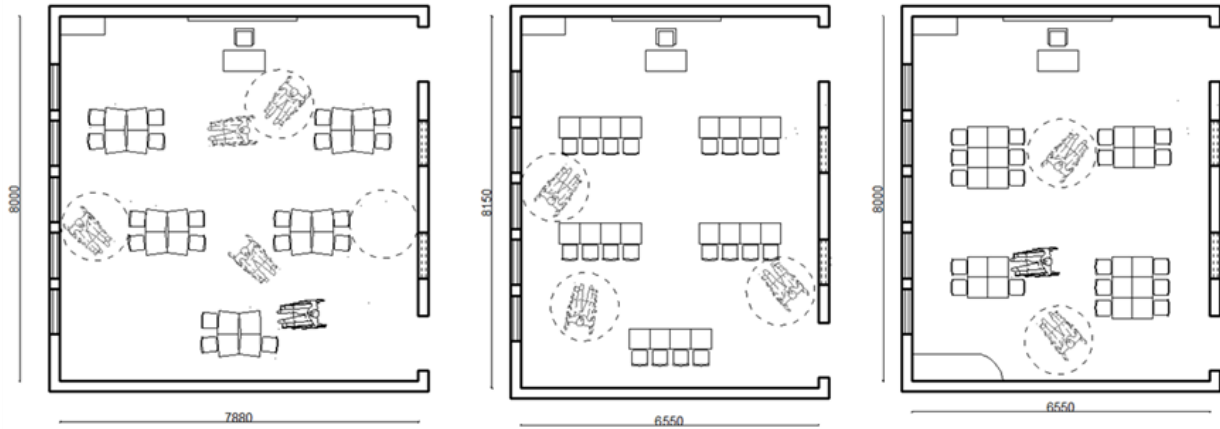
(Age group – 6 to 8)
Total no. of students – 20
Classroom area – 52 sqm & 54 sqm
Area per student – 2.6 & 2.7 sqm
Figure -21 Special class (Age group - 6 to 8)

6. Special Needs Classroom – For Visually Impaired

Such classrooms work in small groups. Space is also provided for computer system to assist students with study material.
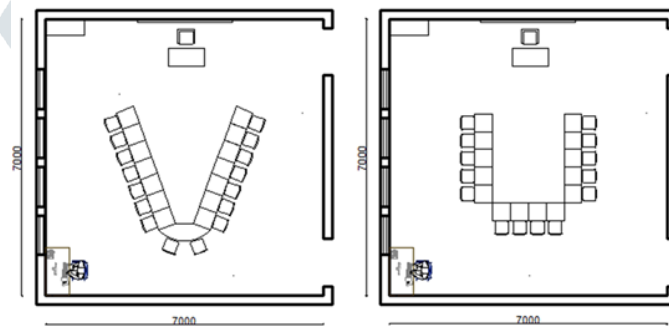
(Age group – 6 to 14)
Total no. of students – 14 - 15
Classroom area – 49 sqm – 55 sqm
Area per student – 3.3 sqm – 3.6 sqm
Figure -22 Special class (Age group - 6 to 14)

Computer Lab
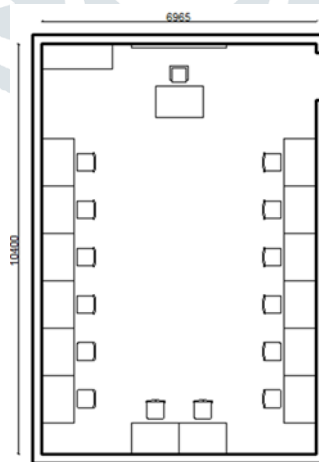
Total Area – 72.4 sqm
Total no. of students – 14
Figure -23 Computer lab for visually impaired

7. Labs – Physics
  Regular
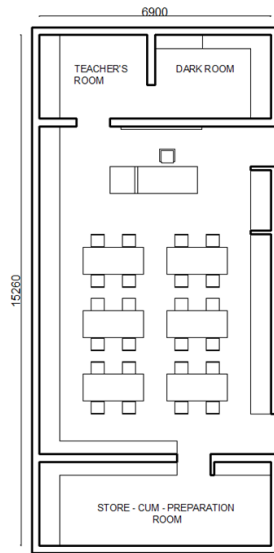
Total Area – 96 sqm
Seating – 24
Figure -24 Physics lab in regular schools
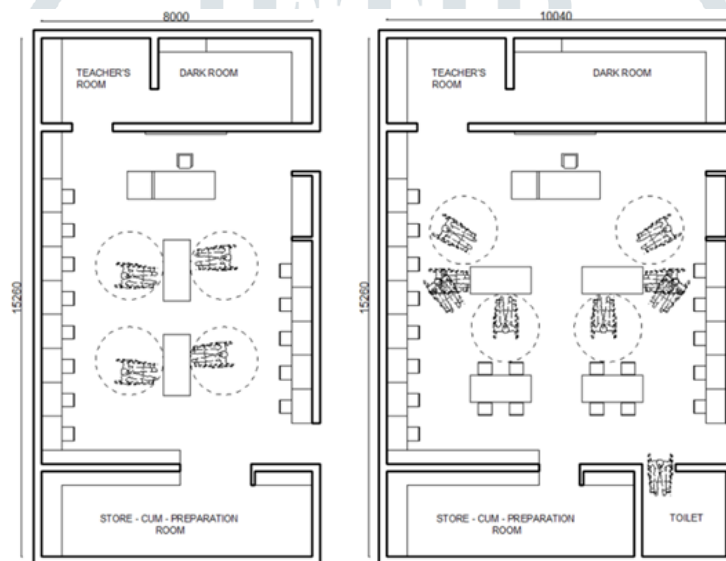
Inclusive

Total Area – 125 sqm Total no. of students – 20
Total Area – 154 sqm Total no. of students – 30
Figure -25 Physics lab in inclusive schools

8. Labs – Chemistry
  Regular
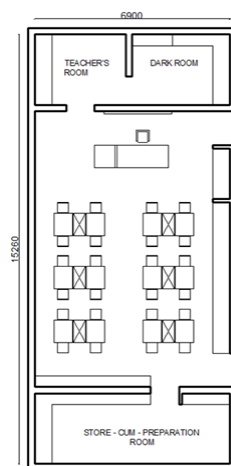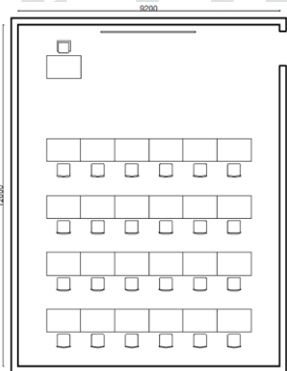

Total Area – 96 sqm
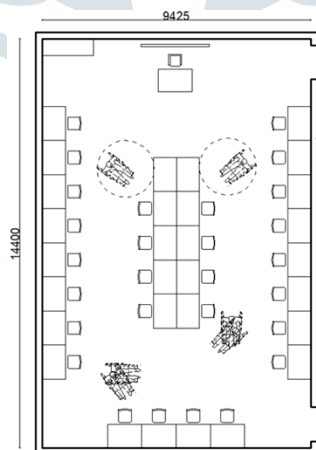Seating – 24
Figure -26 Chemistry lab in regular schools
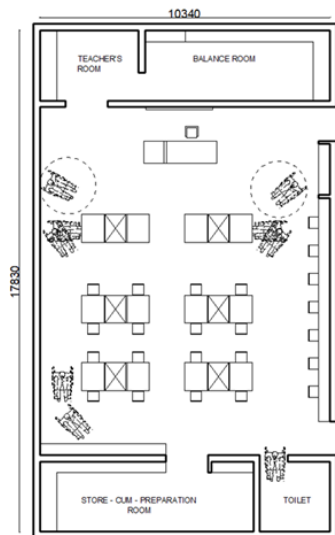
Inclusive

Total Area – 184 sqm
Total no. of students – 20 – 30
Figure -27 Chemistry lab in inclusive schools

9. Computer Lab
  Regular

Total Area – 110 sqm
Seating – 24
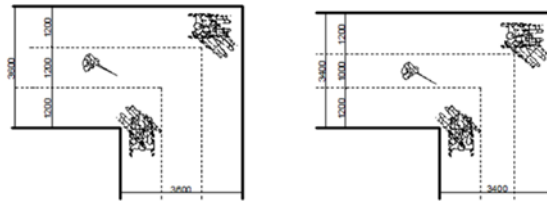Figure -28 Computer lab in regular schools

Inclusive

Total Area – 135.72 sqm
Total no. of students – 30
Figure -29 Computer lab in inclusive schools

10. Circulation Areas -
 Corridors

Case study 2   Literature study 2   Case study 1
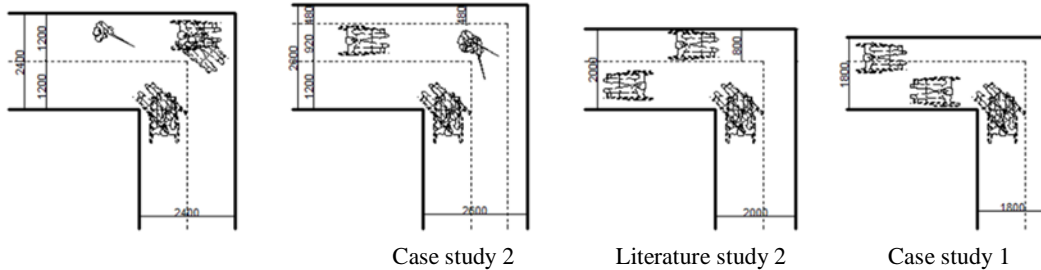
Single loaded corridor – adequate width would be 2400 mm
Figure -30 Single loaded corridor in inclusive schools

Case study 2
Double loaded corridor – adequate width would be 3600 mm
Figure -31 Double loaded corridor in inclusive schools

- Staircase – Adequate width – 2000 mm
- Ramp - Adequate width – 2000 mm
- Orientation and mobility room – 70 sqm
- Braille library – 30 sqm (reading space)
- Braille press – 60 sqm (working space + storage)
- Resource room – 60 sqm each
- Physiotherapy room – 30 sqm
- Speech and language therapy room – 15 sqm
- Circulation spaces - Some resting / informal sitting spaces should be provided in each corridor to provide support for children using mobility aids while traveling from one place to another. These spaces can also serve as spaces for interaction among students as well as for self-learning.

V. CONCLUSION

Inclusive education works with integrated education. In India inclusive schools were started by few organisations in the past with a vision of providing education to differently-abled children with abled ones under one roof. With the change in New Educational Policy and other government initiatives focusing on the change in the education of differently-abled children have given rise to inclusive schools in India by shifting from special education to inclusive education. Inclusive schools mainly require modifications and flexibility in regular schools in terms of built form, curriculum and teaching methods as well as learning areas. Inclusive schools also require teachers to be trained to identify children with special needs at early stages so that these children could be provided with individual learning programmes. There is also a need of assisstance to children with special needs in inclusive schools. Such schools should be designed in consideration of the specific nature and needs of different children being matched with the common requirements which could be suitable for all. Schools where children with physical impairments, visual impairments, learning difficulties and mental illness study together should be adaptable and give a sense of belonging to them. Children with special needs not only require physical accessibility but do require natural environment around them to work as a healing tool as they have emotional instability as well. There are different needs and nature of varied disabilities. Children with physical impairment require resting spaces or informal sitting spaces to provide them comfort for some time when they are spending hours in schools. Some Children with learning difficulties or mental illness require quiet spaces or corners also while studying. Blind children require built and unbuilt forms to be designed in such a way that encourages them to move around independently which will also be challenging and learning process for them at early stages of life. Inclusive schools have categories of classes like special classes which are provided for children at early intervention stage so that they could be trained for being able to cope up in regular / inclusive classrooms with mainstreaming curriculum. Special classrooms could function well in small groups. For classrooms to be inclusive it requires different spaces for different activities and accessibility to move around. Therefore, designing of all the spaces require different approach, areas and comfort for varied user groups.

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