suhrid palsule | Prof. K. Munshi

redesign of school amenities:

sanitation

Background, introduction and objective

Why sanitation in schools?

- sanitation equipment and hygiene tend to get a lesser priority in schools.
- analyse the role of sanitation in schools and
- **design sanitaryware for schoolchildren**.

Initial project brief: To re-design sanitation facilities for schools in India.

Sanitation in schools

Schools in India

- Varied
- Diverse
- Lot of load- students

Why this project

- Interest in sanitaryware
- Personal experience (KV's, Govt. schools)
- Children
- Mass-application

School boys

Essential aspects of the project.
The central gray area represents the zone of work.

http://yoomilee.files.wordpress.com/2006/10/nilpur-school-kids-with-letterswp.jpg

What Product

To redesign one or more of the following;

Washbasin, **Urinal**, WC, Faucet, fixtures, Combination

Why;

- Frequency of use
- Needed in large numbers*
- Gender specific design
- Unique product interaction in schools(explained later)

SSHE: School sanitation, Health and Hygiene, MoHRD

- Comprehensive guide
- Start to finish

The project initially involved the whole range of school amenties, and getting feedbak. it was found that, the whole are]rey to orvemr

*- 1 per 20 boys and 1 male teacher [source SSHE- A Technical note series, 2008]

Schoolkids

School boys

Typical behavior in schools:

- Very energetic
- Hyperactive

Tentative Design criterias for product

*- 1 per 20 boys and 1 male teacher [source SSHE- A Technical note series, 2008]

Understanding the problem

_information collection

From people (exercises/ meetings):

3.1_Creativity sessions(common age group, mixed) [2]

3.2_Focus group discussions(teachers, students) [2]

3.3_Interviews- staff, parents

3.4_Photo study - school, existing products

3.5_Written feedback- Parents

From books:

3.6_School Sanitation and Hygiene(MoHRD)

The Bathroom(Alexander Kira)

From the internet

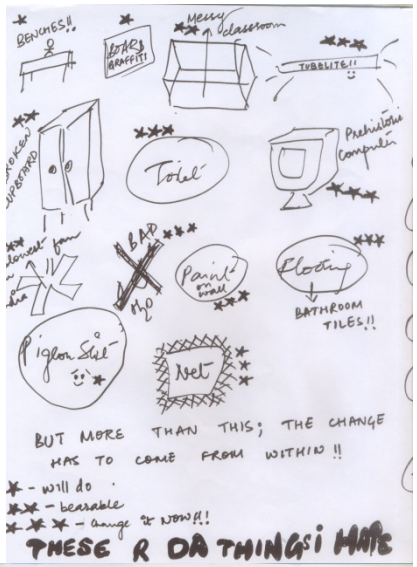
(Study of current scenario- synchronic analysis):

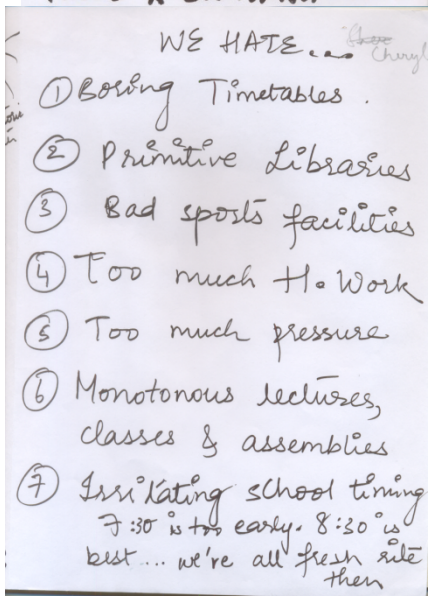
3.7_School toilets, Urinals

Technology :

3.8_Flushless urinals, Material study, Auto flushing

http://en.wikipedia.org/wiki/Focus_group





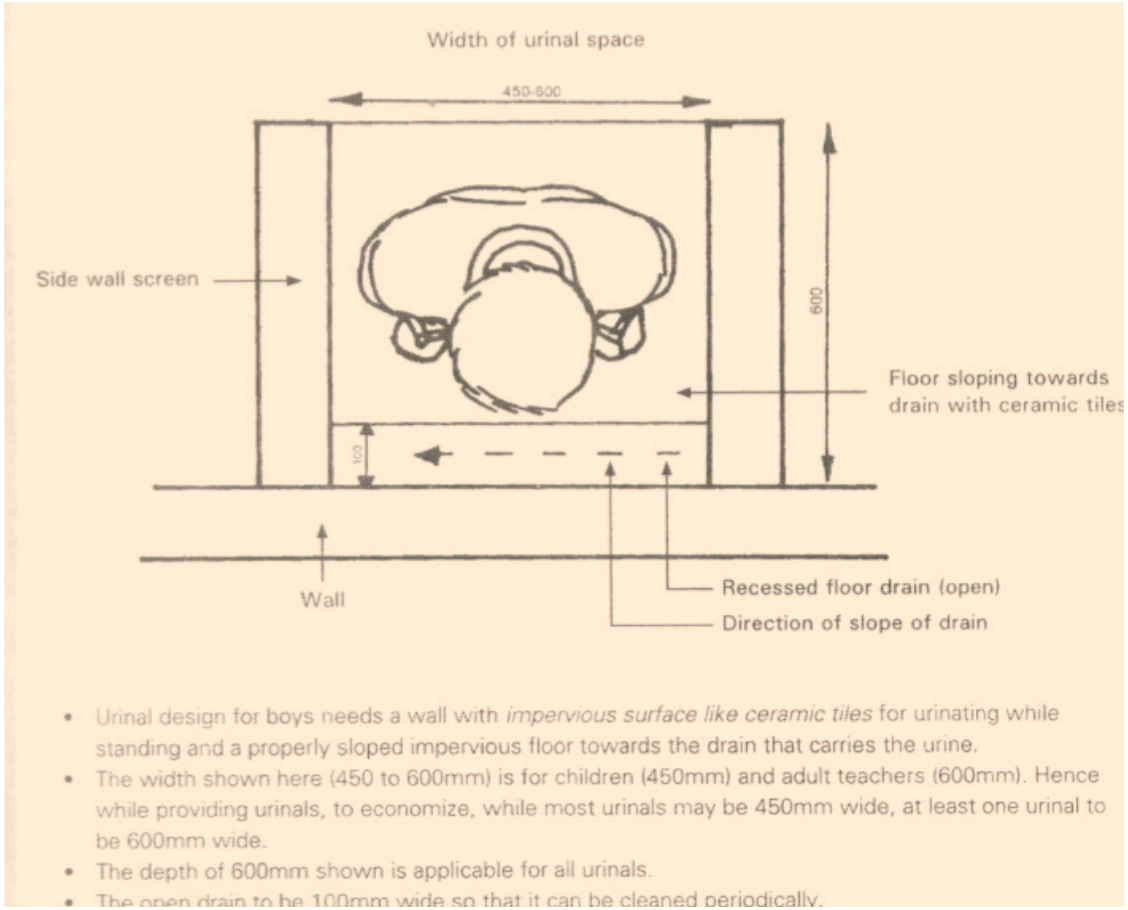
Name: **Age:**

FEEDBACK FORM: As part of a student project currently underway in IDC IITBOMBAY, feedback is sought from parents with respect to **SCHOOL SANITARYWARE**, and issues associated therewith. Kindly highlight any concerns/ issues one might have regarding the condition of school sanitaryware, namely; ***Urinals***(boys) and ***washbasins***. Any information provided would be valuable to the project and will be used solely for that purpose only. Please feel free to elaborate on what is needed in this KV and other similar schools.
[The following images are given for reference purposes only].

_For boys urinal

- Mounting at suitable height for the smaller kids
- Sensor operated flush
- Disinfectant dispenser
- Exhaust fan(for bathroom)
- Flush-less urinal

Survey conducted by SUHRID PALSULE for his M.Des. degree project titled "School Sanitation", under the guidance of Prof. K. Munshi, IDC IITBombay. (Oct 09)



- Urinal design for boys needs a wall with *impervious surface like ceramic tiles* for urinating while standing and a properly sloped impervious floor towards the drain that carries the urine.
- The width shown here (450 to 600mm) is for children (450mm) and adult teachers (600mm). Hence while providing urinals, to economize, while most urinals may be 450mm wide, at least one urinal to be 600mm wide.
- The depth of 600mm shown is applicable for all urinals.
- The open drain to be 100mm wide so that it can be cleaned periodically.

pictures were taken on the morning of 09th Aug '09 between 1000 to 1100 hrs.

_issues discussed

School benches : cramped, no space for bags, instrument of nuisance, vandalism

Sanitation : too many users, subject to abuse, dirty, difficult to clean

Classroom smells : (proximity to toilet), safety issues, security

Desks : too small, no space to keep books, Mica desks, need storage space

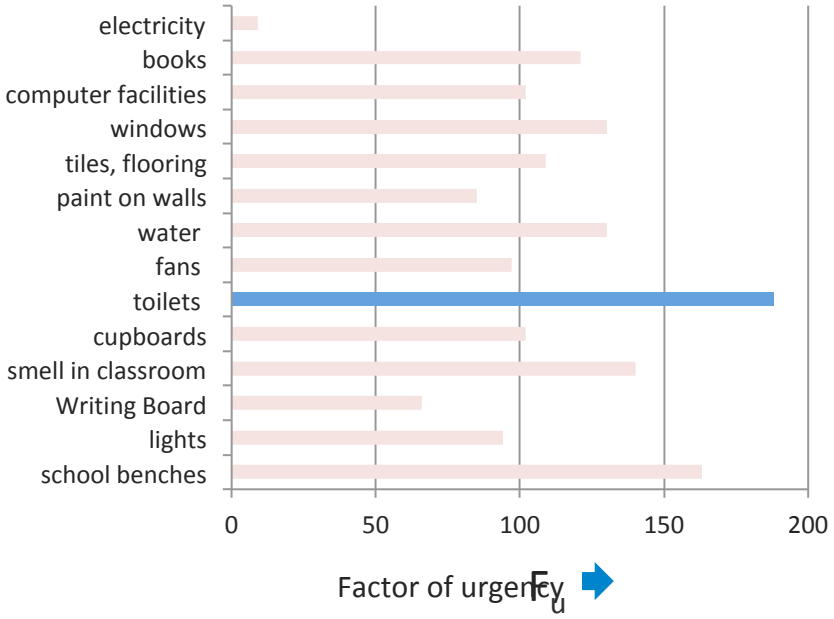
Storage space : lockers for every student, pigeon holes

Monsoons : raincoats, umbrellas, need drying area

OHP : for every class

White Board Mathematical (geometrical) instruments

Teaching Aids : maps, globe, models for science manual



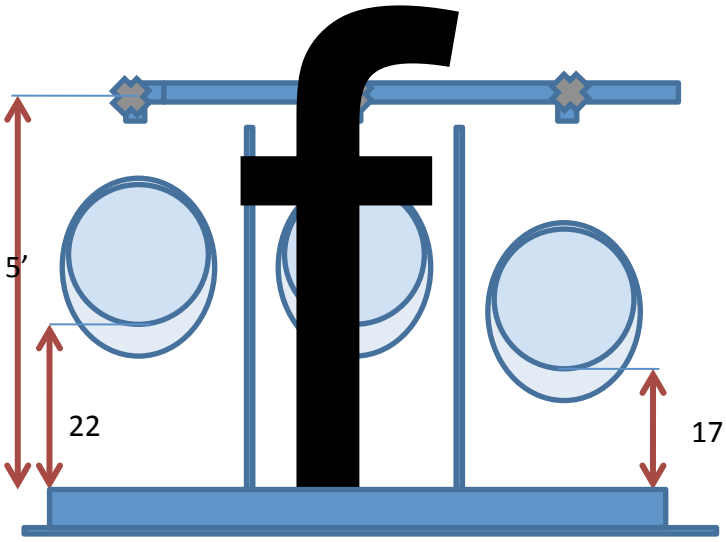
Shows a picture of a washbasin in the particular school, used for study. The unit is constructed on site and is very crudely built. The dimensions are completely inappropriate for use and the essential features like a slope towards the back, placement of drain and faucets does not adhere to any standards.

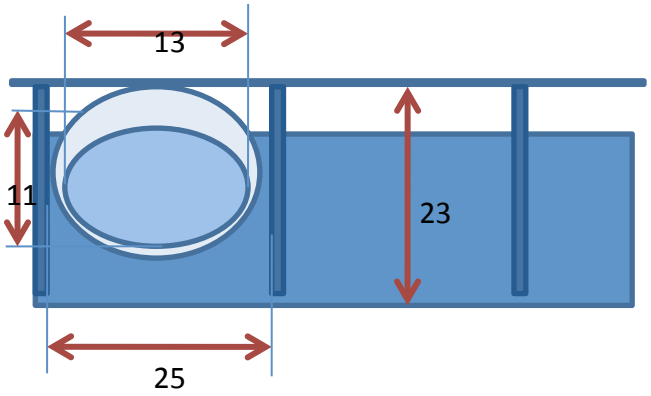
2- the picture shows the cleaner filling water for washing the toilet. He must stand in the awkward square(which, by itself Is difficult to clean) and haul the water from that point in a separate bucket.

3- the platform on which the student is supposed to stand while using the washbasin Is highly incorrect

4- Urinals absent, Waste accumulation in gaps between tiles, Odour generated as a result, cleaning problems. Flushing system absent.

FRONT ELEVATION





All dimensions in inches

_sanitation

_students

.need more toilets
.unclean
.tiles are slippery, always dirty
.broken tiles, fixtures
.taps are loosely mounted/
leak/too tight
.don't like touching anything
.drinking water system is dirty, U/S
.placement of basin
.bad odor, smell
.water gets over
.operating the tap
.cubicles need hooks
Toilet seats are dirty
.latch on cubicle door is dirty/ too tight

_teachers

.too many users
.subject to abuse
.always dirty
.difficult to clean
.safety issues, girl's needs
.dull/gloomy feel

_staff

.tiles difficult to clean
.maintenance impossible during school hours
.bad lighting

_why KV?

Government organization – funding, admin, resources
Largest chain [981 schools nationally]
Self experience
Standardized nationwide – operations, infrastructure

_project scope

_Concepts

Modularity
alternate materials
Ease of installation
Factory fitted/
maintained
Vandal proof, safety
issues
Long-lasting
Changing attitude
towards sanitation
saving water
India specific solution
Removing

dependency on
mason/contractor/
architect

_Products

washbasin
urinal, WC
faucet, fixtures
combination
?

_tentative project brief

To design sanitation facilities for schools (KV's)

_Issues to be addressed

Ease of installation
Ease of maintenance
Proper student-toilet ratio(modular)
Vandal proof, safety issues

Current situation of urinals in schools

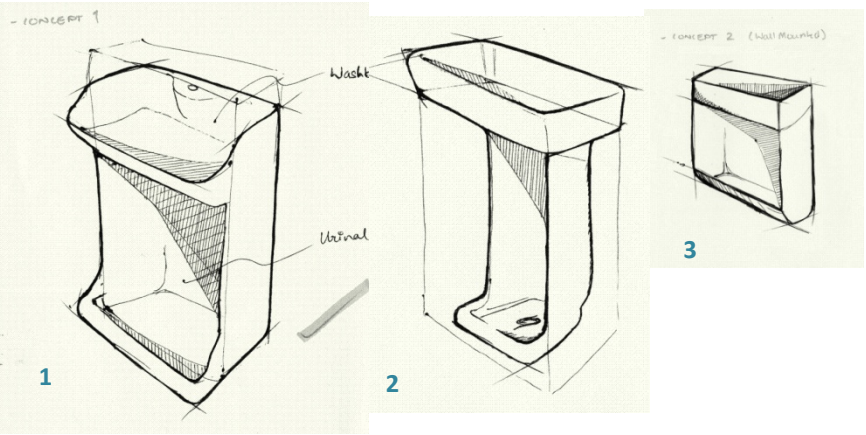
product	remarks			Selected/ not
WC	How is it diff from home?			
urinal	maximum usage(gender specific product)- **Awesome!**			
wash basin	Too complicated			
faucets	too wide a range, no schools specific issues			
cubicle doors	trivial			
drinking water dispensers(DWD)	separate entity, low priority			

Issues with urinal

Problem	Source of Information	Cause	Possible solutions
Repulsive	Student, Parents, self-observation	Unclean, big, bulky form, smells	Unclean-Regular cleaning, easy-to-clean, easy-to-reach surfaces Form- compact, proportional to kids' body sizes Smell- reduce inside surface area
Outside, top surface unclean	self-observation	Surfaces difficult-to-reach, -to-clean. Fixtures, Plumbing makes things harder to clean	Make all surfaces easy to reach, to clean.
Surfaces difficult-to-reach, -to-clean	Cleaning staff, Self	Little space left in urinal cubicle	Smaller, compact urinal. Less volume
Big, intimidating	Parent's accounts	Urinal size too big, inside surface too open	Smaller, friendly-looking urinals
Not suitable for Children	Dull, uninviting,	Bad flushing system,	Child-friendly
Manual Flushing is a put-off	Parents, Students	Flush handle/ faucet is dirty, location is unsuitable. It is also a separate *post-act a*ctivity and calls for courtesy and patience in the user.	Automatic flush

ideation

_urinal+washbasin

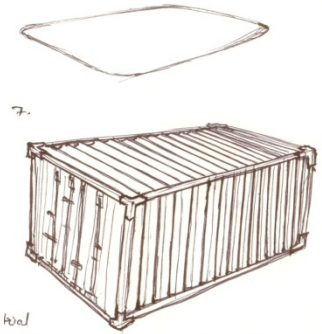


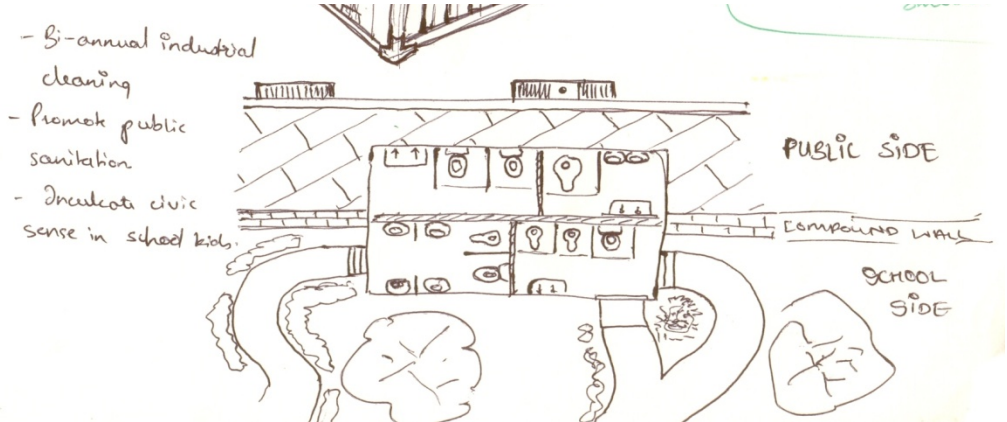
_installable temp. toilet

_mobile infrastructure. Material re-use

_bi-annual industrial maintenance

_open to atmosphere, loss of pressure

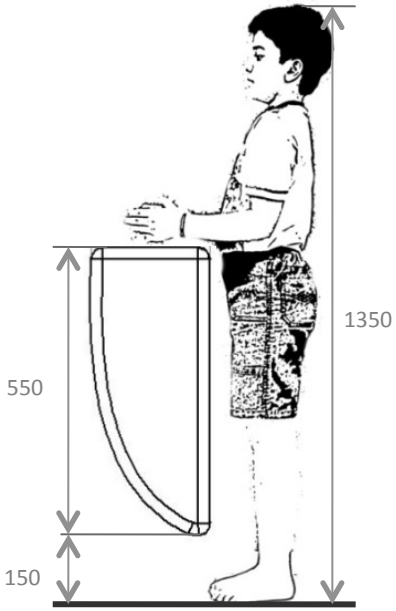




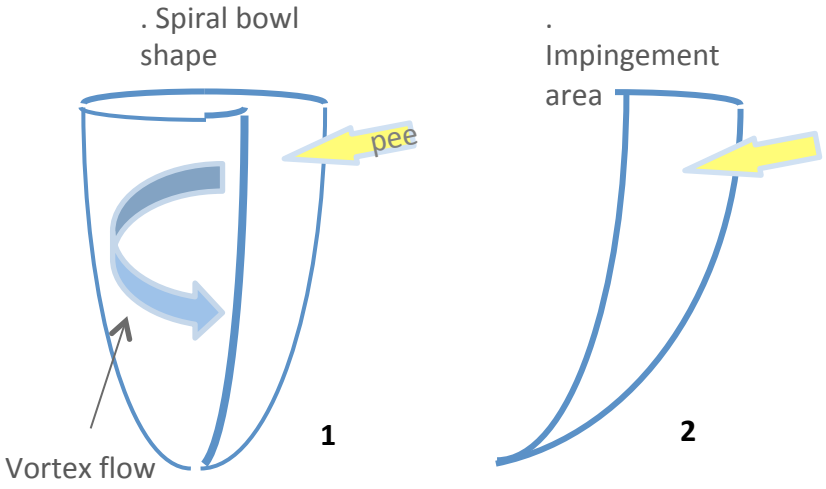
concepts

6.1_Concept 1

The Aim- To reduce splash from the inside surface of urinal
The premise- Splash can be controlled by limiting the striking angle of the stream to a small value.
The solution- by providing a form that has a circular shape, it is ensured that the urine always strikes the surface tangentially(see fig).
Features;
•Curved shape to reduce splash back
•Unique form



Above dimensions in mm



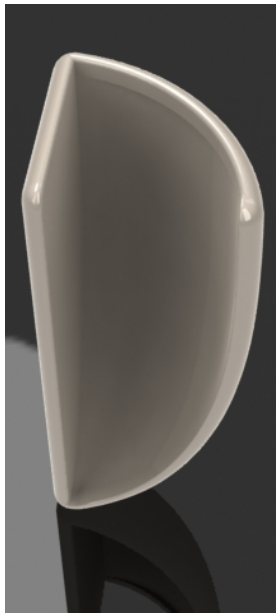
Advantages:
Splash control
Elegant form

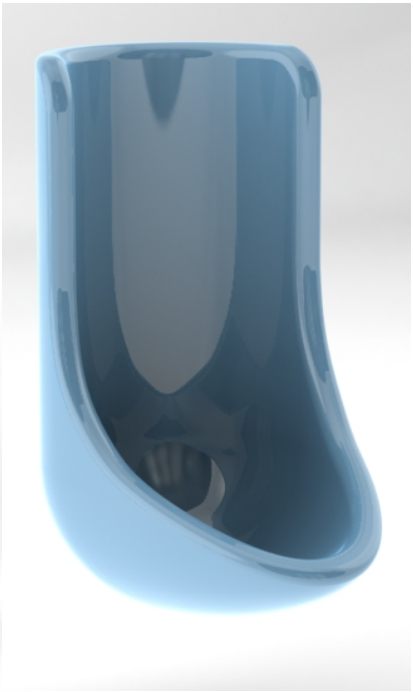
Disadvantages:
No pan at front.

Concept 1 & 2

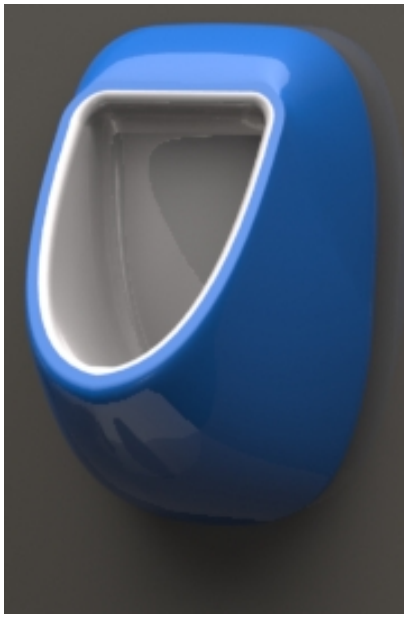
Concept 3 & 4

roundup





Final concept



_Compact urinals

"..reasonable reduction in size.. and better ergonomics. . "

Advantages

- Ergonomics:
- Better access- can come closer
- Reduced chances of spillage/ splashing
- Reduced demands for stream control on part of the user
- Reduced splash(form dependent)

Efficiency/ Saving:

- Smaller volume= less material
- Lesser space consumed in room
- Lesser surface area= less flush water needed

Washbrook FloWise™ Pint Urinal System

DURAVIT-Starck

Starck 3 - Urinal | DURAVIT

Steward Waterless

http://images.google.com/imgres?imgurl=http://www.waterwisetech.net/20.jpg
http://www.architonic.com/imgProSat/duravitsat/Starck1_083432.jpg

Rig pictures

1. Deciding dimensions of frame
2. Front face options , side view options

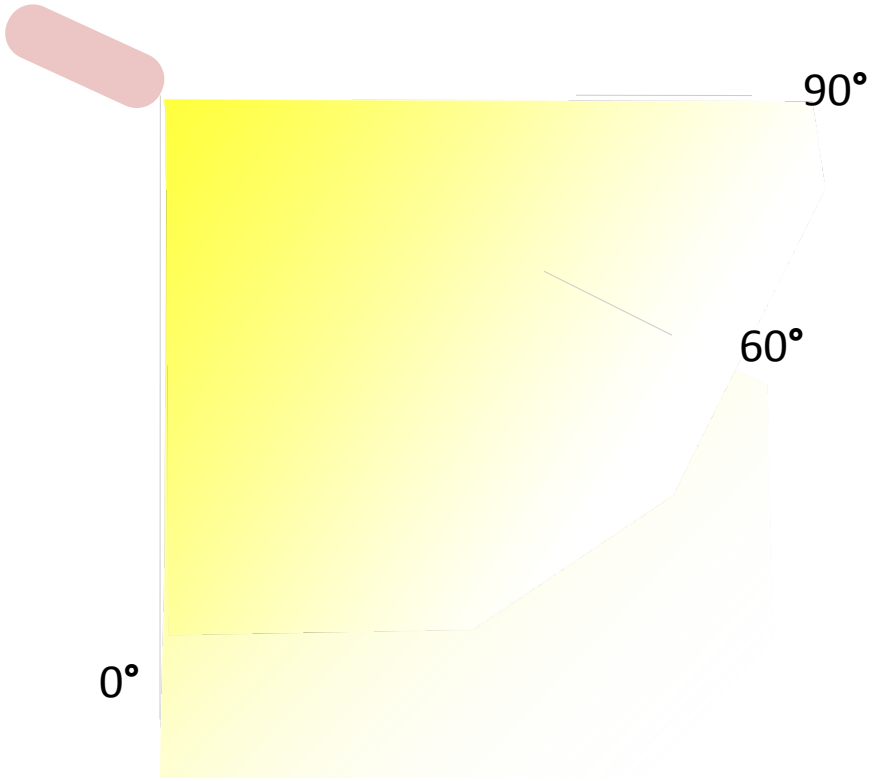
Deciding dimensions (and form): (ergonomics)

Depth and inside surfaces

- **Pee angle story: dick-urine path(top and side) give Kira reference**
- **Show counter surfaces (15 and 30 degrees), show strike angle and rebound paths**

- **Tell about process in mind(deep drawn or slip casting, and avoidance of undercuts)**
- **Then speak about splash-proofness and show final form**

Process technicalities



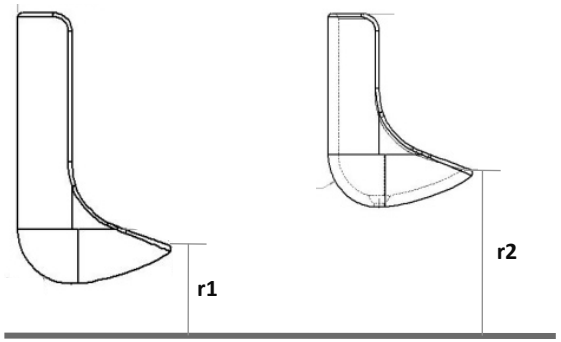
“In the course of normal urination, the angle formed by the maximum trajectory rarely exceeds 60 degrees from the vertical (with the notable exception of small boys)..*”
Hence range considered= 0 to 90 degrees.

***- Kira, Alexander; The Bathroom, 1979**

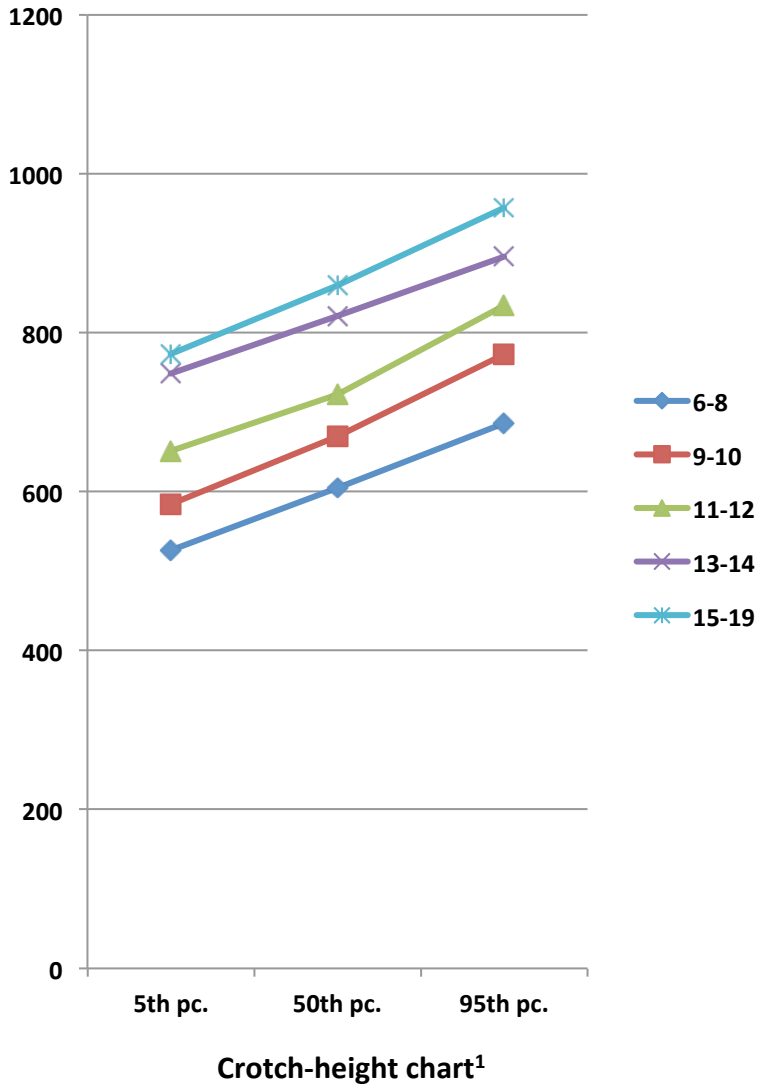
_Mounting height for urinal

"*mounting-height* - height of the lowermost point of the urinal bowl rim, (shown in diagram)"

- very diverse range of body-sizes,
- need different mounting heights for the urinal
- that it is easily accessed by all



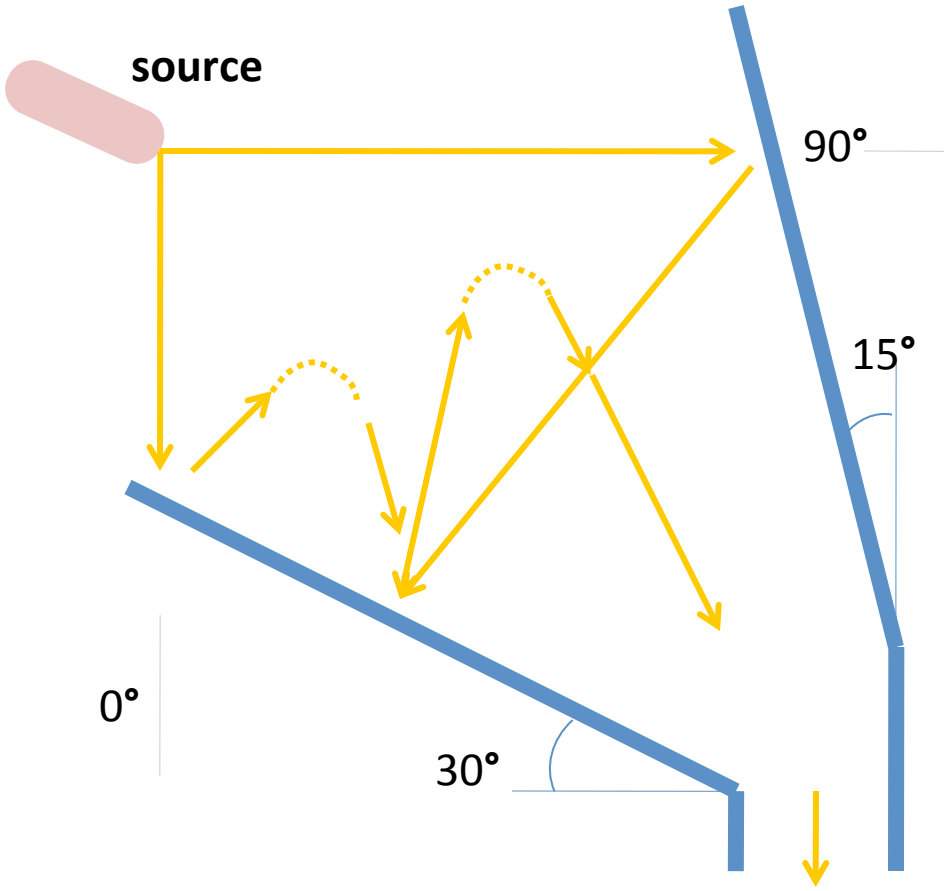
r1, r2 ="Rim" height [Mounting height parameter for urinals]



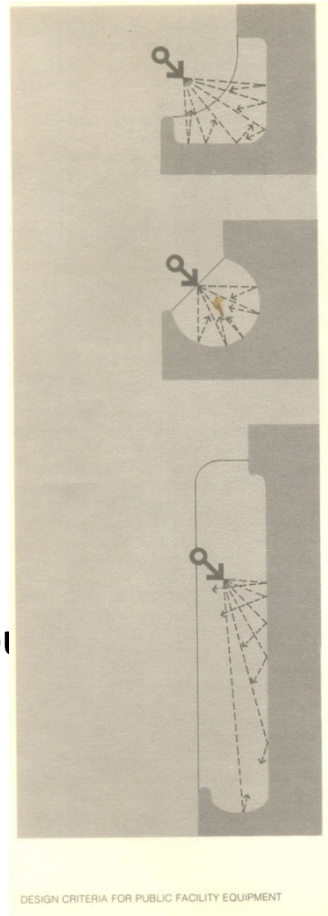
Crotch-height chart[1]

1- Ray G. G., Sadhu N.;- "*Anthropometry of Indian School Children*", Ergonomics Cell, Industrial Design Center, Mar 1986

Urinal bowl ergonomics 1 (side)



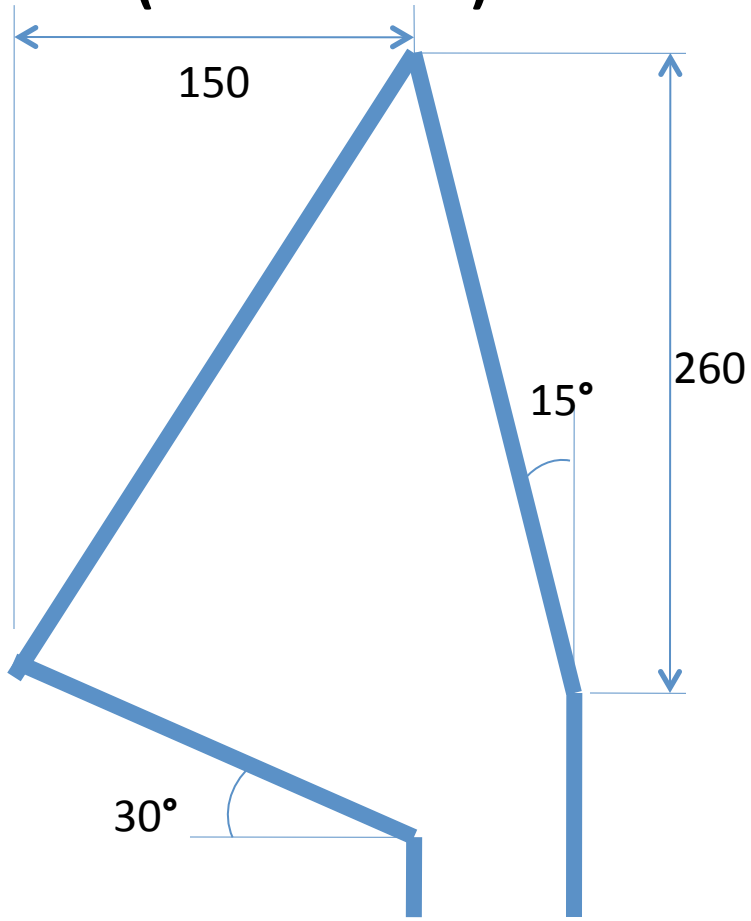
: the fig on the right are scans from the same book. Image 1 and 2 show the various sectional possibilities for a men's urinal and the "splash" controlling ability in each of them.



- The main surfaces (back and bottom) are designed such that the rebou of the urine stream is contained within the bowl.
- The angles deduced from this method are 15° and 30°

Urinal bowl ergonomics 2 (side & front)

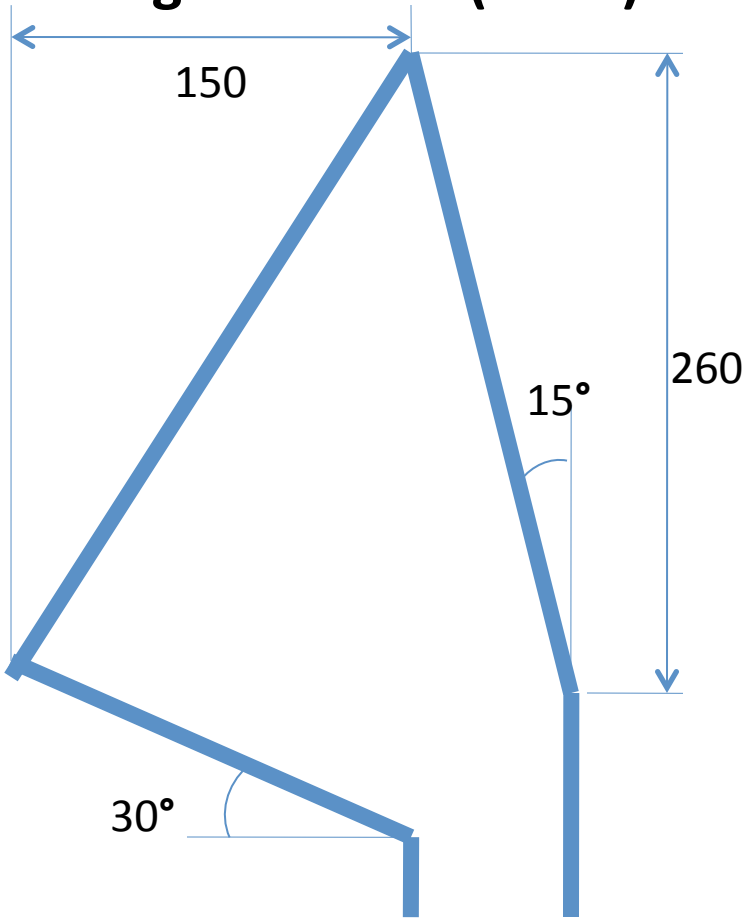
source

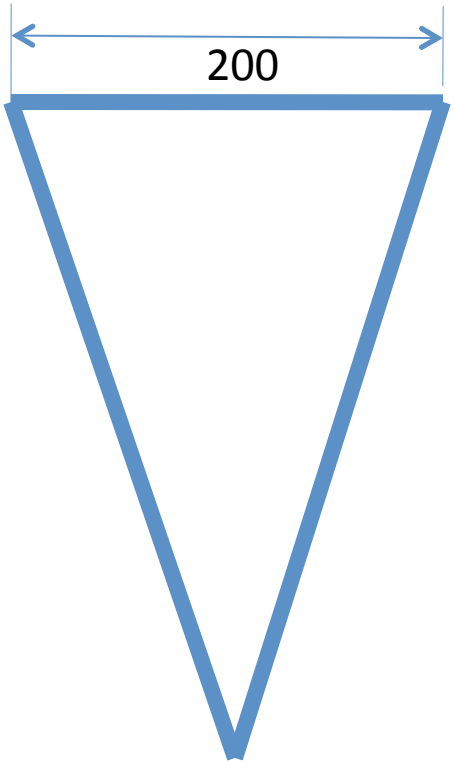


- The main surfaces (back and bottom) are designed such that the rebound of the urine stream is contained within the bowl.
- The angles deduced from this method are 15° and 30°

Urinal bowl ergonomics 2 (front)

source





- **260 mm. is the height difference between the two mounting heights**
- **The depth is kept at 150 mm.**

Flushing

- the second part of the process.
- In schools (as all public places), ppl. don't like to flush.
- Malfunctioning flushes make urinal unclean, unhygienic, and sometimes, waste a lot of water, if broken
- Auto-flushing, or sensor-operated flushes offer an excellent solution to both problems
- Needed badly in schools
- Reasons:
    - Flush tap is either too high, awkwardly mounted or dirty*
    - Manual flushing requires operator to either open the tap before the act and close it after, or wait for adequate water to flow, post-operation(courtesy flush). Both activities are disliked by kids.
    - Kids are always in a hurry. Hardly ever use the flush
- Hence Auto-flush is necessary in a school toilet.

*- feedback from focus group-

Product development

•It was observed that the quality of masonry and general installation work was poor.

• In order to ensure proper functioning of the product, it is proposed to integrate the auto-flush and urinal bowl in 1 unit

•This can be achieved in the foll. Ways;

•[show casing go from just on top to rim to full covering]

•From full steel to semi plastic to steel and plastic

•Then speak about advantages of having a casing

*- feedback from focus group-

Flexibility in design

[Materials, etc.]

- **First considered fully in plastic. Then in steel and plastic, ceramic and plastic, fully in ceramic, enamelware and plastic, etc**
- **in The same form can be implemented in a number of material possibilities.**

(ceramic, steel, enamelware and plastic)

- **This can be achieved in the foll. Ways;**

*- feedback from focus group-

Design justification/ validation

- **AF: cant put in walls as masonry is bad.**
- **Wish to make a single industry manufactured unit**
- **Bottom drain vs. side drain- fine for both**
- **Maintenance- none.**

*- feedback from focus group-

costing

- **Tabulate**
- **Write list of parts, volume, sp wt, weight, cost/kg and cost of material, plus manufacturing costs and other overheads etc.**

•

*- feedback from focus group-

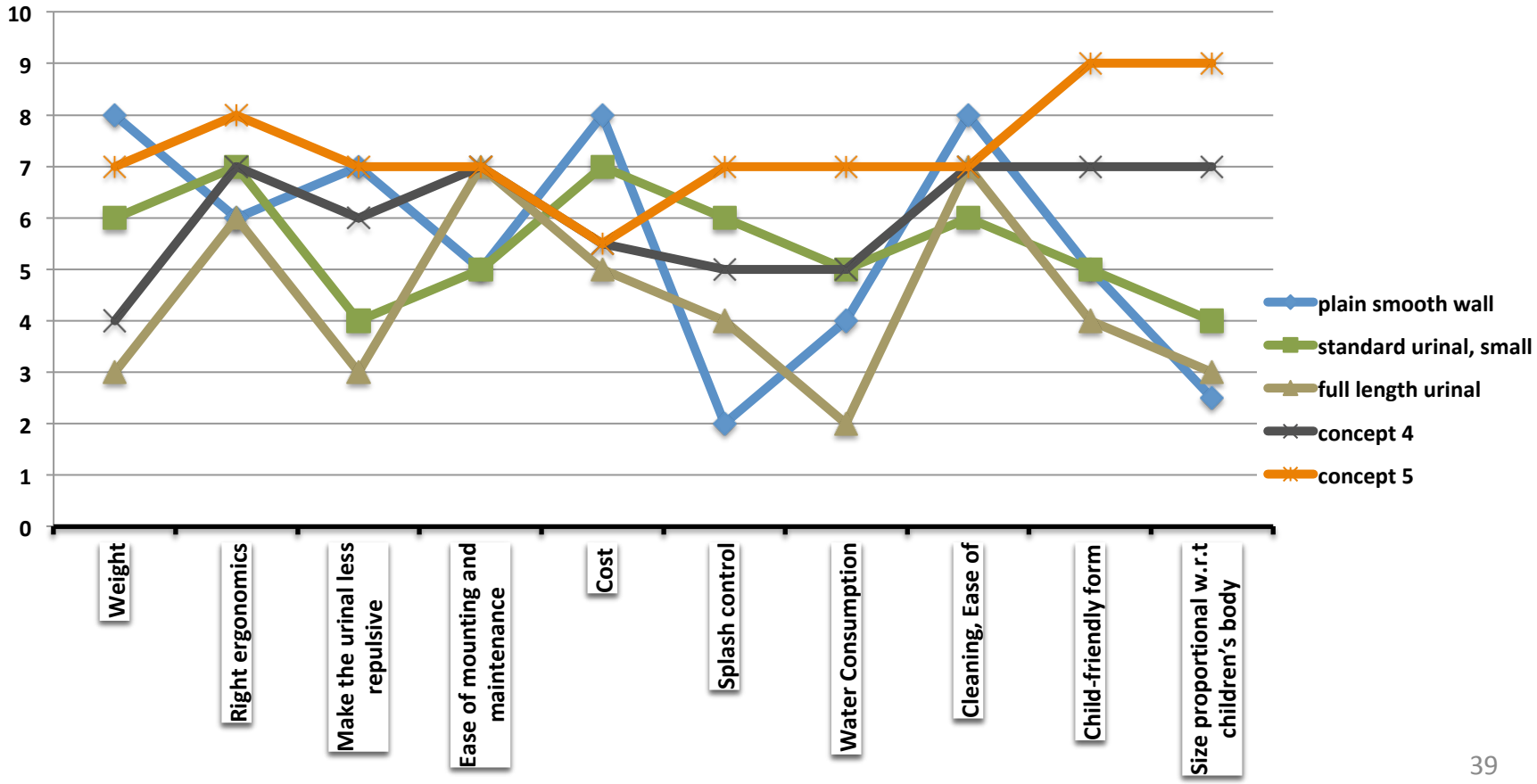
8.1_EVALUATION
Product Analysis and Comparison

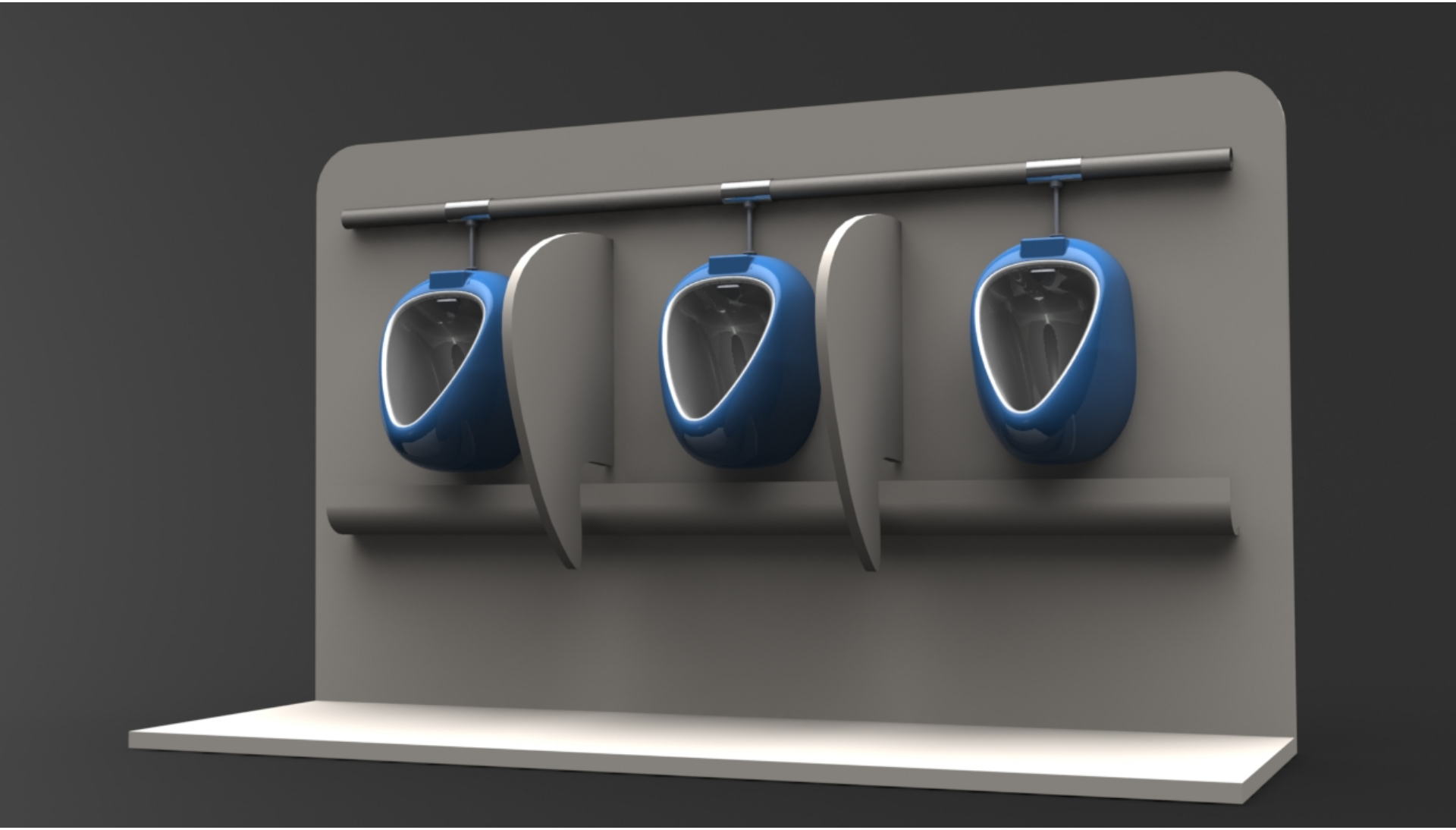
Small urinal

Full length urinal

Concept 4

Concept 5





references

_references

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•**Ray G. G., Sadhu N.- "*Anthropometry of Indian School Children*", Ergonomics Cell, Industrial Design Center, Mar 1986**

•**Ministry of Health and Education, UNICEF- "*School Sanitation and Hygiene Education- Technical Note Series*", July 2008**

_acknowledgements

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Mr. & Mrs. Janardhanan

friends