Child friendly Elements for Rural Primary schools

Developmental Education Programme
Child-friendly Elements for Rural Primary Schools

an engineer's handbook

District Primary Education Programme
Introduction

Improving school environments is a very important area under DPEP Civil Works. All DPEP states are now using improved designs for construction of new schools - these new designs cater to most of the functional requirements.

However, there is scope for further improvement. Certain issues are yet to be addressed. For example, in many cases, our schools do not have enough learning spaces. Display and storage facilities are often inadequate. Also, we are yet to provide a "barrier-free environment" for our disabled children.

'Child-friendly' Elements

Certain building elements have been identified to address such issues, and make the school environment more 'child-friendly'. For example, the provision of a simple chalutara (platform) under a tree, with a chalkboard, creates an outdoor space that is usable for teaching. The provision of ramps, handrails etc. encourages children who are physically disabled.

The addition of such small features also makes the school more attractive to the child.

About this document

DPEP engineers in most states are now beginning to incorporate these elements. This document attempts to provide information, which would help them get a clear picture of what to construct.

The handbook consists of the following:

1. Descriptions of elements: Elements that have been successfully tried out are described here. The following details are provided:
   - General description and purpose
   - Photographs of elements in use
   - Hints about where to locate them
   - Typical construction method in brief
   - Technical drawings showing typical heights, widths and other dimensions
   - Item quantities of a 'typical' element. (By applying local rates to these quantities, the engineers should be able to estimate how much this kind of element would cost in their situation.)

2. Case Studies: Child-friendly elements can be easily incorporated into existing designs and buildings. Proposals have already been made for Orissa and Maharashtra.
   - Both states have two kinds of designs -
     - two rectangular classrooms
     - two hexagonal classrooms
   - (Many other DPEP states have very similar designs.)

It can be seen that these proposals have not resulted in any change to the original designs. In fact, the elements now seem to be a part of them. The proposals are shown here as case studies.

Upon going through this booklet, one can see that these elements are low in cost and are easy to construct. They do not need any special technical know-how, or new materials. Also, they can mostly be incorporated into any existing design or building. With the help of this document, all DPEP engineers will be able to easily design, estimate and implement child-friendly elements into their schools.
Low Cost Student Benches

Many of our rural primary schools do not possess furniture. Permanent benches provided along the classroom walls are very useful in these situations. Students can use these benches as seating, and also as worktops. The space underneath these benches can be used as storage, and the bench itself can be used to display models and other items.

Here ferrocement benches have been placed all along the classroom walls. Storage spaces are provided underneath.

Students using the benches in different ways - as seating, as worktops, individually and in groups.

Benchs can be provided in the verandahs too.

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Placement
The benches can typically be placed all around the classroom/verandah, except near the chalkboards and doors.

Construction
The bench seats are normally of sandstone, or precast/cast-in-situ ferrocement or Reinforced Concrete. The typical span of these could be between 900-1200 mm.
The supports are normally of 115 mm thick brickwork, of three courses so as to get the required height.

A Typical Bench Arrangement

Dimensions
The height of these benches should be between 260 and 275 mm. The width should be between 325 – 350 mm.

Quantities of a typical bench, per running meter

<table>
<thead>
<tr>
<th>Material Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>25mm thick Ferro-cement Slab/40mm thick Stone Slab</td>
<td>0.345 sqm</td>
</tr>
<tr>
<td>Brick work in 1:6 mortar.</td>
<td>0.019 cum</td>
</tr>
</tbody>
</table>
Storage and Display

Storage Spaces
At least one regular cupboard must be provided in every classroom. A typical cupboard should have open shelving below, which can be used by students, and lockable storage above, which can be used by the teacher.

Important: Small storage spaces must also be provided which can be used as personal storage spaces by children.

Placement
The regular cupboards should be near the teacher's chalkboard. The small storage spaces for children should be provided in all possible nooks and corners in the room. If benches are provided, then the spaces underneath can be used as students' storage spaces.

Wooden battens should be provided at various levels for display of educational material.

An educational chart has been hung on a wooden batten, which is provided at a lower level. Storage space is available under the benches.

Storage spaces of different heights could be provided under the benches.
**Construction**

Cupboards can be made of 115 mm brickwork, with stone or precast/cast-in-situ ferrocement or RC shelves.

**A TYPICAL CUPBOARD**

<table>
<thead>
<tr>
<th>Quantities of a typical cupboard</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>25mm thk. Ferro-cement Slab/40mm thk. Stone Slab</td>
<td>1.84 sqm</td>
</tr>
<tr>
<td>Half brick work in 1:6 mortar</td>
<td>1.45 sqm</td>
</tr>
<tr>
<td>Country board shutters</td>
<td>0.33 sqm</td>
</tr>
</tbody>
</table>

**Display Elements**

Wooden reapers with hooks can be provided at various levels, to allow for exciting display arrangements. Strings tied at differing levels would also work well.

**Typical Elevation of a classroom wall with display elements and storage spaces.**

Typical elevation of a classroom wall with display elements and storage spaces.
Lower cost Learning Spaces

In many cases, we do not have the funds to provide rooms for all classes. Here, we can provide low-cost spaces, where classes can be held. A verandah costs about 80% of the cost of a similar-sized classroom. A pavilion, which is basically a classroom-sized platform with a roof, would cost only around 60%, and a platform would cost around 20%.

Later, when funds are available, these elements can be constructed upon. A pavilion can be converted to form a classroom, and a platform can be constructed upon to form a pavilion or a classroom.

Placement
Since they can be converted into rooms, platforms and pavilions must always be located in a place which is appropriate for an additional classroom. They should be easily accessible from existing rooms, and should ideally share a plinth with them. Where possible, they can be between two existing rooms, so that two walls are saved, and the space feels more enclosed.

Construction
These elements should always be designed for future expansion. It should be kept in mind that they will later be converted to full-sized classrooms. Therefore, the foundations must be provided accordingly. It is preferable to provide permanent roofing in pavilions.

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A pavement which costs about 60% of a classroom.

A verandah which costs about 80% of a classroom.

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Plan of a typical pavilion.

Section A

Plan of a typical Hexagonal Pavilion.

Quantities of a typical rectangular pavilion as shown

<table>
<thead>
<tr>
<th>Material Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:4:8 PCC in foundation and sub floor.</td>
<td>5.03 cum</td>
</tr>
<tr>
<td>Brick work in 1:6 mortar.</td>
<td>15.2 cum</td>
</tr>
<tr>
<td>Cement Flooring</td>
<td>35.33 sqm</td>
</tr>
<tr>
<td>Roofing in sandstone and metal girders.</td>
<td>44.78 sqm</td>
</tr>
</tbody>
</table>

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Access Ramps

Ramps should be provided to help physically disabled children to climb the floors of the school.

Placement

The ramp should be straight as far as possible. It should never turn sharply. If it does, a flat landing should be given at the turning point. Normally, the ramp leads up to the verandah, which leads to the classroom. The ramp should be placed in such a way that the child can go easily from the ramp to the classroom door. The child should not need to turn sharply to do this.

The walking surface should be non-slip. Here waste stone chips have been used.

An attractive ramp has been provided here and is the main entrance for all.

Ramp provided at side of verandah, leading directly to the classroom door.

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Construction
A ramp can be made by simply creating a sloped surface with toe walls on the sides, and filling in the middle. The width should not be less than 1 m.

Walking Surface
The walking surface should be just rough enough to prevent slipping, but smooth enough so as to not have any holes. Brick paving is a common finish. IPS cement flooring can also be provided, with closely-placed grooves on the surface.

Slope
As per the IS: 4963 - 1987, the slope of a ramp should ideally be 1:12 up to 9 m length, and 1:20 above that.

Handrail
A handrail is a necessary provision next to a ramp. It could be an MS rail attached to an existing wall, or a railing, or a stub wall with hand-holds provided. The handrail should extend beyond the ramp, at least 300 mm both ways. The ends of the handrails should be bent downwards to avoid injuries.

Quantities of a typical ramp for plinth ht. - 0.45 m

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brickwork in side walls</td>
<td>1.73 cum</td>
</tr>
<tr>
<td>1:5:10 PCC in Sub Floor</td>
<td>0.67 cum</td>
</tr>
<tr>
<td>IPS Floor finish / Brick Flooring</td>
<td>6.74 sqm</td>
</tr>
<tr>
<td>MS railing on stub wall</td>
<td>0.85 sqm</td>
</tr>
</tbody>
</table>

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Outdoor Learning Spaces

External Benches
In some cases, there is a shortage of classrooms, and classes need to be held outside. Benches can be constructed, such that they enclose an area where classes can be held. The space enclosed could be of any form, a rectangle, hexagon, circle etc.

Amphitheatres
An Amphitheatre is a series of wide steps, with a stage and chalkboard in front. The steps are used for seating, while the stage can be used for teaching, as well as children’s programmes. It can be created by simply widening the steps up to the existing plinth, and adding a stage and chalkboard in front.

Chabutaras (platforms under trees)
The shaded areas under trees are very often used to hold classes. A simple low platform (chabutara) with an external chalkboard could be constructed to improve this space. These platforms can be created with leftover material at very little cost.

Here, the teacher is conducting activities on a chabutara, under the pleasant shade of a tree. An external chalkboard placed nearby helps her to conduct her classes.

Low cost external ‘classrooms’ in Mandla dist., MP, the amphitheatre seats are in the shade of a tree, and face a chalkboard. A circular set of benches has a low cost roof as a shade.
Placement of Amphitheatre
The most convenient place for an amphitheatre is in front of the verandah, with steps rising to the plinth. If it cannot be provided in this position, it should be located at a prominent spot on the plot so as to be visible and approachable from everywhere.

Construction
The amphitheatre can be economically made by providing toe walls for the steps, and filling in between.

Plan of an amphitheatre in front of a verandah.

Section through a typical Amphitheatre for plinth height of 600mm

Placement of external benches
These spaces should be placed so as to be in full view of existing classrooms. This helps the teacher to control the activities, and also allows for easy usage. They should preferably be in a shaded area.

Construction
The bench seats can be of stone or precast/cast-in-situ ferrocement or RC. The supports could be of stone or brick masonry.

Quantities for a typical amphitheater for plinth height 600mm.

<table>
<thead>
<tr>
<th>Material</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCC 1:4.8 in foundation</td>
<td>1.57 cum</td>
</tr>
<tr>
<td>Brickwork in 1:6 cement mortar</td>
<td>3.13 cum</td>
</tr>
<tr>
<td>40mm thick cement floor</td>
<td>13.32 sqm</td>
</tr>
</tbody>
</table>
Learning Aids

Geometrical figures, patterns, educational games etc. are items that are used for teaching children. These items can be included into building components such as floors, walls, window glasses etc. Thus, they become permanent "aids" for children to learn with. Floor elements should ideally be placed in group activity areas, such as in the centre of classrooms, verandahs etc. This helps the teacher to use them effectively. Wall elements can be provided both indoors, and outdoors.

Construction

Floor elements should ideally be placed in group activity areas, such as in the centre of classrooms, verandahs etc. This helps the teacher to use them effectively.

Construction

Floor patterns can be made with coloured IPS cement flooring, or with waste stone chips, as per site. The patterns can be engraved while casting or laying the floor. For wall displays, coloured cement plaster and waste stone chips are materials that could be used. Paint is normally not a good option, since it is not permanent.

Cost

The cost of these elements is negligible, and should be essentially covered in the cost of construction itself.

Geometrical patterns made with coloured IPS in pavilion flooring.

*Educational games inlaid into the verandah floor

*Game of "Snakes & Ladders" is used to teach numbering to the children.

*Educational game in flooring in Rajasthan

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Chabutras made into various geometrical shapes act as valuable learning aid.

A simple 10x10 grid made into the wall encourages all kinds of activities. The surface should be like that of a good blackboard so that children can write and wipe on it.

The window grill becomes an interesting learning aid. Care should be taken in design of grills that those which face the outside may be used only from inside, while those facing the verandah may be used from both sides.

The "Geometrical Man" made into a grill pattern.

Educational murals on walls are used as teaching aids.
Chalkboards

Teachers' Chalkboards
Chalkboards should be provided in all places where classes are held – in classrooms, verandahs and also in outdoor teaching spaces.

Placement
In rectangular verandahs, chalkboards should be provided at the shorter ends, as shown. This makes the verandah more usable as a teaching space.
Outdoor chalkboards should be placed near external benches, under trees, with amphitheatres, etc. as per site requirements.

Construction of External Chalkboards
A simple freestanding wall can be made of the required height and width, and the chalkboard can be made on it in cement plaster.

Children's Chalkboards
Attractive children's chalkboards should be provided on the classroom verandah walls. These can be in various shapes, of animals, fruits, geometrical figures such as hexagons, triangles, etc., as shown.

Placement of Children's Chalkboards
These boards should start from 150mm above ground level and can go up to 1350mm above ground level.

Some interesting shapes which can be used to make children's chalkboards.
Qu quantities for a typical external chalkboard as shown:

<table>
<thead>
<tr>
<th>Material</th>
<th>CM</th>
<th>SQM</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCC 1:4:8 in foundation</td>
<td>0.157</td>
<td>2.5</td>
</tr>
<tr>
<td>Brickwork in 1:6 cement mortar</td>
<td>0.82</td>
<td></td>
</tr>
<tr>
<td>1:5 cement plaster for chalkboard</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Section through outdoor chalkboard.
Play elements such as slides, swings etc. can be made at very little cost, and make the school environment more attractive.

Placement
These play elements should be provided in front of the classrooms, so as to be in full sight of the teacher always. They should ideally be placed in a sandpit, to avoid injuries. Masonry slides can be placed next to ramps, as shown.

Construction
Local cheap materials should be used to make these elements. Stone or brick masonry can be used to make the slides. Attractive coloured IPS cement finish should be provided on all possible surfaces. Some other low-cost play elements that can be provided are: playhouses, bamboo jungle-gyms, maze of brick walls, crawl-through arches etc.
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