ARCHITECTURAL DESIGN GUIDELINES **FOR SCHOOLS**

TECHNICAL SERVICES BRANCH

Facility Planning & Architecture Section

November 2012

TABLE OF CONTENTS

Cover image:
Lawrence Grassi Middle School
Canmore, Alberta
GEC Architecture
Photo by Architect

INTRODUCTION

"Alberta is to be known through its architecture as a place of innovation, excellence, technology, creativity, strength and beauty."

-Government of Alberta Infrastructure Department Policy Statement
"Design Excellence", Policy Number 01241

The Ministry of Infrastructure advocates for the value and benefit of architecture and urban design in order to raise both the quality and the profile of Alberta's built environment, and to demonstrate leadership, collaboration, creativity and accountability in its pursuit of design excellence.

Quality of space and quality of experience are core architectural concepts which are often challenging to express in the two-dimensional realm of spreadsheets and procedural documents. While poor design is readily apparent to most, good design can be so subtle that it may go completely unnoticed. In the process of satisfying demanding technical and temporal requirements for a new project, spatial and experiential quality may be overlooked or taken for granted, and although the finished product may be perfectly *ADEQUATE,* it may miss opportunities to fully engage and better serve its users and its surroundings.

ARCHITECTURAL DESIGN GUIDELINES **FOR SCHOOLS**

As a building typology, schools offer an exciting opportunity for architects and owners to surpass the basic requirements of utilization formulas and functional programming; design excellence recognizes the value of architecture to create an environment which enriches the lives of its users, inspires learning and creativity in teachers and students, and contribute to the vitality, pride, and identity of the community.

This guide provides an overview of best practices in contemporary school design from around the world, and is intended to serve as a point of departure for architects and owners in the holistic, artistic, and humanistic design of modern educational facilities.

-Technical Services Branch, Fall 2012

SECTION 1

SCHOOL PLANNING TYPOLOGIES

01

What are the five basic school planning **TYPOLOGIES**?

Top Image:
Denver School of Science & Technology
Denver, Colorado, USA
Klipp Architecture
Plan by architect

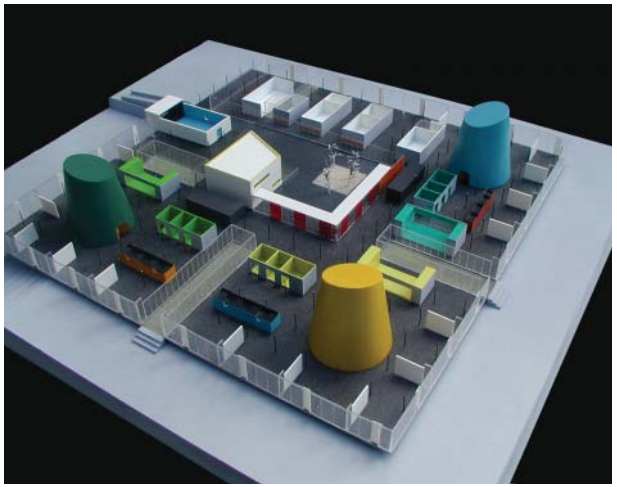
Bottom Photo:
Raholt Secondary School
Raholt, Eidsvoll, Norway
Kristin Jarmund Architects
Photo by Architect

BACKGROUND

The spatial organization of schools typically responds to teaching pedagogy, student demographics and site restraints, however, most schools exhibit characteristics of one or more of five basic planning typologies:

1: SPINE/STREET

Major school functions are situated along a central linear space (simplifies wayfinding and reduces secondary circulation). The spine/street is an active, inhabited space - a building focal point rather than a simple conduit. Situating the main entrance at one end establishes a strong axis which is often expressed in the massing of the building. High ceilings and clerestory windows for natural light and ventilation, as well as careful selection of materials and furnishings creates a welcoming, desirable "heart" of the school.



2: CITY/TOWN

the urban/city layout is reinterpreted as a loose composition of forms within a matrix of open, flexible social spaces. Classrooms are informally located around the library and "town hall" (main

gathering space). The resultant "plazas", "streets", and "parks" create flexible, student-scaled learning and instructional spaces; common in primary schools where the familiarity of the city/town fabric instills a sense of community and society.

3: ATRIUM/OFFICE

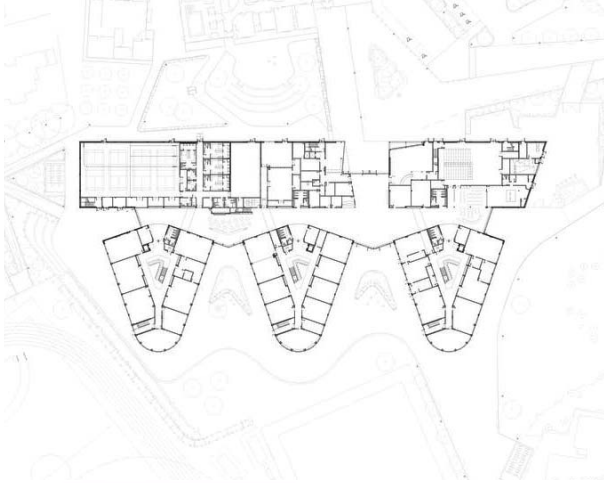
Modeled after the "typical" office environment, this scheme is best suited to large multi-storey high schools. A full height atrium serves as the main organizational hub, bringing daylight into deep floorplates and creating a unified, central gathering and circulation node. Open floor plans utilize glazed partitions to access light and views, and to define classroom spaces.

4: STRAWBERRY/LEARNING CLUSTER

Classrooms, support, and flexible spaces are clustered into smaller groups ("strawberries") and connected by a central core providing circulation, social and shared spaces. Schools are divided into less intimidating faculties and may specialize in particular subjects or simply foster closer student/staff relationships. The core may include most or all of the characteristics of the Spine/Street typology (also referred to as "Strawberry/Spine").

5: COURTYARD

Providing security, visual focus, and a sheltered microclimate, courtyards vary in size and shape while offering flexibility for year-round activities. Provision of a courtyard may increase the amount of building envelope and circulation space required (especially if corridors are single-loaded), however benefits include better access to natural light, views, ventilation and more pleasant interior spaces.



Top Photo:
Orestad College
Copenhagen, Denmark
3XN
Photo by Adam Mork

Middle Photo:
Bristol Metropolitan College
Bristol, UK
Wilkinson Eyre Architects
Plan by Architect

Bottom Photo:
Oslo International School
Oslo, Norway
Jarmund Vigsnaes As Arkitekter
Plan by Architect

SECTION 2

EDUCATION MODEL TYPOLOGIES

BACKGROUND

Approaches to the philosophy and delivery of education are constantly evolving in response to changing attitudes, technologies, and evidence-based design. Within this broad scope, however, commonalities exist, all of which may inform the design, construction, and use of schools.

1: CLASSROOM

The traditional method of educational instruction, characterized by 25-30 students seated in a classroom and taught a standardized curriculum within a fixed timetable.

2: STUDIO

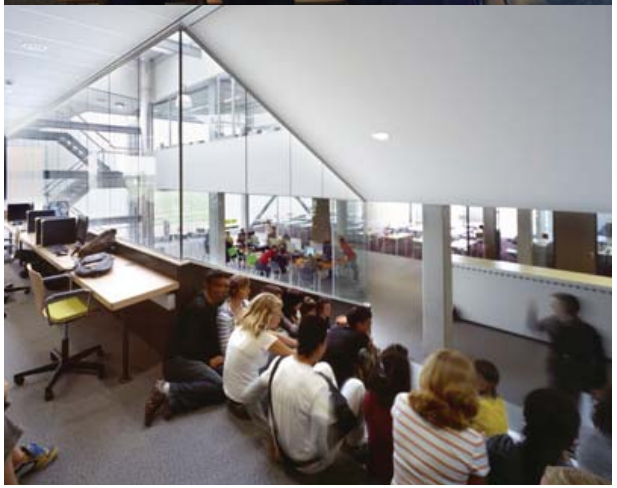
Most commonly used at the junior and senior high level, studio setups promote vocational, hands-on learning, often utilizing specialized technologies and equipment within a workplace-like setting.

3: OFFICE

Within an open plan layout, students undertake personalzed learning at individual workstations, similar to a standard office environment. Educational agendas and topic based projects incorporate student input and are undertaken individually or in small or large groups.

What are the five basic education model **TYPOLOGIES***?*

Top Photo:
St. Luke's CE Primary School
Wolverhampton, UK
Architype
Photo by Leigh Simpson



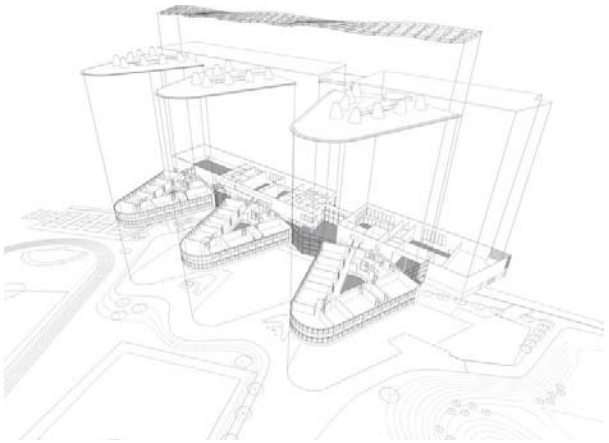
Bottom Photo:
Corlaer College
Nijkerk, Netherlands
Broekbakema
Photo by Rob'T Hart Photography

4: SCHOOL WITHIN A SCHOOL

Common in higher education systems, sub-schools within the overall school facility are equipped to teach a full curriculum of studies semi-autonomously. Ability and attainment indicate how long a student spends at a particular level, while students of varying ages provide cooperative peer support and mentoring.

5: FACULTY

Based on specific subject clusters, this model allows individual subject departments to identify and develop specialized curricular, spatial, and visual identity requirements tailored to a particular area of instruction within a larger institution.



Top Photo:
Saltire Centre
Glasgow, UK
Building Design Partnership
Photo by David Barbour

Middle Photo:
Aurinkolahti Comprehensive School
Jeskanen-Repo-Teranne Arkkitehdit
Helsinki, Finland
Plan by Architect

Bottom Photo:
Bristol Metropolitan College
Bristol, UK
Wilkinson Eyre Architects
Drawing by Architect

SECTION 3

URBAN DESIGN

How does good urban design contribute to the **VALUE** *of a school within a community?*

How does the school respond to the three scales of context: **CITY, NEIGHBOURHOOD, AND SITE***?*

VALUE

- A school is a symbol of the community, in built form; functionally it should be extended and promoted as a place of community assembly.

- Good urban design improves the human experience of the city through the thoughtful interplay of buildings, transportation, outdoor public spaces and landscaping to create a vibrant, safe, and pedestrian-oriented environment. As schools are highly public and highly visible institutions within the community, their architecture should be welcoming and extroverted.

- Time invested in understanding where the school is located, who uses it, and how, establishes the school as an integral part of the community by reflecting these qualities in built form. A sense of pride, place and identity is strengthened when the community can relate to the buildings within it.

CITY

- Identify and respond to the unique patterns, historical buildings/precedents, geographic features, districts and boundaries within the

Photo:
High Line Park
New York, New York, USA
Diller Scofidio + Renfro
Photo uncredited, from www.thehighline.org

project context. Architectural responses need not replicate a particular style, but may allude to massing, materials or proportions reflective of the surrounding built environment. Explore what differentiates the project from others of similar type, scale, and form.

NEIGHBOURHOOD

- Identify opportunities for pedestrian oriented, mixed use activities within the school grounds, such as community gardens, playgrounds, or public art. Incorporate attractive hard and soft landscaping, fixtures, furniture, and lighting to enliven and enhance the streetscape.

- Develop connections to the surrounding community. Utilize adjacent public parks, trails, sports fields, etc. to encourage activity and raise the profile of the school in the neighbourhood. Take advantage of nearby landmarks and public amenities to extend the learning environment of the classroom out into the "real world".

- Consider how wayfinding and signage can provide connections to local destinations and give students and neighbours a sense of place within the community.

SITE

- Study the specifics of site, such as orientation, climate, topography, and natural features to generate a contextually responsive design. The aesthetics of the project's form, massing and roofscape should reflect the identity of the surrounding community, and the overall design details should be clear and coherent throughout the facility. If applicable, consider the meanings, legacy, cost savings and enbodied energy of preserving significant existing

Top Photo:
Edible Schoolyard Concept
Brooklyn, New York, USA
Work Architecture Company
Image by Architects

Middle Photo:
Fuji Kindergarten
Tokyo, Japan
Tezuka Architects
photo by Fototeca co., ltd.

Bottom Photo:
Strawberry Vale Elementary School
Saanich, British Columbia
Patkau Architects
photo by James Dow

architecture through restoration, adaptive reuse, or integration with new construction.

- Well designed projects consider how the building and site affect human experience and provide architectural responses which strive to improve these interactions. The design must provide a safe environment for all users, of all abilities, in all seasons. A diversity of active and quiet spaces allows for flexibility of use for both staff and students.

- Buildings should be "human scale" and create active edges between site and street. Clear visual prominence should be given to the main entrance, with pedestrian and vehicular access/ parking within convenient proximity to primary and secondary entrances.

- School facilities are utilized beyond class hours; as such, the project must be designed to reflect the changing patterns of day and night. Windows offer security, connection to the streetscape, and a clear sense of time, weather, and location.

Top Photo:
Nelson Mandela Centre
Gouda, Netherlands
Atelier PRO Architects
Photo by Petra Appelhof

Middle Photo:
Mat Su Career & Technical High School
Wasilla, Alaska, USA
McCool, Carlson, Green Architects
Photo by Kevin J Smith

Bottom Photo:
East Harlem School
East Harlem, New York, USA
Peter Gluck & Partners
Photo by Erik Freeland

SECTION 4

SITE PLANNING & LANDSCAPING

Does the site plan rationally and efficiently **ORGANIZE** *the various site and building elements?*

How does the site plan and landscaping design **ADDRESS** *and* **ENHANCE** *the existing site?*

ORGANIZE

- Situate buildings to maximize flexibility for future building and site developments (e.g. modular classrooms, new sports fields, storage buildings).
- Interior building layout should respond to the site and ensure that light and views are enjoyed by inhabited spaces such as classrooms or offices (as opposed to loading or garbage areas).
- Building massing will cast shadows and may negatively affect interior access to light and views. Ensure building massing and geometry is oriented to minimize detrimental effects on quality of interior spaces.
- Provide a balance of hard and soft landscaping, avoid vast expanses of asphalt, concrete or sod (unless required for playing fields). Incorporate low maintenance, drought tolerant and indigenous species: consider xeriscaping in areas where vegetation or maintenance may be impractical.

Photo:
Oslo International School
Oslo, Norway
Jarmund Vigsnaes As Arkitekter
Photo by Ivan Brodey

- Bicycling is a valued, yet fragile experience. A single "poor" day (e.g. light snow) may be discouraging enough to see cyclists prematurely put away their bikes for the rest of the season. Provide covered, secure bicycle parking for staff and students. This may also be decentralized and situated at commonly used staff/student entrances - Consider ease of snow clearing when locating racks. *Bikes activate communities!*

- Provide a vehicular passenger drop-off area near the main entrance and a separate zone for school buses, to reduce safety concerns and improve traffic flow. Separate students, pedestrians, staff and visitors from vehicular traffic, buses and service areas. Take advantage of landscaping, fencing and building massing to create well-defined human and vehicular zones.

- Continuous fencing around the school yard defines school property and improves the ability of teachers to supervise outdoor areas.

- Provide screening around bins, mechanical equipment, etc. where such elements are visually prominent. Use caution in the design of hidden spaces.

ADDRESS

- Respond to Alberta's four season climate and consider the aesthetic quality of the site, even during winter months. Landscape design and plant selection should anticipate minimal maintenance following building turnover and should be robust enough to thrive and remain attractive with minimal upkeep.

- Consider weather, sun, wind, snow drifting, etc. when designing outdoor microclimates and

Top Photo:
Gray Middle School
Tacoma, Washington, USA
Muhlum Architects
Photo by Benjamin Benschneider

Middle Photo:
Enter Upper Secondary School & Vocational College
Sipoo, Finland
k2s Architects
Photo by Marko Huttunen

Bottom Photo:
Kirkkojarvi School
Espoo, Finland
Verstas Arkkitehdit
Photo by Architect

take advantage of favourable conditions and views. Provide easy access to outside spaces to encourage year-round use.

- Courtyards can offer weather protection in a securable outdoor area. Provide canopies, overhangs, and shared areas as protection and informal learning spaces for students, staff and visitors.

- On greenfield sites, investigate how to retain existing mature trees, wetlands and other geographic features into the site and building.

- On sloped sites, incorporate natural grade changes into landscape and building design. Where landscape maintenance is required, enhance safety by creating berms, etc. with a maximum slope of 3:1, or on steeper slopes utilize low maintenance vegetation or xeriscaping to reduce the need to access these areas.

ENHANCE

- Seating need not be typical institutional outdoor furniture, selected only for durability and economy. Gathering spaces can utilize landscape features such as boulders, sculpture, benches, covered areas, or stairs as informal seating areas. A simple tree or grassy bowl can be conducive to studying, socializing or eating lunch during breaks.

- Incorporate Crime Prevention Through Environmental Design (CPTED) principles to address issues of safety and security. Landscaping can be used to control access points, define boundaries, and improve natural surveillance, while doors, fences, sidewalks and porches further define territory and discourage access by unintended

Top Photo:
REDBROOK HAYES PRIMARY SCHOOL
Regely, Staffs, UK
Walters & Cohen Architects
Photo by Dennis Gilbert

Middle Photo:
Martinkallio School
Espoo, Finland
Arkkitehtitoimisto Lehto Peltonen Valkama Oy
Photo by Architect

Bottom Photo:
Colin Powell Middle School
Matteson, Illinois, USA
Legat Architects Inc.
Photo by James Steinkamp

users. Windows from occupied rooms and administrative zones to outdoor play areas provide "eyes on the street", while exterior building, perimeter and landscape lighting provides architectural interest and discourages inappropriate after-hours activity.

- Create a variety of outdoor gathering areas for students, to accommodate groups of various sizes. Outdoor spaces should provide seating and make use of opportunities to include local art and sculpture. These areas can double as outdoor teaching spaces during class hours.

- On large sites, consider providing designated walking trails to encourage student physical activity.

- Outdoor areas should support native flora and fauna, which can also be used for teaching. Vegetable gardens have been successfully provided where student and community groups maintain the plants over the summer months.

- Examine how existing topographic conditions can accommodate a range of activities, including seasonal activities (e.g. skating, tobogganning), and design/orient the building to best respond to existing site conditions.

- For new elementary schools, ensure playgrounds are completed prior to the first day of class so that facilities are immediately available for student use. Provide views to the playground from administrative areas for improved supervision and security of students.

Top Photo:
BARTON CLOUGH PRIMARY SCHOOL
Manchester, UK
Photo uncredited, from http://grounds.bartoncloughprimary.net

Middle Photo:
ROGERS IB ENVIRONMENTAL MAGNET SCHOOL
Stamford, Connecticut
Tai Soo Kim Partners LLC
Photo by Paul Warchol Photography

Bottom Photo:
COW HOLLOW SCHOOL PLAYGROUND
San Francisco, California, USA
Photo uncredited, from http://architypesource.com

SECTION 5
COMPOSITION & AESTHETICS

How can the architectural quality of a school be elevated through the artistic and experiential **TECHNIQUES** *of composition and aesthetics?*

BACKGROUND

Composition and aesthetics refer to the abstract and artistic qualities which separate "buildings" from "architecture". *Composition* is the organization of the volumes, surfaces, and masses of a building into a rationalized whole. The interrelationships between components may be expressed explicitly or implicitly. *Aesthetics* utilizes design techniques such as style and finish to appeal to the physical senses with the goal of eliciting an emotional response, perceived as "beauty".

TECHNIQUES

- Does the massing and formal articulation of the project respond to the unique context of site/town, climate/weather, landscape, and history? Can the design be clearly and succinctly expressed as a parti?
- Are the relationships of building components unified and coherent at the scales of site, building, and detail? Are the activities and layout of the facility reflected in a unique architectural response?
- Do additions/renovations reflect the architecture of the original structure, or are they deliberatley juxtaposed and expressed as new and distinct elements (a *compliment by contrast)*?

Photo:
Tonstad School
Sirdal, Norway
Filter Arkitekter
Photo by Nils Petter Dale

- Are the principles of functionality (does it work), firmness (will it last), and delight (does it look good) evident in the planning, construction and form of the project?

- Are the buildings visually well organized; has care been demonstrated in the symmetry/asymmetry, proportion and balance of key elements and forms? Is it suitably prominent or discreet, and are materials and detailing appropriate, attractive, and timeless?

- Does the scale of the building relate properly to the site and adjacent buildings? Does the massing and form create useful, appropriately sized interior and exterior spaces which allow the facility to be both teaching space and teaching tool?

- Have services, lighting, downspouts, etc. been carefully integrated into the elevations? Are elements such as structural systems, fenestration, and entrances well defined, detailed, and celebrated? Are the elevations configured to reduce energy consumption within the building?

- Are materials varied in colour, texture, and pattern? Are they located and proportioned to give appropriate visual emphasis to important parts of the building?

- Are signage, graphics, and art integrated into the composition of the elevations?

- A school is an institution within the community, and should impress upon the user a sense of permanence. Durability, maintainability and longevity of materials and details contribute to this sense of permanence (while increasing the inherent sustainability of the building).

Top Photo:
Clapham Manor Primary School
London, UK
DRMM
Photo by Jonas Lencer

Middle Photo:
Hazelwood School
Glasgow, Scotland
GM+AD Architects
Photo by Keith Hunter

Bottom Photo:
Marysville Getchell High School Campus
Marysville, Washington, USA
DLR Group
Photo by Architect

SECTION 6

COMMUNITY INTEGRATION, INVOLVEMENT & IDENTITY

What is the **ROLE** *of the school within the community?*

How does the school **CONNECT** *to the community?*

How does the school create a sense of **IDENTITY** *within the community?*

How does the school **IMPROVE** *the community?*

ROLE

- Schools act as a beacon/hub for a community and should integrate form, function, and flexibility to accommodate both school and community activities.

CONNECT

- Integrate and create connections, both physical and perceived, which enhance and broaden the learning and social experiences of the students as well as the community. Consider axes and views to and from the school and neighbourhood.

- Provide a welcoming public entry, informal seating, one or two private meeting rooms and a parent information centre for parents to learn about the school, its activities, and to share knowledge and information.

- Provide secure, controllable access to after-hours spaces used by the community. Access to sports, meeting and washroom/changing facilities should be clearly defined and secured. Consider a community kitchen for after-hours use and parent run activities (e.g. hot lunch program).

Photo:
Martinkallio School
Espoo, Finland
Arkkitehtitoimisto Lehto Peltonen Valkama Oy
Photo by Architect

- Locate facilities close to residential areas to encourage pedestrian access, public interaction, civic enrichment and pride.

- Supplemented with smaller breakout areas, open, flexible, and accessible assembly spaces (suitable for public meetings, performances, exhibitions, etc.) within the school can be offered to the community in exchange for learning opportunties at other public facilities or local businesses.

- Onsite daycare offers parents the convenience of one-stop drop-off of children of varying ages and eases the home-to-school transition for children.

IDENTITY

- A school is a landmark, public forum, resource centre, activity amenity, and a wayfinding device within the community.

- The history, culture, and teaching philosophy of the school are shaped in part by the people that have passed through its doors; achievements are celebrated and enrich the heritage of the school and the community. How is the school and its community distinguished?

- Good school design understands and responds to the physical and cultural context of the immediate and peripheral site.

IMPROVE

- Engage the community during the design phase to identify opportunities to support and enhance public activities and lifelong learning. participation fosters strong school/community relationships and civic pride.

Top Photo:
Joensuu Lyceum
Joensuu, Finland
Ilmari Lahdelma Heikki Viiri
Photo by Jussi Tiainen

Middle Photo:
Vikurskoli
Reykjavik, Iceland
Arkitektastofan OG
Photo by Architect

Bottom Photo:
Kindergarten Sighartstein
Salzburg, Austria
Kadawittfeldarchitektur
Photo by Angelo Kaunat

SECTION 7

EXPERIENTIAL SPACE PLANNING

BACKGROUND

From Kindergarten to Grade 12, a typical student will spend thirteen years in the school system. Throughout the span of an entire career, a teacher (and admin/support staff) may spend more than *THIRTY* years in the school environment. In the challenge to meet the demands of programme, schedule, and budget, it is vital to keep in mind that a school is ultimately a place for inspiring *PEOPLE;* as such, each decision made by the owner and design team can have a profound effect on the daily lives of students, teachers, and the community.

IMPROVING EXPERIENCE

- Smaller groupings of students have shown increased participation in school and classroom activities, improved social relationships and behaviour, and greater overall student satisfaction. Preschool groupings of 60-75, elementary groups of 200-400, and 600-800 in high schools are ideal; this may be achieved through decentralizing the school into wings, floors, etc. to groups with a maximum of 400 students.

What role does good design play in **IMPROVING** *the* **EXPERIENCE** *of a school?*

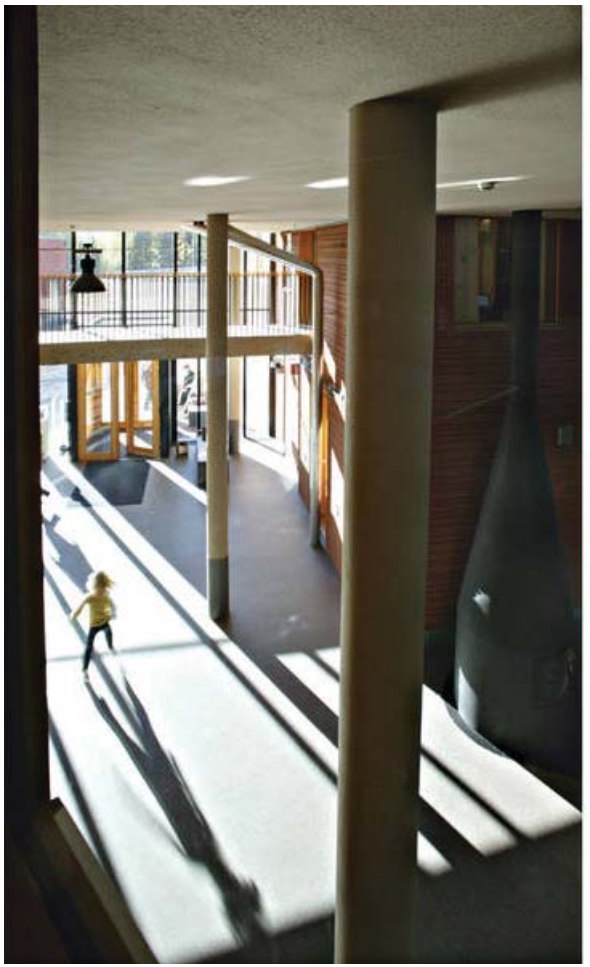


Photo:
Sakarinmaki School
Sipoo, Finland
Arkkitehtitoimisto Sari Nieminen Oy
Photo by Architect

- Age and physical stature of the students is critical in designing, selecting, and installing millwork, furniture, fixtures and equipment (e.g. mounting height of bathroom fixtures). Younger students respond most positively to small groups and architectural details which are welcoming and appropriately sized. Entrances, millwork, fixtures and indoor and outdoor play areas should be designed with this in mind. As students transition from a residential setting into that of the school and community, consider the home/family environment when looking for design cues.

- Incorporate a variety of natural materials, colours, textures, and forms to create visually interesting, engaging and non-institutional spaces.

- Provide individual storage spaces within primary school classrooms to support personalization and ownership of space (contributing to the development of self-worth, place and school pride).

- Provide teachers with an individual space for secure storage of personal items as well as a work area with phone and data access. Rather than one large teacher's lounge, consider a suite of spaces for work, socializing, meetings and kitchen/washroom spaces.

- Wider corridors improve traffic flow and reduce confrontation anxiety when moving between classes. Avoid long monotonous corridors by providing alcoves for small social and study groups, access to exterior views or visually interesting interior spaces.

Top Photo:
Ouca Creche & Elementary School
Ouca, Melgaco, Portugal
Jose Adriao Arquitecto
Photo by Architect

Middle Photo:
College Notre-Dame-de-Lourdes
Longueuil, Quebec
Lemieux & Smith Vigeant Architects Collective
Photo by Yves Beaulieu

Bottom Photo:
Nelson Mandela Centre
Gouda, Netherlands
Atelier PRO Architects
Photo by Petra Appelhof

- Avoid small, unsupervised spaces which may encourage bullying and intimidation. Consider sightlines and natural surveillance to increase comfort and security in areas such as washrooms and grooming spaces.

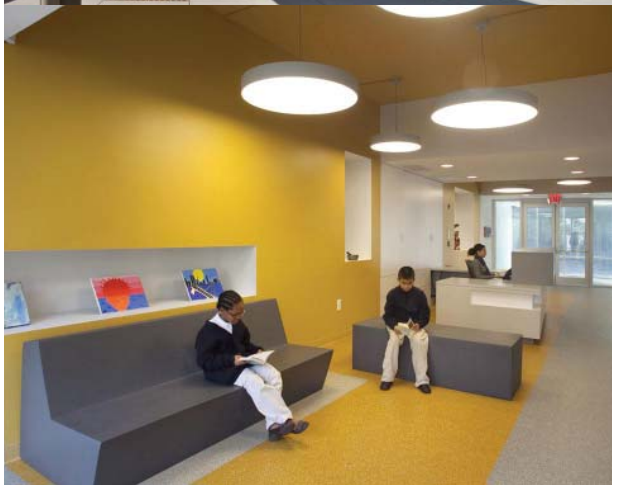
- Ensure adequate space for coathooks, lockers, backpacks and shoes in the corridor. Consider spatial needs during peak times when most students are accessing lockers and moving between classrooms.

- Size entry areas for storage and changing of indoor/outdoor shoes. Use long recessed walk-off mats to further reduce dust and dirt ingress into the building. Investigate the benefits of preserving significant existing architecture through restoration, adaptive reuse, or integration with new construction.

- Does the architectural design create a sense of place? Does it connect to nature, take advantage of light and views, provide protection from the elements, and provide pleasant, inclusive, and human scaled interior and exterior spaces?

- Provide comfortable seating, outdoor access, views, and gymnasium/ main entrance adjacencies for student gathering during regular school hours.

- The "procession" to the school introduces the building to the community. Naming, flagging, crosswalks, lighting, etc. should all work together to create a positive impression and connection to the neighbourhood.



Top Photo:
Elementary School
Schmitten, Switzerland
Lehmann Fidanza & Associes
Photo by Thomas Jantscher

Middle Photo:
Gray Middle School
Tacoma, Washington, USA
Muhlum Architects
Photo by Benjamin Benschneider

Bottom Photo:
East Harlem School
East Harlem, New York, USA
Peter Gluck & Partners
Photo by Erik Freeland

SECTION 8
UNIVERSAL DESIGN

BACKGROUND

"The design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design".

-North Carolina State University, The Centre for Universal Design

PRINCIPLES

As with most other public institutions, a school should endeavour to accommodate all users, including those with physical, cognitive, auditory or visual limitations.

Originating from Barrier-Free and accessibility principles, Universal Design aims to improve the built environment through the creation of facilities, products and spaces which are inherently accessible, functional, attractive and equitable to all. For example, wheelchair ramps have often been designed as discrete elements, intended for providing access to those with mobility issues. Often retrofitted to buildings, these components are typically added where space permits, not necessarily at the main entrance. Despite serving the purpose of providing accessibility, dedicated and isolated ramps may stigmatize users, be used

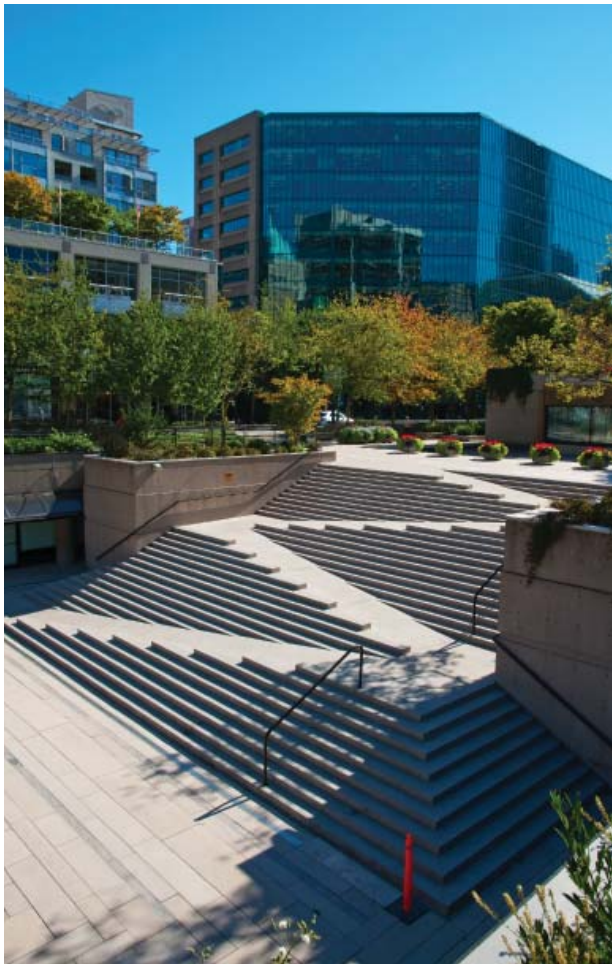


Photo:
"Stramp", Robson Square
Vancouver, BC
Photo by Dean Bouchard
Source: www.flickr.com

infrequently, and negatively impact the visual quality of the building and site. A Universal Design approach would be to integrate site grading, landscaping, and building configuration in order to provide a gentle slope to the building which eliminates the need for ramps and stairs and creates one common, dignified, and attractive entry point.

While the constraints of a project will inevitably limit the practical application of all Universal Design Principles to every conceivable situation, the designer should understand and apply the Seven Principles of Universal Design wherever possible).

1: EQUITABLE USE

The design is useful and marketable to people with diverse abilities.

Examples:

- Power doors make visiting public spaces easier for all users.

- "Maze" entrances to public washrooms eliminate doors, improving access for all users and reducing hygeine issues associated with door knobs/levers.

2: FLEXIBILITY IN USE

The design accommodates a wide range of individual preferences and abilities.

Example:

- Large flat panel light switches which can be used with either hand, closed fist, elbow, etc. rather than small toggle switches.

Middle Photo:
Power Door
Source: www.hitechdoor.ca

3: SIMPLE & INTUITIVE USE

Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or education level.

Examples:

- Public emergency stations utilize recognized emergency colours and a simple design to quickly convey function to passersby.

- Use of meaningful icons with text labels for signage and wayfinding.

4: PERCEPTIBLE INFORMATION

The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.

Example:

- Rough or textured borders which contrast with smooth walking surfaces and indicate a change in grade or transition to soft landscaping, water, etc.

5: TOLERANCE FOR ERROR

The design minimizes hazards and the adverse consequences of accidental or unintended actions.

Example:

- Selection of lab equipment for tolerance to accidental dropping.

6: LOW PHYSICAL EFFORT

The design can be used efficiently and comfortably and with a minimum of fatigue.

Example:

- Door lever does not require grip strength, and can be operated by a closed fist or elbow.

Top Photo:
Touchless Faucet
Source: www.trendir.com

7: SIZE & SPACE FOR APPROACH & USE

Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility.

Example:

- Wide corridors accommodate wheelchair users as well as students with backpacks.

Source: "The Centre for Universal Design (1997). The Principles of Universal Design, Version 2.0. Raleigh, NC: North Carolina State University, Principles (Except Examples): copyright © 1997 NC State University, The Center for Universal Design see http://www.ncsu.edu/project/design-projects/udi/ for the 29 guidelines which accompany each principle.

ADDITIONAL CONSIDERATIONS

- Provide simple, clear circulation with clearly defined paths, doorways, etc.
- Provide handrails as necessary and consider material textures as tactile means of wayfinding.
- Ensure circulation routes are of appropriate width (min. 1.5m wheelchair turning diameter), solid, level, and kept clear of obstacles.
- Locate hardware and controls within reach of users, and select for ease of operation.
- Consider the importance of acoustics for the visually impaired: buildings and rooms can be designed to reduce echo, reverberation and extraneous background noise.
- Provide appropriate lighting (natural and artificial) for circulation, speech reading and sign language. Control glare and avoid extremes in light intensity between adjacent spaces.

Top Photo:
Elementary School
Schmitten, Switzerland
Lehmann Fidanza & Associes
Photo by Thomas Jantscher

Bottom Photo:
Titus Salt School
Baildon, Shipley, UK
Anshen+Allen
photo by Tim Soar

SECTION 9
NEAT & ACTIVE DESIGN

NEAT

NEAT (Non-Exercise Activity Thermogenesis) is the energy expended by all activities other than sleeping, eating and exercise. Research conducted by the Endocrine Research Unit at the Mayo Clinic has proven that the cumulative effect of seemingly insignificant activities such as getting up from a chair or typing on a keyboard actually contribute meaningfully to caloric metabolization and health.

ACTIVE DESIGN

Developed and published in 2010 by the City of New York, *Active Design Guidelines - Promoting Physical Activity and Health in Design* - leverages an understanding of how people work, play, rest, socialize and move as a means of encouraging non-exercise activity in building users. Active Design strategies relate to how buildings and sites are designed so that elements which encourage activity (e.g. stairs), are designed as preferable and more attractive options than low-energy choices (e.g. elevators). With the growing prevalence of inactivity-related health issues including childood obesity and type-2 diabetes, it is vital that Active Design principles are integrated into the built environment.

How can the incorporation of ***NEAT*** **and ACTIVE DESIGN** *principles into the building and site improve the physical health of its users?*

Photo:
Trias VMBO School
Zaanstad, Netherlands
Atelier PRO
Photo by Jannes Linders

Stairs & Elevators

- Provide a central open staircase as a key design element of the school and an attractive alternative to elevators for everyday vertical travel. The central stair should be integrated with the principal orientation, view, travel zones/axes and main entrance/social core of the school. Finishes should be selected for durability, safety and visual appeal.

- Consider central hybrid stairs which incorporate social/seating areas. Make stairs wide enough for group travel in both directions, and ensure rise/run proportions facilitate comfortable and safe use.

- Highlight interesting indoor or outdoor views, incorporate artwork, bright inviting colours, natural light and ventilation. Consider fire-rated glass in secondary (exit) stairs to provide light, views and visual connections to adjacent space.

- Locate stair prompts where they will be most visible, and provide age appropriate motivational messages on key areas such as elevators which encourage stair use.

- Locate elevators out of direct view of building entrance/central stairs, but within reasonable range for Barrier Free access. Consider slower cab door open/close speeds, and do not program elevators to return to ground floor and rest with door open.

Building Programming

- Locate building functions to encourage short, pleasant walks to common amenities. Locate gathering spaces around a central lobby or atrium to promote walking to social areas.

Top Photo:
ROC Graafschap College
Doetinchem, Netherlands
Atelier PRO
Photo by Petra Appelhof

Middle Photo:
Kindergarten Sighartstein
Salzburg, Austria
Kadawittfeldarchitektur
Photo by Angelo Kaunat

Bottom Photo:
Stair Signage
Uncredited
Photo from
media.treehugger.com

- Consider the age groups the school is designed to serve - ensure walking routes provide convenient, safe, and efficient access to spaces, especially when students must change classrooms between periods.

Appealing & Supportive Walking Routes

- Provide paths of travel which incorporate daylighting, good interior design and supportive infrastructure (easy access to washrooms, water fountains, seating, etc.) along walking routes.

- Long, narrow corridors quickly consume area and circulation time without adding any positive or constructive experience or alternate use.

- Signage can be used to provide information about walking routes in and around the building, while incremental distance markers allow users to gauge time and distance travelled. Paths and sidewalks with distance information can be used for informal walking, or as part of the physical education program.

Building Facilities That Support Exercise

- Provide secure, sheltered bike parking near the front entrance, within convenient access to locker rooms and showers. Smaller, decentralized bike racks may be located at secondary entrances.

- Consider how seasonal activities can be accommodated (e.g. skating, tobogganing).

- Design physical education/activity spaces to accommodate a range of uses (e.g. yoga, weight room, dance, etc.). Utilize colour and provide access to outside views and ventilation to provide an attractive, stimulating space and

Top Photo:
Martinkallio School
Espoo, Finland
Arkkitehtitoimisto Lehto
Peltonen Valkama Oy
Photo by Architect

Middle Photo:
Mimers Hus
Kungalv, Sweden
Wingardh Architects
Photo by Architect

Bottom Photo:
Bike Rack, Western Washington University
Bellingham, Washington, USA
Design/Photo by Wade West

encourage regular reuse. Provide individual control of temperature and ventilation for activity spaces when natural ventilation is not practical.

- Take care to anticipate and address potential acoustic and visual distractions.

- Utilize central, highly visible signage and information boards to promote facilities, services and groups related to physical activity.

Building, Site, & Exterior Massing

- Maximize variety, transparency, and detailing at the street/ground level to enhance the pedestrian experience. Incorporate canopies, awnings, stairs and ramps, and celebrate as design features.

- Provide multiple entries, and design the building massing to engage with nearby parks and public spaces. Provide landscaping to create protection from the elements as well as a visually interesting and vibrant experience which promotes regular use.

- Community groups/sponsors/parents should work in conjunction with the design team to ensure playgrounds are properly designed, sited, and ready for use when a new school opens.

Top Photo:
Covolo di Pederobba Nursery
Treviso, Italy
C&S Associati
Photo by Alessandro Chemollo

Middle Photo:
Machias Elementary School
Snohomish, Washington, USA
NAC Architecture
Photo by Architect

Bottom Photo:
Playground
Ghent, Belgium
Fris in Het Landscap
Kadawittfeldarchitektur
Photo by Landscape Architect

SECTION 10
DESIGN FOR FLEXIBILITY

27

What design features add **DAY-TO-DAY FLEXIBILITY** *for staff, students, and the community?*

Does the design offer **LONGTERM FLEXIBILITY** *for evolving uses and future growth?*

How do **OUTDOOR SPACES** *support and encourage teaching, learning, and social activities?*

BACKGROUND

Designing a building to accommodate every conceivable use is impossible; however it is possible to design spaces to support immediate and future change. Inevitably, schools will expand and contract, teaching methodologies will evolve, and technology will change the way students learn. Design for a variety of learning groups, sizes, and activities; ensure spaces can support multiple types of uses, and that furniture, equipment, systems and finishes are durable and adaptable.

DAY-TO-DAY FLEXIBILITY

- Allow for a range of breakout group sizes situated around a large group instructional space. This can be accomplished through moveable partitions or shared spaces between rooms. Ensure moderate visual openness with adequate acoustic separation to support multiple groups of varying size working simultaneously, while minimizing visual and acoustic distractions.

- Carve out niches in or adjacent to large teaching, administrative and social/circulation spaces for small groups of students, staff or visitors. Provide furniture, surfaces, and

Photo:
Orestad College
Copenhagen, Denmark
3XN
Photo by Adam Mork

equipment to support activities in these areas (e.g. locate a niche close to the main entrance for parents and visitors, and provide electronic or hardcopy information about the school and its activities).

- Flexibility can also be achieved in non-instructional spaces. The provision of a generously sized central stair can function as an informal gathering space and also encourage physical activity when carefully located and detailed (see *Active Design* section).

- Flexible spaces for daily school activities and after-hours school/community use must be easily reconfigurable, and incorporate functional and adaptable furniture and equipment.

LONGTERM FLEXIBILITY

- Adaptable, multi-functional spaces improve the longterm viability of a facility by accommodating the changing requirements of its users. Avoid intermediate structural columns in open spaces, and consider the location of structural elements and loadbearing walls where smaller rooms could conceivably be opened up to create larger spaces in the future.

- Provide adequate storage space for furniture, equipment, partition systems, etc.

- Anticipate and plan for potential future expansion and contraction. Consider the adaptability of the building and site to accommodate a change of use (e.g. how might an inner city school be repurposed if enrolment declines and the facility closes?).

Top Photo:
Musachino Art University Library
Tokyo, Japan
Sou Fujimoto Architects
Photo by Iwan Baan

Middle Photo:
Hosmarinpuisto School and Daycare Centre
Espoo, Finland
Studio Suonto Oy Yrjo Suonto Arkkitehti
Photo by Architect

Bottom Photo:
Burleson Elementary School
Burleson, Texas, USA SHW Group, Inc.
Suonto Arkkitehti
Photo by Nana Wall Systems Inc.

OUTDOOR SPACES

- School grounds offer opportunities for teaching, learning, recreational, and social activities, both for students/staff, and the surrounding community. Establish a variety of outdoor areas, and utilize natural and manmade site features to provide exploratory learning environments and to create interesting, unique, and flexible spaces. Make use of adjacent community: its parks, trails, and other amenities.

- Create microclimates with southern exposure and protection from winter winds and extreme sun. Design spaces to accommodate a range of group sizes. This can be as simple as a bench for one or two people, a shade tree to read or teach under, or a covered entrance which doubles as an informal classroom.

- School grounds can be publicly accessible outside school hours. Community/school gardens offer learning and physical activity opportunities while providing access to local fresh produce and urban agricultural space.

- Provide outdoor space for creation and exhibition of student art (e.g. durable outdoor furniture can double as an outdoor classroom or studio space, while a bare gymnasium wall can be utilized as a community-facing projection screen for display of student artwork.

Top Photo:
Outdoor Classroom, Our Lady Help of Christians School
Richmond Hill, Ontario
Photo uncredited, from avivacommunityfund.org

Bottom Photo:
Dijkstein Nursery School
Dijkstein, Belgium
Architectenburo OOSTPOOL
Photo by Dries Van den Brance iov Xella-Ytong

Bottom Photo:
Outdoor Classroom, Swarthmore College
Philadelphia, Pennsylvania, USA
Photo Uncredited, from ucblibraries.colorado.edu

SECTION 11
MODULAR CLASSROOMS

BACKGROUND

Factory-built, portable classrooms relieve the strain on increasing school populations and offer the flexibility to add or remove units as enrolment numbers change over time. Despite the urgency to provide one-size-fits-all, "plug-and-play" classroom space, opportunities exist for customization and improved integration of modulars into the context of school, site, and community.

INTEGRATION

- Consider site topography and floor heights between core and modulars to avoid ramps or stairs and to provide Barrier-Free access (crawlspace ventilation and detailing is required to avoid moisture issues).
- Engage the ground, sky and the landscape. Vary parapet heights and provide durable skirting materials which complement the core and modulars.
- Provide attractive, stimulating finishes, colours, and textures (vs. standard neutral vct/vinyl floors, acoustical ceiling tiles, beige walls, etc.). Both interior and exterior finishes, as well as natural and artificial lighting influence mood and behaviour.

What techniques can be used to improve the **INTEGRATION** *of modular classrooms into a school, site, and community?*

Photo:
Harvard Yard Childcare Centre
Cambridge, Massachusetts, USA
Anderson Anderson Architects
Photo by Architect

- Consider the spaces created by the addition of modular classrooms, both inside and outside. Investigate how to turn incidental spaces into useful, attractive social and learning zones.

- Design permanent (core) school areas to anticipate addition of modulars and acknowledge the hierarchy of massing and volumes between different building elements. Where space permits, screen portables behind the core school to present the facility's "best face" to the community.

- Customization can be provided, even within the constraints of standardized construction. Exterior panels, such as cementitious fibreboard, can be painted to complement existing core school buildings, or to personalize each unit with a different colour. Smooth faced panels, such as metal, can be customized with adhered graphics ("truckwrap") which can be applied or changed quickly and economically.

- Ensure complimentary landscaping is provided to integrate modular classrooms into the site. Shrubs, grasses and perennials located around the perimeter help to anchor the modules and provide a sense of permanence. Shrubs are relatively economical to relocate (trees may also be incorporated, but require greater planning consideration when locating). Students, staff, parents, and the community can be involved in the planning and planting; this strategy provides multiple benefits: learning opportunities and physical activity, development of school/community relationships and pride.
- Develop a modular vestibule which links the core school and portable classrooms, and provides a formal entry space at the end of a

Top Image:
Sprout Space
Concept
Perkins + Will
Image by Architect

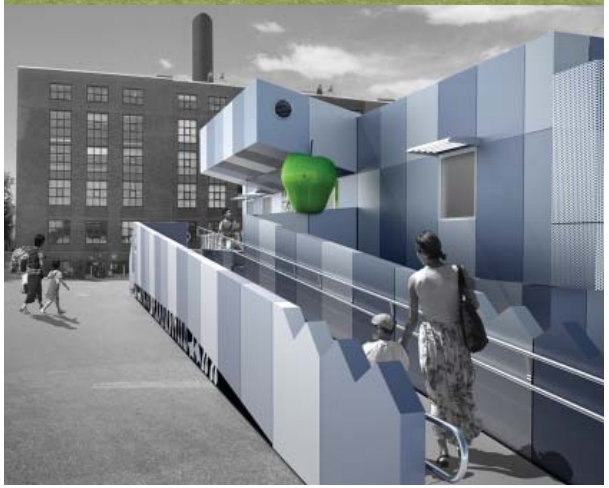
Middle & Bottom Images:
Alberta Infrastructure Portable & Vestibule Concept
Technical Services Branch/Facility Planning & Architecture
Image by TSB/FP&A

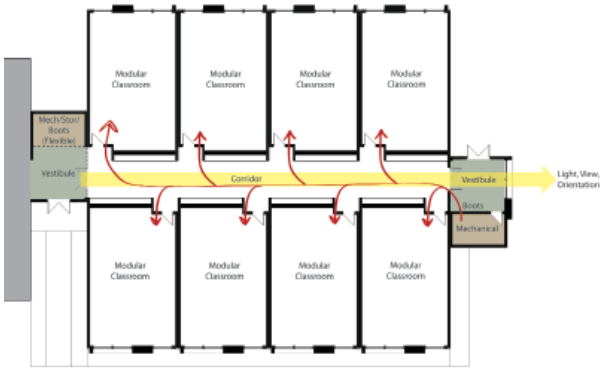
string of portables. Vestibules should provide barrier free access and follow Universal Design Principles.

- Vestibules should be outfitted with an entrance canopy, factory installed and integrated with the structural and architectural design. Finish materials (cladding) can be site applied to match the finishes of the portable units or that of the core school, serving as a "bookend" and unifying the building composition.

- Alternately, build vestibules as part of the core school which are designed to accommodate the addition of modular classrooms.

- Remove individual mechanical rooms from portables. A shared utility room within the vestibules and mechanical/electrical/plumbing racks within the ceilings of the modular classroom corridors reduces redundant equipment, maintenance, noise, cost, and improves energy efficiency. Additionally, classrooms benefit from increased useable space, greater flexibility, and the relocation of lockers into the corridors.





Top & Bottom Images:
Alberta Infrastructure Portable & Vestibule Concept
Technical Services Branch/Facility Planning & Architecture
Image by TSB/FP&A

Middle Photo:
Harvard Yard Childcare Centre
Cambridge, Massachusetts, USA
Anderson Anderson Architects
Photo by Architect

SECTION 12
MATERIALITY

How can a thoughtful approach to materiality improve the aesthetics and experience of a school's **INTERIOR and EXTERIOR** *form?*

BACKGROUND

Materiality refers to the strategic selection and application of materials in the built environment. Perceived primarily through sight and touch, materials contribute to the experience, function and memory of a space. Other sensory or psychological responses may also be triggered, such as the smell of cedar wood, or the perception of certain materials as being warm/cold, soft/hard, etc.

INTERIOR

- Ensure materials are selected for durability, maintainability and longevity, and are appropriate to the climate, building use, and architectural context. Design assemblies or components for ease of repair or replacement, with minimal impact to adjacent building elements. Common, economical materials can be used in thoughtful, expressive ways - celebrate details!

- Material choices have the power to affect mood, performance and behaviour. Consider how a space will be used when selecting finishes, textures and colours. Avoid overuse of cold, hard materials such as concrete block, and provide natural materials such as wood to add warmth and inspire users.

Photo:
Sakarinmaki School
Sipoo, Finland
Arkkitehtitoimisto Sari Nieminen Oy
Photo by Architect

- Apply innovation to mundane design problems (e.g. incorporate colours or embedded objects into polished concrete floors to create a durable, attractive and unique finish).

- Evidence based design proves that achievement is improved with increased access to light and views. Light (especially natural light) greatly affects how a room or space is experienced, and varies with time of day/time of year. Daylighting should be utilized where practical as a means of activating a space and reducing reliance on artificial light sources.

- Ensure appropriate choices of materials and systems to control illumination levels, reflectance, glare and solar heat gain. Avoid fluorescent lighting in favour of full specturm and natural lighting wherever possible. Situate indoor activity spaces to take advantage of the most appropriate sun exposure.

- Provide variation in ceiling treatments. Atria, common areas, and classrooms can utilize a range of design approaches, from exposed structure to suspended bulkheads, acoustic panels or artwork. Care must be taken to ensure light and sound levels are within acceptable ranges.

- Do not rely solely on acoustical ceiling tiles to solve noise or privacy issues. Consider spatial adjacencies, other surface finishes, and the configuration of furnishings, walls and ceilings to anticipate and mitigate sound problems. Quieter spaces such as classrooms and administrative areas should be acoustically separated from loud zones (common spaces, gymnasium, etc.).

Top Photo:
Evelyn Grace Academy
London, UK
Zaha Hadid Architects
Photo by Luke Hayes

Middle Photo:
East Harlem School
East Harlem, New York, USA
Peter Gluck & Partners
Photo by Erik Freeland

Bottom Photo:
Oslo International School
Oslo, Norway
Jarmund Vigsnaes As Arkitekter
Photo by Ivan Brodey

- Modular assemblies are increasingly used for walls and ceilings, improving efficiency, durability, aesthetics, and reducing cost.

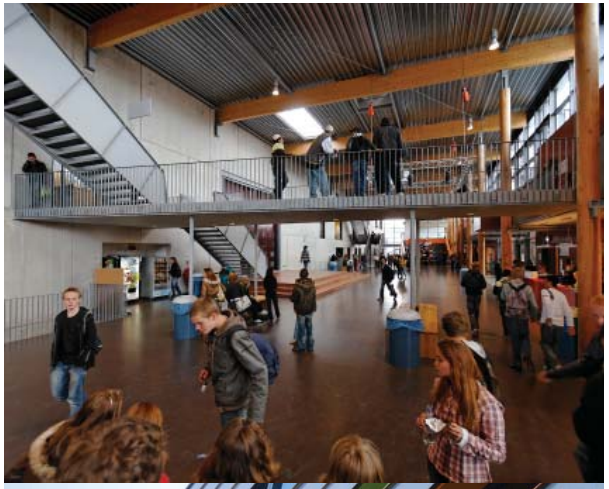
- Expression of interior or exterior structural systems can add dramatic effect to a space and inform architectural detailing. Exposure and presentation of a building's systems (e.g. mechanical, electrical, etc.) provides learning opportunities and visual interest.

EXTERIOR

- Vary materials, textures and massing to provide visual interest and engage users and passersby. Create a coherent vocabulary of details; utilize materials to unify the building as a thoughtfully articulated composition rather than an assemblage of disparate parts. Capitalize on opportunities to strengthen the design by incorporating local or regional materials, craftsmanship and construction methods in order to express the identity of the neighbourhood and city/town.

- Where materials create strong horizontal or vertical lines, consider incorporating finishes with contrasting directions or textures and utilize this juxtaposition to emphasize important or interesting building components (e.g. main entrance).

- Apply an understanding of the physical properties of materials (e.g. texture, thickness) in providing visual relief to facades, landscaping and other surfaces. Utilize the experiential qualities of materials (e.g. warmth, visual weight) to compose welcoming, human-scaled spaces.



Top Photo:
TRIAS VMBO School
Zaanstad, Netherlands
Atelier PRO
Photo by Jannes Linders

Middle Photo:
Ypenburg Lyceum
The Hague, Netherlands
DP6
Photo by Architects

Bottom Photo:
Vikurskoli
Reykjavik, Iceland
Arkitektastofan OG
Photo by Architect

SECTION 13
SIGNAGE, GRAPHICS & ART

What is the **VALUE** *of signage, graphics and art for staff, students, and the community?*

How can signage, graphics, and art **ENHANCE** *the architecture and experience of a school?*

BACKGROUND

When considered with respect to the overall cost and effort of building a school, signage graphics and art are relatively small parts of the building process that are often left out or left to the operators and users after building turnover. When incorporated into the design process, however, these elements can be powerful tools in creating identity, connecting to the community, and improving the first impressions and visual experience of the school environment.

VALUE

- Signage identifies the school to the public, and provides wayfinding and information for users and visitors on events and activities.

- Graphics add visual interest and appeal to the utilitarian function of signage. Graphic devices such as shape, pattern, images, colours and text can be used independently of signage to define spaces/zones, create moods within spaces, and motivate or inspire users.

- Art can take various forms, including graphic, sculptural, or digital, and can exist as a

Photo:
Hiidenkivi School
Helsinki, Finland
Hakli Architects
Photo by Jussi Tiainen

standalone concept, or as a means of expression of the history, culture or spirit of the school and community.

ENHANCE

- Treat visual media as part of the school design (defer mascots, slogans, banners/penants, etc. to operators). Provide areas for incorporation, both interior and exterior (building and site). consider large scale graphics, art walls, or temporary exhibit/projection areas.

- Location and visibility of visual media are key to their effectiveness. High traffic areas such as main entrances and shared central/gathering spaces are excellent places to display art and to provide signage or graphics which describes the activities, attitudes and achievements of the school.

- Visual media provides opportunities for customization and creation of identity within a school even within standard school designs. Landscaping, outdoor fixtures, and furniture may include an artistic or sculptural element and can help to establish a school as an identifiable landmark within the community.

- Consider scale, location, lighting, colour, material, durability and budget. Consider sign mounting height for visibility to younger/ shorter students, those in wheelchairs, etc.

- Connect with local governments, businesses, and community groups to encourage and support both student and public art at the school. Make art accessible to the public, especially in smaller communities, where facilities, classes, and exhibit space may be lacking.

Top Photo:
Signage, MAXXI
Rome, Italy
Ma:Design
Photo by Rossano Ronci
Cesare Querci

Middle Photo:
Da Vinci College
Dordrecht, Netherlands
Mecanoo Architecten
Photo by Christian
Richters

Bottom Photo:
Merchant's Academy
Bristol, UK
Penoyre & Prasad
Photo by Ben Smith

SECTION 14
SUMMARY

"To encourage the pursuit of Design Excellence, the Ministry will advocate the value and benefit of architecture and further an understanding of both product and the process of building design."

-Government of Alberta Infrastructure Department Statement "Design Excellence", Number 01241

Design Excellence, when applied to school design, enhances the basic architectural and urban planning strategies of a project in order to create a unique, holistic, functional, and attractive community landmark. Long and short term flexibility, careful selection of durable, timeless materials, appropriate use of innovative and sustainable design solutions, and skillful planning and aesthetic treatment results in a high quality building which proves the value of exceptional architectural design.

By responding to the context of site, removing barriers, and promoting sustainability, art, and activity, a successful school project creates a welcoming, comfortable and flexible environment with the power to strengthen communities, and inspire its designers, staff, and students.

Photo:
Redbrook Hayes Primary School
Regely, Staffs, UK
Walters & Cohen Architects
Photo by Dennis Gilbert

SECTION 15

REFERENCES & LINKS

"10 Criteria for Successful School Design"
Commission for Architecture and the Built Environment:
http://webarchive.nationalarchives.gov.uk/20110118095658/http://www.cabe.org.uk/design-review/schools/criteria

"33 Educational Design Principles for Schools and Community Learning Centers"
Jeffery A. Lackney, PhD AIA University of Wisconsin-Madison, sponsored by the National Clearinghouse for Educational Facilities (NCEF):
http://schoolstudio.typepad.com/school_design_studio/33-educational-design-pri.html

"Active Design Guidelines, Promoting Physical Activity and Health in Design"
New York City Department of Design and Construction:
http://www.nyc.gov/html/ddc/html/design/active_design.shtml

Imagine School Design Database
compiled by the School of Architecture, University of Sheffield, and sponsored by the Balfour Beatty Education and Partnerships for Schools:
http://www.imagineschooldesign.org/index.html

"Lessons Learnt:
A Practical Review of Design in Scotland's Newest Secondary Schools"
Scottish Futures Trust:
http://www.scottishfuturestrust.org.uk/docs/61/Lessons%20Learnt.pdf

National Clearinghouse for Educational Facilities (NCEF):
http://www.ncef.org/

"Nonexercise Activity Thermogenesis (NEAT): Environment and Biology"
James A. Levine, American Journal of Psychology (Endocrinology and Metabolism):
http://ajpendo.physiology.org/content/286/5/E675.full

"Principles of Universal Design"
Universal Design Initiative, College of Design, North Carolina State University:
http://www.ncsu.edu/project/design-projects/udi/center-for-universal-design/the-principles-of-universal-design/

"Principles of Urban Design"
Edmonton Design Committee, City of Edmonton, Alberta:
http://www.edmonton.ca/city_government/documents/PDF/2007EDCBrochure.pdf

APPENDIX A

SAMPLE DESIGN DEVELOPMENT REPORT TABLE OF CONTENTS

2.3 Functional Relationships

Circulation
Zoning
Site Planning
Area Redevelopment Plan, UDRP, Overlays, Integration of Sports Fields & Other Neighbourhood Amenities
Land Use Analysis
Civil Design (Watershed Controls, Riparian Developments/Ponds)
Expansion (Classrooms, Parking)
Parking & Vehicular Circulation (cars/buses, bicycles, loading, shipping, handling, waste)

3.0 Project Principles

3.1 Methodology

Structure of Meetings
Key Stakeholders
Public Process

3.2 Implementation

Procurement & Tendering Strategy

3.3 Research

Benchmarking Analysis
Typologies
Systems & Materials

3.4 Concepts

Approach & Parti
Analysis of Options (Circulation, Zoning, Functional Relationships)
Materiality
Organizational Principles

3.5 Research

Benchmarking Analysis
Typologies
Systems & Materials

3.6 Mature Buildings (>40 years)

Modernism

3.7 Historic Places

Designation & Character Defining Elements
Scope & Standards
Guidelines for Conservation

9.0 Mechanical

- Mechanical Overview
- Site Service Distribution
- Heating Systems
- Cooling Systems
- Ventilation Systems
- Plumbing Systems
- Fire Protection
- Pipe & Duct Insulation
- Acoustics (Active & Passive Attenuation)
- Energy Management Control Systems
- Building Start-up & System Verification
- LEED
- Operating Costs & Energy Consumption

10.0 Electrical

- Electrical Overview
- Exterior & Site Electrical Systems
- Building Interior Systems
- Lighting (Artificial & Natural: skylights, clerestory, windows)
- Special Considerations
- LEED
- Controls
- Security System

11.0 Acoustics

- Active & Passive Strategies

12.0 Food Services & Kitchen Design

13.0 Mechanized Circulation

- Elevators, escalators, moving walkways, etc.

14.0 Active Design

15.0 Flexibility & Futureproofing

16.0 Code Review

17.0 Budget/Costing

18.0 Schedule

19.0 Safety, Security & CPTED

- Exterior & Site Security Technical Description
- Interior & Occupant Security Technical Description
- Miscellaneous Systems & Special Considerations
- Crime Prevention Through Environmental Design (CPTED)

20.0 Signage & Wayfinding

- Heraldry: naming, flagging, etc.

Appendix

- Geotechnical Report
- Drawings & Renderings
- Outline Specifications
- Cut Sheets