TOP TEN
Design Things to Watch For

Alberta Infrastructure

DESIGN & TECHNOLOGY SERIES **13**

Technical Services Branch (TSB) reviews dozens of publicly owned or funded projects each year. Design Reviews check for compliance with the Government of Alberta's Technical Design Requirements for Alberta Infrastructure Facilities (TDR), as well as other codes, standards, and best practices. ***Top Ten Design Things to Watch For*** offers a quick overview of the design and technical considerations that have the greatest impact on the long-term quality, efficiency, functionality, and cost of public infrastructure.

Thing 1: Jigs, Jogs, and Shaken Plans

Compare floor plans with the roof plan:

- Rectilinear works best for efficiency (in time, cost, and construction)
- Avoid unusual shapes (circles, curves, strange angles) if they are not purposeful
- Overly articulated buildings waste space, materials, energy, and money
- Avoid jigs and jogs: these add complexity and increase surface area of exterior walls
- Consider ease of construction, furniture placement, and future maintenance

Thing 2: Crazy Roofs

Complex roof designs introduce a variety of challenges:

- Avoid complicated/unusual geometry (e.g. roof/wall intersections, back-slopes)
- Avoid waterfall edges that shorten roof membrane life (spillage, icicles, ponding, etc.)
- Avoid undulating roof shapes that increase snow drifting/snow shadows
- Avoid low parapets and thin roof edges that complicate detailing and construction
- Show future PV

Thing 3: A Good Roof and a Continuous Air Barrier

Use straightforward, constructible, and durable building envelope details:

- A skillfully built roof using proven materials and methods
- Sloped structural roof drainage and good drainage practices (i.e. redundant drains)
- Protected connections at roof penetrations and between roof and wall
- A continuous air barrier that minimizes materials, plane changes, and penetrations
- Cladding and insulation to protect the air barrier and connections

Thing 4: Clerestories and Simpler Glass Shapes and Sizes

Avoid locating windows down to grade (and up to parapet). Rather, locate windows in a good wall, not a "window-wall":

- Avoid excessive glazing and spandrel due to performance, durability, and cost
- Err on the side of durability, longevity, and maintainability vs. experimentation
- Glazing shall have similar, small, rectilinear shapes. These are easier to maintain, construct, and seal
- Optimize window head and sill heights for practical occupant access to light and views (e.g. windows below desks serve no purpose and reduce envelope efficiency)

Use clerestories instead of skylights to avoid issues of overheating, condensation, solar glare, and frequent maintenance:

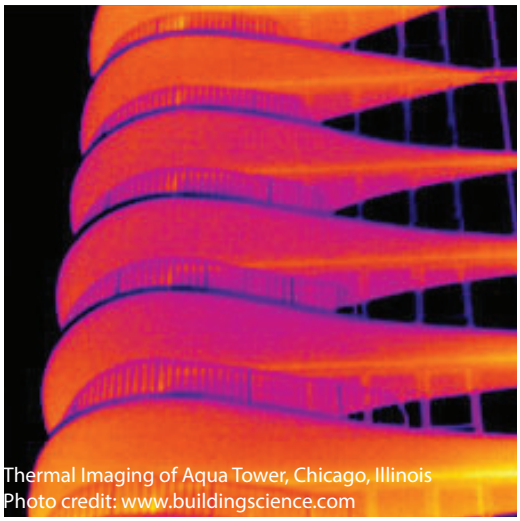
- Limit the number of clerestories to avoid building complexity
- Size the spaces to not be overly tall to reduce building volume
- Avoid (inefficient) north facing glazing

Housing with Verandas, Vienna, Austria
Photo Credit: Michael Hierner, www.divisare.com

Keep it Simple

Simple building shapes promote efficiency:

- Purposeful designs support functionality, flexibility, durability, and sustainability
- Structural regularity improves constructability and supports future adaptability
- Rectangular rooms are easier to build, furnish, and maintain
- Mechanical and electrical systems are less complex (e.g. straight service runs)
- Building envelope performance is increased through simpler building form and fewer complex details
- Air and vapour barriers are easier to detail and install
- Thermal bridging is reduced, saving energy over the life of the building
- Reduced capital cost for materials and labour by minimizing complicated geometry and building intersections
- Standardized, rectangular windows are easier to build, seal, and maintain
- Better energy efficiency (simpler details reduce thermal losses/moisture problems due to leakage)
- Less construction waste (vs. angles or curves that require extra cutting)
- Good roofs prioritize drainage and PV orientation over expensive and unnecessary sculptural expression



Thermal Imaging of Aqua Tower, Chicago, Illinois
Photo credit: www.buildingscience.com

Time, Cost, and Quality

Technical Services Branch provides design and technical advice to Project Teams in order to ensure that built outcomes meet Government of Alberta standards. Early TSB involvement is critical in reducing negative impacts to project budgets, schedules, and quality.

TSB's Design Review Process is of greatest benefit at the Schematic Design and Design Development phases when changes are easiest (and cheapest). *Top Ten Design Things to Watch For* is a tool that allows Project Teams to proactively avoid some of the most common design issues encountered by TSB reviewers.

Effort invested in design results in quality public facilities that provide enduring value to Albertans. To support the efforts of Project Teams in delivering successful GoA buildings, TSB maintains an online Technical Resources Centre with access to an extensive inventory of construction details, best practice guides and standards, research white-papers, and the Technical Design Requirements for Alberta Infrastructure Facilities:

https://www.alberta.ca/infrastructure-technical-resources.aspx

Thing 5: Projections: Canopies, Overhangs, and Fins

Avoid elements that compromise PERSIST building envelope principles:

- Construct shallow or thin elements outside the plane of air barrier and insulation (e.g. unheated canopies)
- Deeper/broader projections built inside the envelope can isolate air pockets and cause thermal or moisture problems. They must be open or mechanically conditioned.

Thing 6: Wasted Volumes

Eliminate crazy big roof shapes with excessive ceiling space/heights:

- Reduce unnecessarily high volumes. These increase material and operational costs
- Be wary of wasted volumes driven by grand architectural gestures, forms, and massing
- Avoid dead spaces/cavities next to the envelope, often created by decorative elements
- Avoid crazy shapes such as saw-tooth roofs, wedges, multi-directional curves, etc.

Thing 7: Future Growth

Demonstrate adaptability and flexibility of the design:

- Simple, uniform (modular) structural grid that allows for possible future extension
- Site plan anticipates future expansion (e.g. future wing)

Thing 8: Safe Sites

Design site layouts that optimize site safety:

- Allow for safe passenger drop-off. Separate pedestrians, cyclists, and vehicle traffic.
- Use the CPTED lens: imagine views of the building at night from a police patrol car
- Avoid climbable features
- Include strategically located fencing that enhances safety
- On-site garbage pick-up minimizes service vehicle traffic, 3-point turns/backing up
- Consider secondary loading and garbage

Thing 9: Follow the Sun

Situate the building and building features to benefit from the sun's path:

- Incorporate passive solar features that naturally benefit from available heat and light
- Achieve visual prominence to the community at the main entry
- Enjoy sunny, wind-sheltered outdoor classrooms/plaza (microclimates)
- Utilize south orientations for features: sheltered entrances, increased daylighting
- Consider orientations for future renewable energy features (BPIV, rooftop PV, etc.)
- Consider shade and shadow: avoid deep overhangs or sunshades on north elevations

Thing 10: Great Common Area

Great common areas are important to the success of a design:

- Consider volume (formality, grandeur, pride)
- Support informal assembly (strong points for speaker/stage; light and sound controls)
- Consider administration counter sightlines for casual supervision (inside/on approach)
- Provide plenary space for: breakout, coats, ticketing, food
- Provide security (locking off) ancillary zones
- Axes, natural light/views give intuitive wayfinding and orientation

TECHNICAL SERVICES BRANCH
3rd Floor, Infrastructure Building
6950 - 113 Street NW
Edmonton, AB
Canada
T6Y 5V7