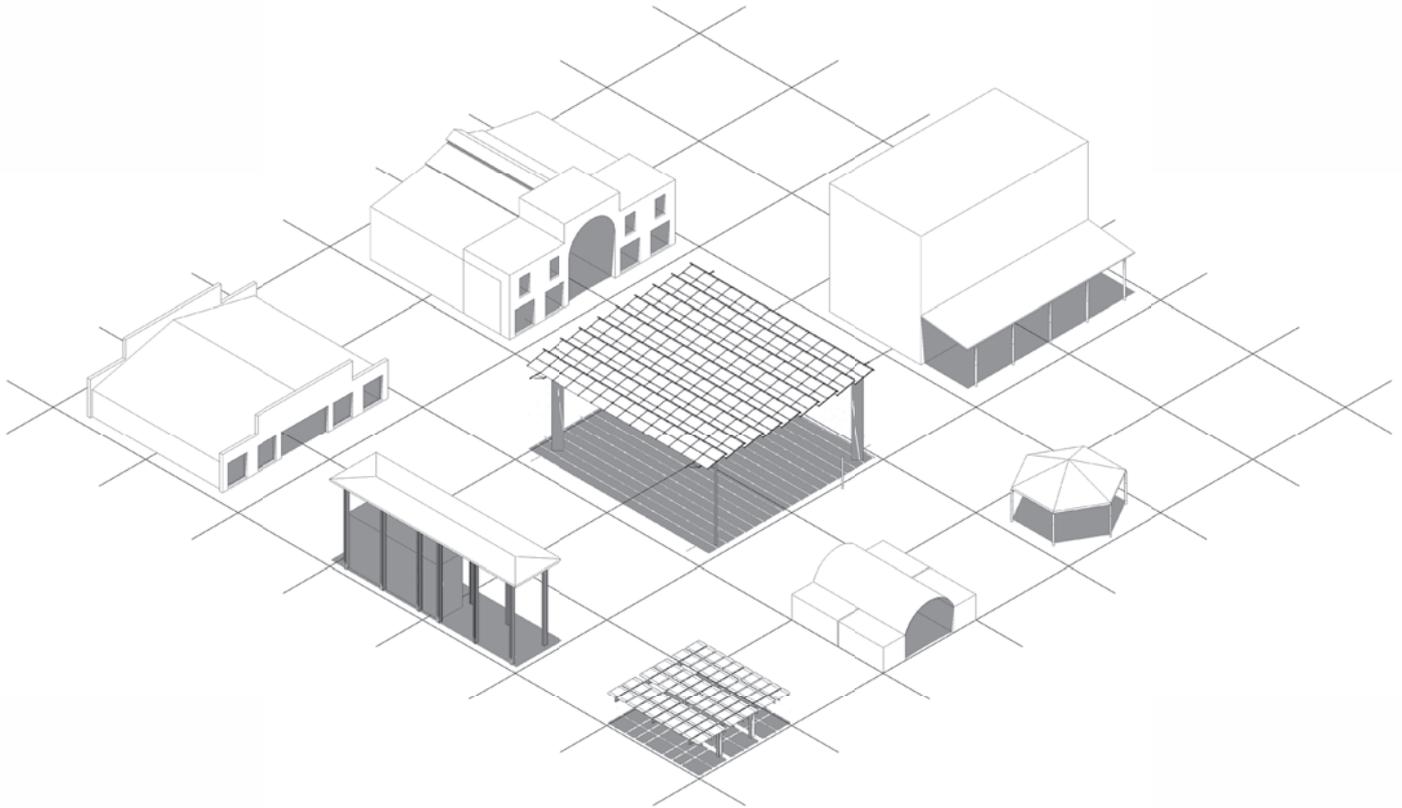
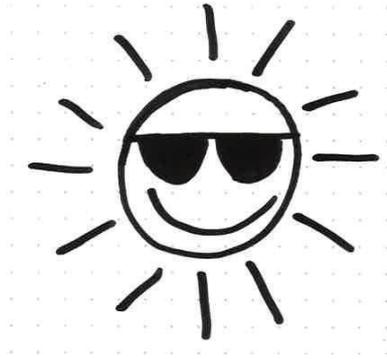


ATLAS OF SHADE

FRANK HOLLINGSWORTH



INTRODUCTION

The following is a collection of examples and analyses that illustrate the concepts and technologies laid out in the Guidebook.

A designer might look for examples relevant to their project as a starting point for a project. It represents at very least a collection - a zero-degree accumulation of knowledge.

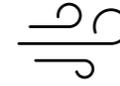
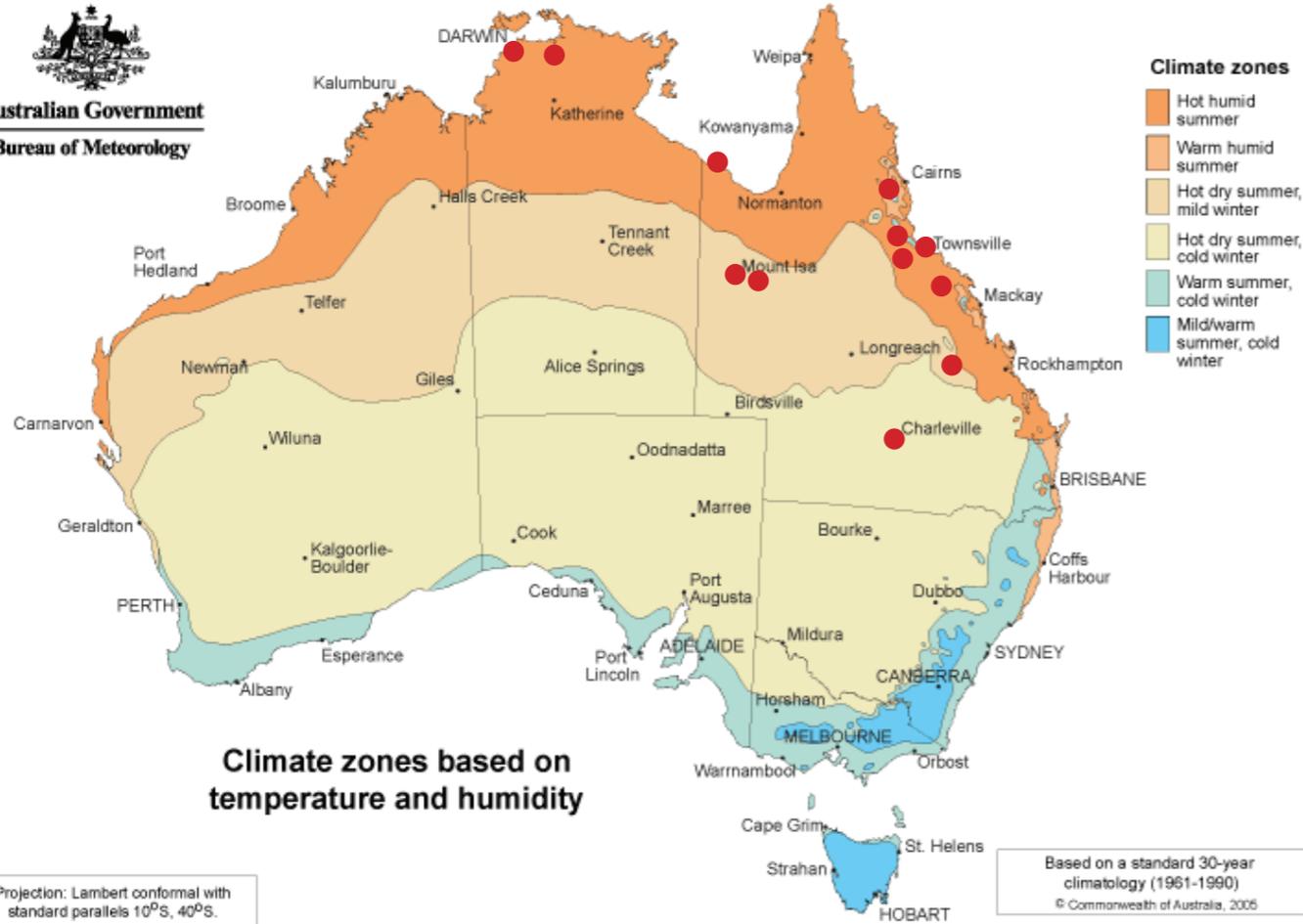
My own analysis may or may not be useful - though ideally it indicates possible understandings of the collected structures from which a designer could generate another shade structure.

To aid in classification and ordering, several types have been defined based primarily on scale and formal characteristics of the found shade structure examples. There are several examples that could be considered to be of multiple types, however for simplicity's sake they have been given a single type classification.

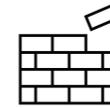
All photos and drawings are my own unless noted otherwise.

PLACES

TECHNOLOGIES



Mechanical airflow



Thermal Mass

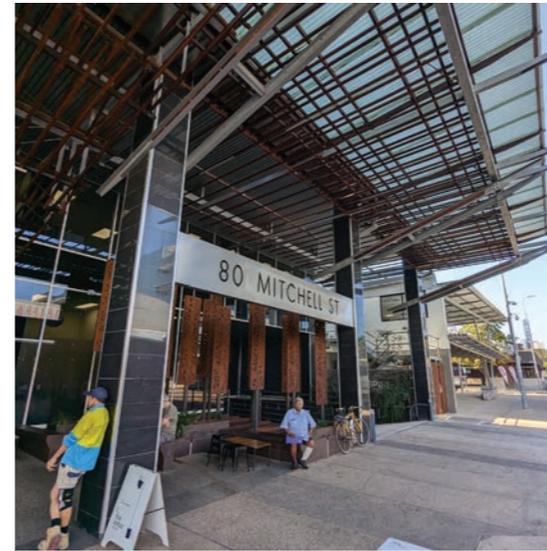
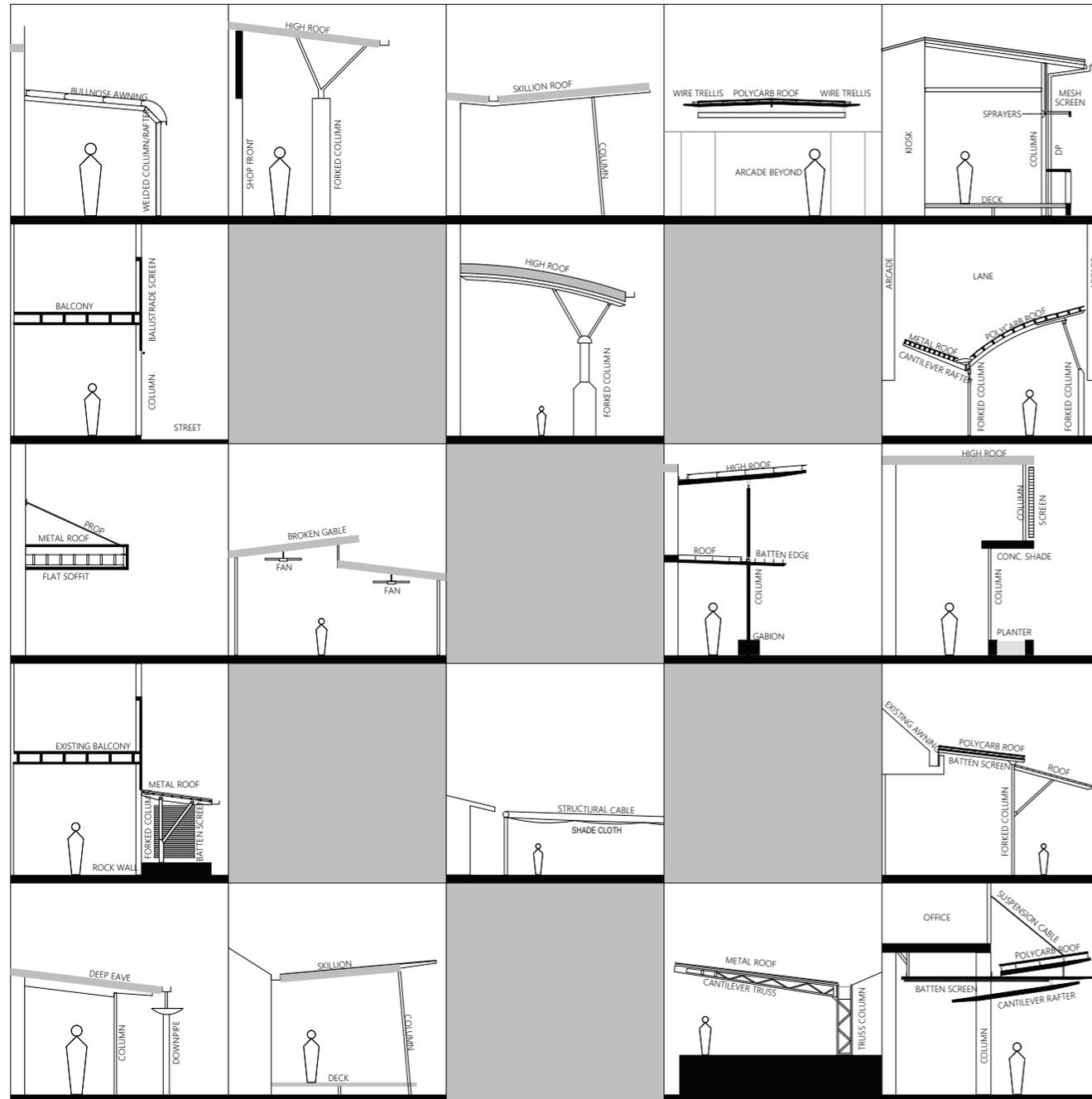


Evaporative Cooling



Planting

AWNING



Awnings are the most represented category of public shade in the Atlas. This may be because they are a part of a building and would represent an easily justifiable cost to the owner as only a small percentage of the overall build cost. From the pedestrian's perspective, awnings are an essential part of the street, and their absence is felt both on hot days and during storms. With regard to urban heat they prevent the sun's rays from heating the pavement below most times of the day.

Awnings also reduce heat load on buildings which reduces their energy consumption for air conditioning.



Awning shade is accounted for in the National Construction Code's (NCC) requirements for energy efficiency and so, of the listed types, are possibly the most prevalent due to their quantifiable benefit to building owners.

Care must be taken in their design that they don't trap hot air under their span which can amplify the heat of the shade material. Ensure there is a route for convection. Screens can be included on their vertical members to prevent sun entering in early and late periods of the day.

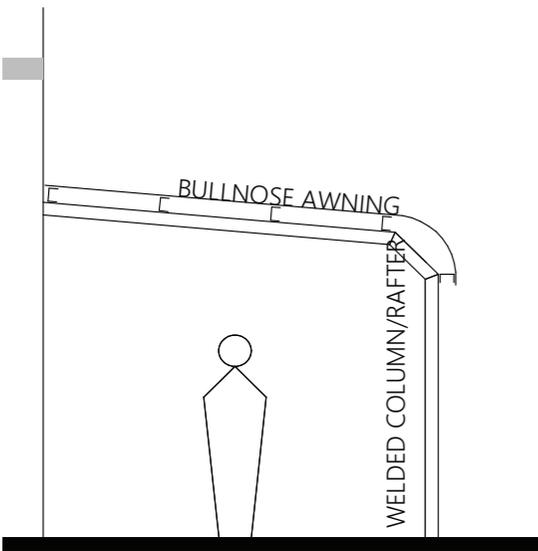


Cavenaugh St Awning

Unknown

Darwin NT

Hot Humid Summer



A simple bull-nose eave in corrugated steel can shield more of the shopfront and pathway from low level sun.

Sloping the awning toward the building makes sense for water drainage however it can cause hot air to become trapped against the side of the internal space - increasing its heat load.

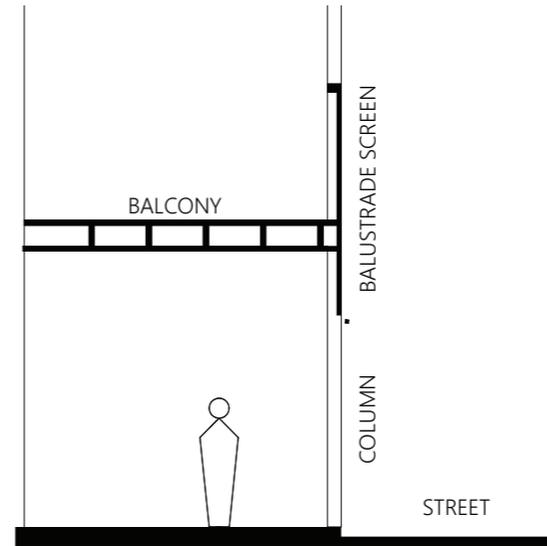


Cloncurry Pub Awning

Unknown

Cloncurry QLD

Hot Dry Summer



A common vernacular in regional Queensland, timber pubs have wide verandahs supported by posts on the street front.

Excellent deep shade is made possible by the placement of columns on the street front. This structure is seen less in modern buildings possibly due to the vulnerability of the columns to car impacts and modern fire safety requirements.

Worth investigating feasibility further.



Charleville Town Hall

Unknown

Charleville QLD

 *Hot Dry Summer*

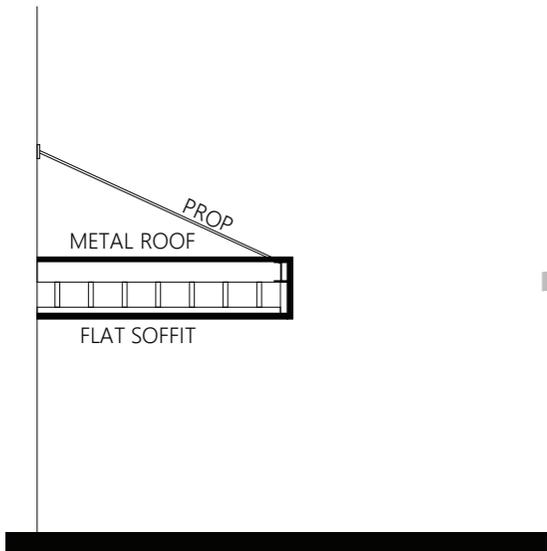


Shelter

Unknown

Atherton QLD

 *Warm Summer Cold Winter*

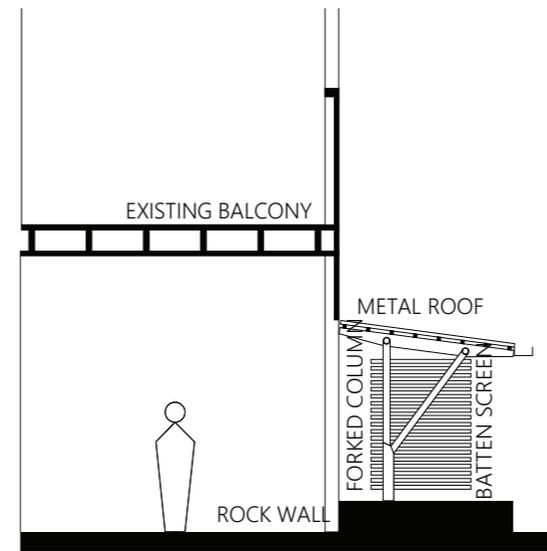


Common vernacular awning type throughout Australia.

Thick, framed out roof structure allows for plenty of air-insulation if nothing else.

Flat soffit allows hot air to escape.

Strut/cable support off existing building is efficient, requiring no ground works for columns.



Attaches to existing eaves shade for efficiency.

Forked column provides wide span roof with one footing per section.

Batten screen blocks direct sun while allowing airflow through.

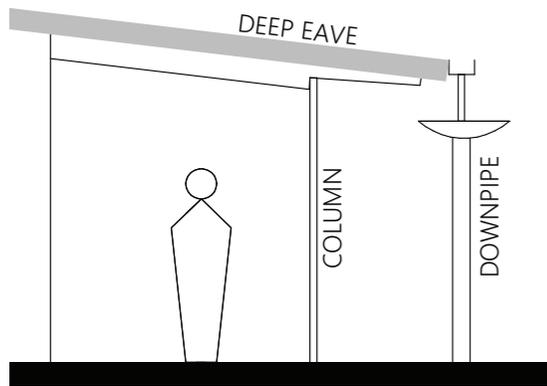


Doomagee Airstrip Entry

Unknown

Doomagee QLD

 Hot Humid Summer



A simple wide awning on the admin building for a remote airstrip keeps sun off the building itself while keeping it cool.

Interesting downpipes form slightly shades concrete patio.

Hot air may collect against building on still days due to soffit slope.

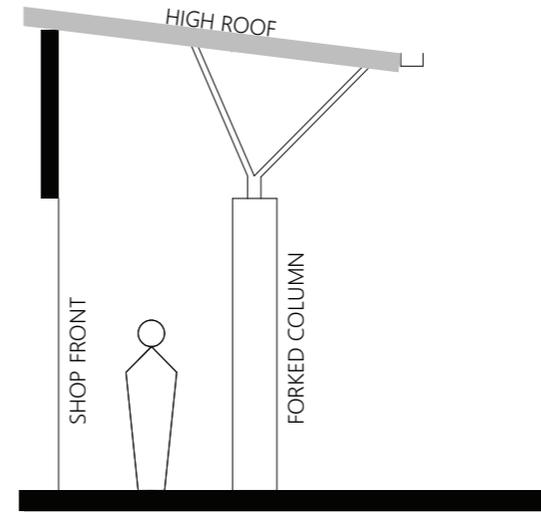


Mitchell St Awning

Unknown

Darwin NT

 Hot Humid Summer



Forked columns allow wider span eave with single column footing.

High soffit allows for airflow and mitigates radiant heat and trapped hot air due to slope of soffit.

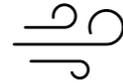


Mornington Island Airstrip Entry

Unknown

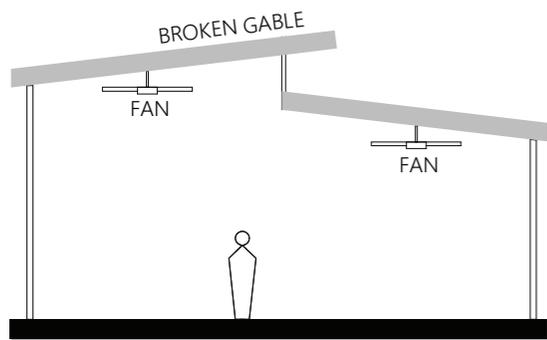
Mornington Island QLD

 *Hot Humid Summer*



Extended awning on the Mornington Island airstrip building has a split eave to ventilate the space with convection and nearby ocean breeze.

Mechanical fans further aid in moving air in the space and providing sensible air movement on still days.



Eva's Cafe Extension

Bennett Architecture

Darwin, NT

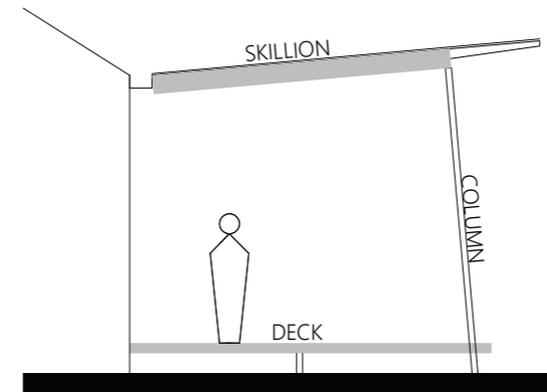
 *Hot Humid Summer*

Roof pitch allows hot air to escape.

Deck floor completely shades ground preventing heat load from reaching thermal mass.

Deck allows airflow from underneath floor.

Timber soffit increases resistive insulation reducing heat of ceiling.





Casuarina Pool Awning

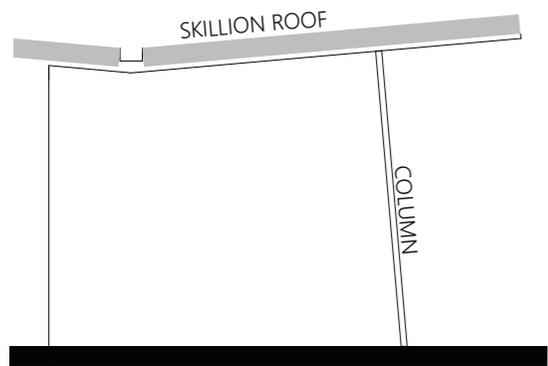
Unknown

Darwin NT

 *Hot Humid Summer*

Roof pitch allows hot air to escape.

Timber soffit increases resistive insulation reducing heat of ceiling.



Casuarina Square Ramp Entry Awning

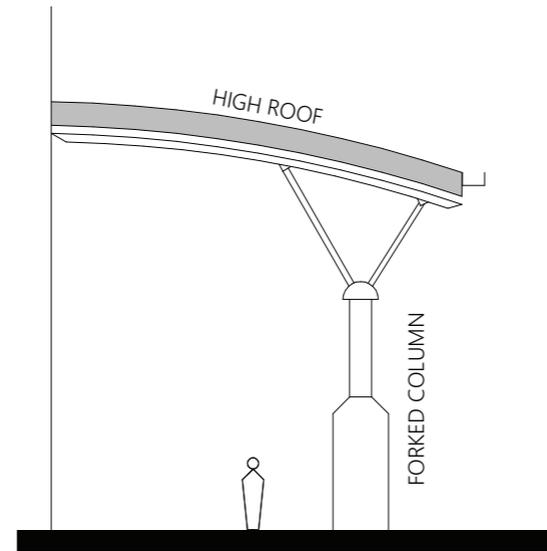
Unknown

Darwin NT

 *Hot Humid Summer*

Forked columns allow wider span eave with single column footing.

High soffit allows for airflow and mitigates radiant heat.





Retractable Shade Sail

Unknown

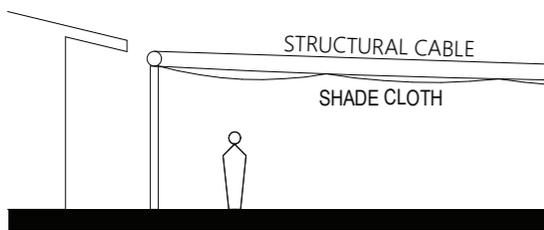
Jubilee Bowls Club, Townsville QLD

 *Hot Humid Summer*

Shade cloth reduces intensity of sunlight on Astroturf space.

Operable, can be extended to cover large space when shade is required and stowed to maximise airflow and re-radiation of heat to the sky.

Lightweight, supported by cables over large spans for structural efficiency.



Cross-Laneway Shade

Tropo Architecture

Darwin City, NT

 *Hot Humid Summer*



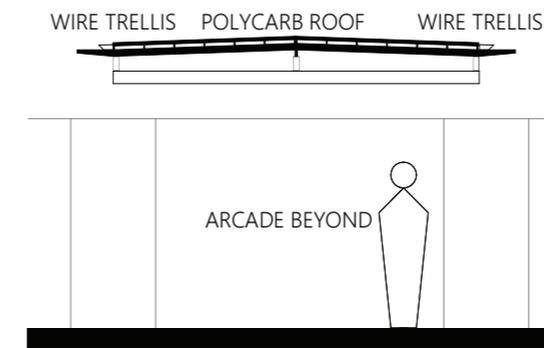
Spans between existing buildings, so no column footings for a street-spanning eave.

High roof allows all traffic to circulate under and hot air to escape.

Spans lane, shading high thermal mass road.

Trellis for vines to provide evapotranspiration,

Batten and polycarb used to soften shadows and provide muted natural light to depth of shade.



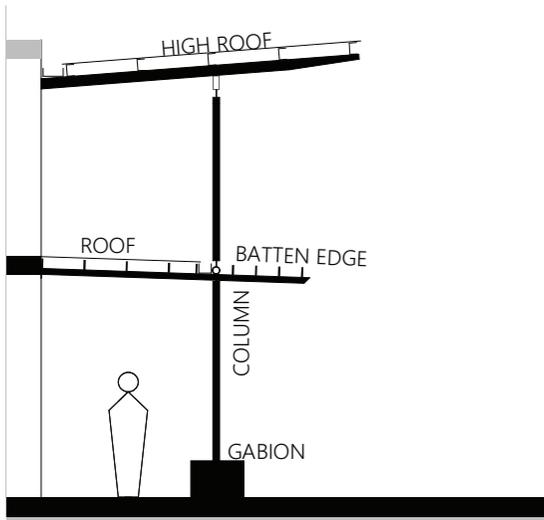


Awning Shade

Troppo Architecture

Darwin City, NT

 Hot Humid Summer



Nearby to the previous structure, this shades the otherwise exposed corner of the street.

Wide roofs take the heat load off the building while the batten screen softens the edge of the shadow it casts.

The pitch of both roofs allows hot air to escape.

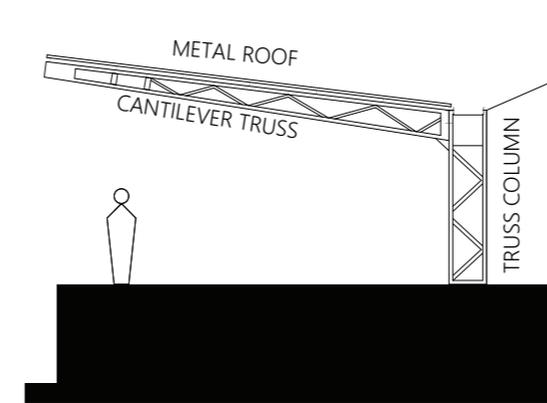


Charleville Train Station

Unknown

Charleville QLD

 Hot Dry Summer



Cantilever steel truss roof structure with steel truss columns.

Cantilever provides deep shade while presumably avoiding columns that would impede train access.

Upward slope to allow hot air to escape in convection.

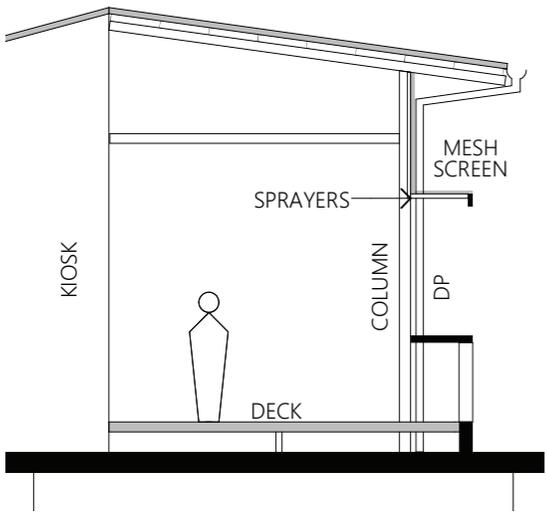


Mt Isa Hotel Deck

Unknown

Mt Isa QLD

 Hot Dry Summer



Excellent cool shaded space, one of the few to use evaporative cooling.

High level screening allows convection while shading from low level sun.

Deck off ground allows for air circulation from cool shaded ground.

Water sprayers ideally suited to desert environment. Particularly effective in low-humidity environments and mounted above space to allow cold air to sink into habitable zone.

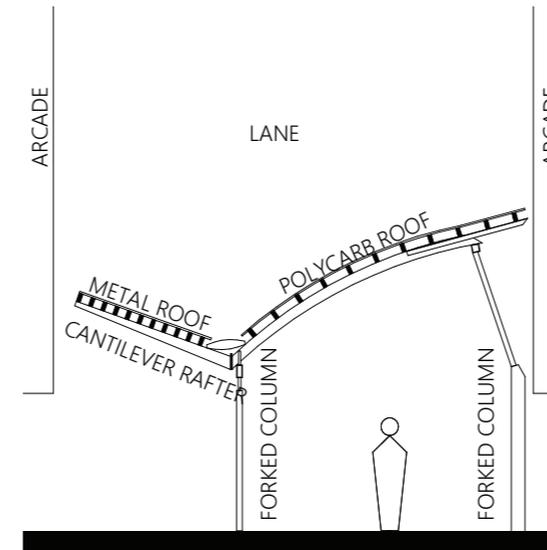


Cross-Laneway Shade

Tropo Architecture

Darwin City, NT

 Hot Humid Summer



Forked columns and cantilever are structurally efficient requiring less column footings for a street-spanning eave.

High roof allows all traffic to circulate under and hot air to escape.

Spans lane, shading high thermal mass road.

Batten and polycarb used to soften shadows and provide muted natural light to depth of shade.

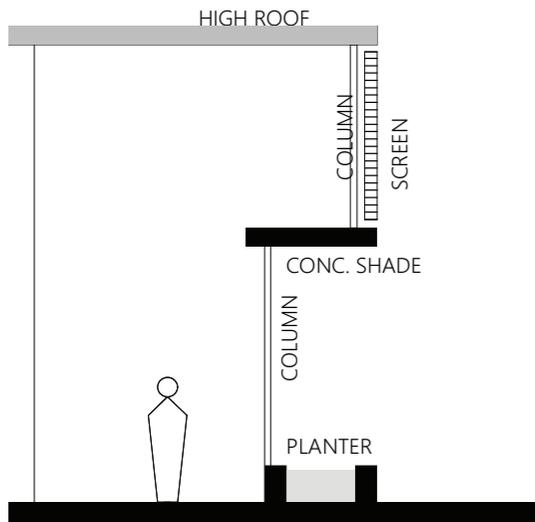
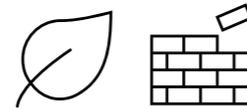


Proserpine Entertainment Center

Cox Architecture

Proserpine QLD

 *Hot Humid Summer*



High roof with flat soffit allows airflow and convection to ventilate.

High level screening allows ventilation while blocking sun ingress

Low level planting screens and cools evaporatively

Shaded concrete absorbs heat.

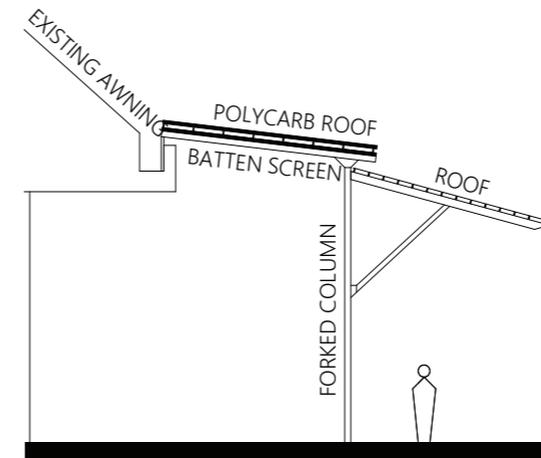
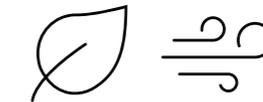


Mall-end Park

Tropo Architects

Darwin City, NT

 *Hot Humid Summer*



Forked columns, cantilever and attachment to existing building are structurally efficient requiring less column footing for wide eave.

Segmented skillion roof overshoots existing building to ventilate convection heat.

Mechanical fans provide airflow to cool down occupants.

Batten and polycarb used to soften shadows and provide muted natural light to depth of shade.

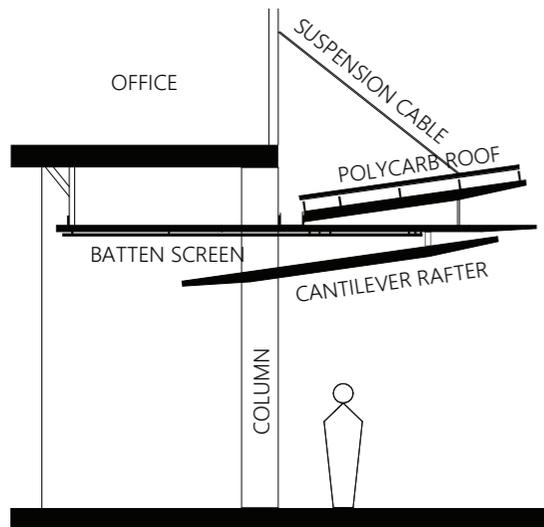


Awning Shade

Tropo Architecture

Darwin City, NT

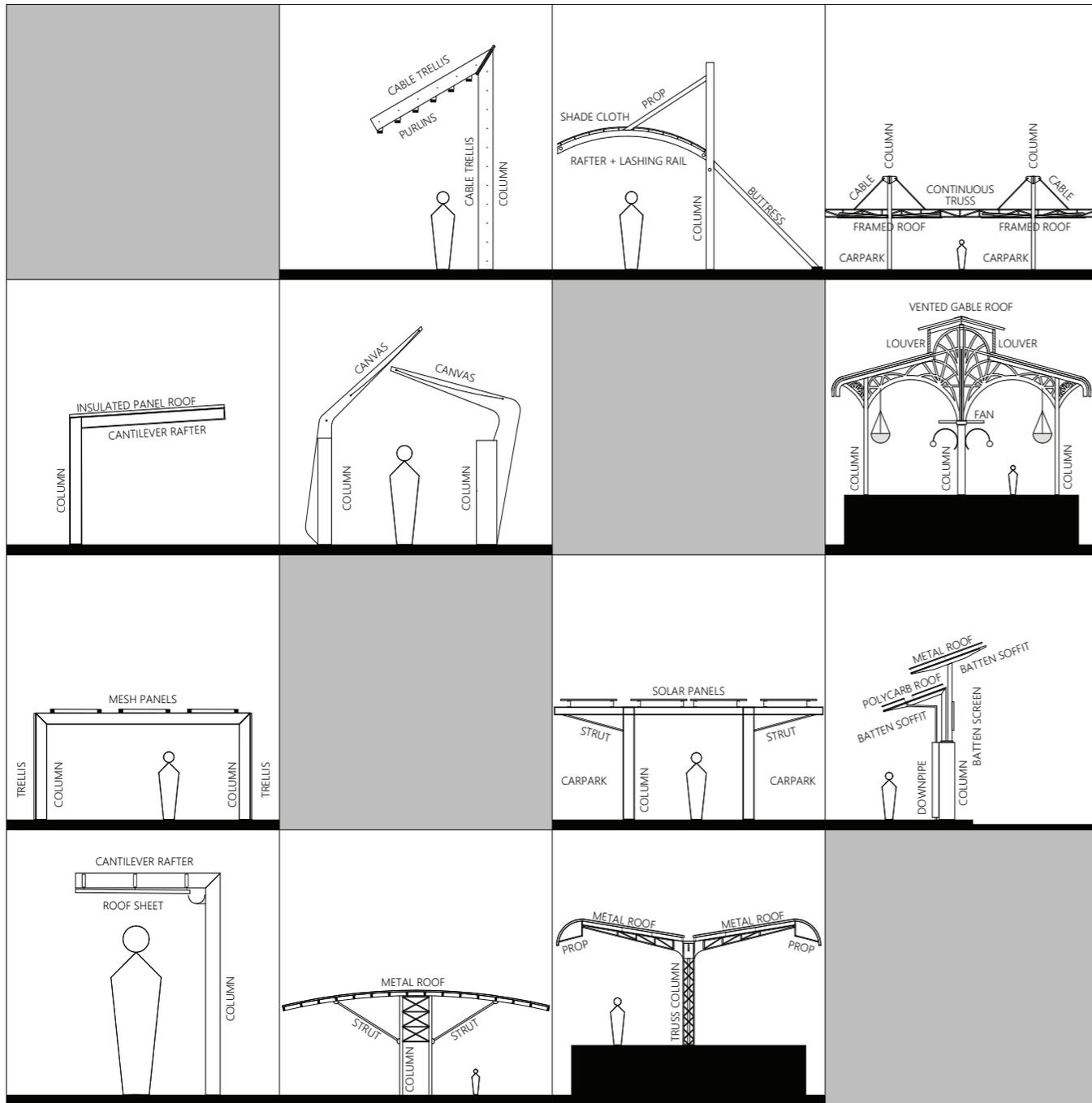
 Hot Humid Summer



Awning structure fits elegantly under the existing overhang of the office tower.

The construction overcomes a common issue with awnings - that they trap hot air under them. This structure allows hot air to escape the structure through convection and airflow with its height and separation from the building structure.

COVERED PATH



Covered paths were identified as a category similar to awnings but less common due to their standalone structure. Included in this category is train stations, which follow a similar type though typically cantilevered to allow access to the rail-side.



This type is typically shelters people moving through spaces that are not inhabited in the long-term such as green spaces and car parks. In parks they are used to define the edge of open spaces and shade bench seating and thermal mass concrete paths. This shade type is an excellent improvement to car parks in the heat, providing solid shade and preventing the thermally massive concrete or asphalt from absorbing the sun's heat. Mt Isa airport used a solar panels with no weatherproofing below to create a simple defence against UHI effect and providing an energy source to the airport.



Centennial Park

Tract Consultants

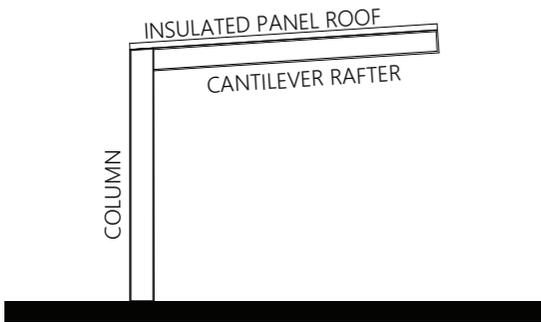
Mt Isa, QLD

Hot Dry Summer

Simple steel cantilever structure allows one side to be open to the grassed area.

Insulated panel roof provides resistive insulation to sun's heat.

Flat soffit allows hot air to escape.



Centennial Park

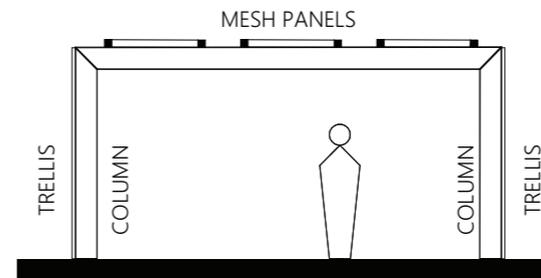
Tract Consultants

Mt Isa, QLD

Hot Dry Summer

Mesh structure provides minimal shade, unsure if the desired result is trellising for a vine that hasn't grown yet.

Steel portal frame.



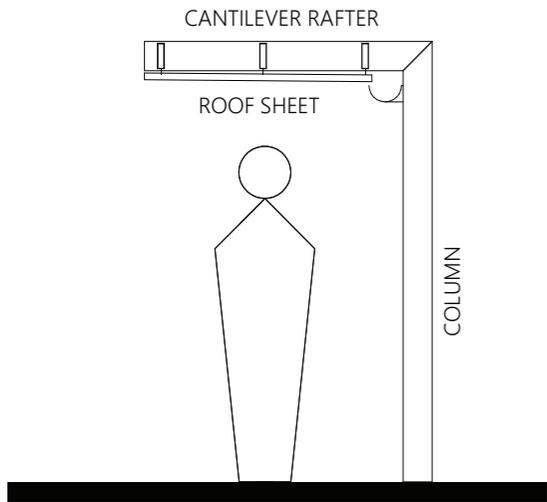


Shade structure

Unknown

Emerald QLD
Photo by Mackenzie Barclay

Hot Dry Summer



Simple bus stop structure, fixing is through the top of the ridge of the corrugated steel sheet to avoid water leakage.

Flat soffit and weatherproof roof with minimal materials.

Cantilever steel beam reduces groundwork requirements and opens to bus ingress.

Low, uninsulated roof may allow radiant heat to affect inhabitants.

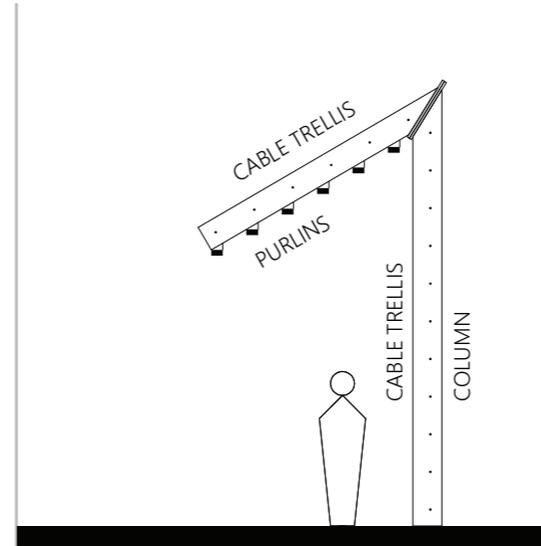


Florence Clark Memorial Park

Cox Architecture (?)

Cloncurry QLD

Hot Dry Summer



Steel structure with cables for trellising.

Trellised plants (Bougainvillea) are typically hardy which is important for desert environments however a trellised plant may not be the best option for a low-water environment. This is evidenced by the plant's low-coverage so far.

Cantilever structure saves on groundwork.



Temporary Path Shade

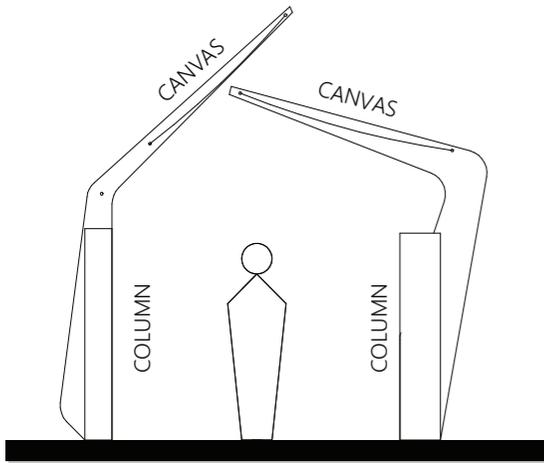
Unknown

Darwin City, NT

 *Hot Humid Summer*

Prefabricated, seemingly temporary shade with shade sails interspersed to block sun.

Cheap, interesting structure though with many redundant columns supporting no shade.



Car park Shade

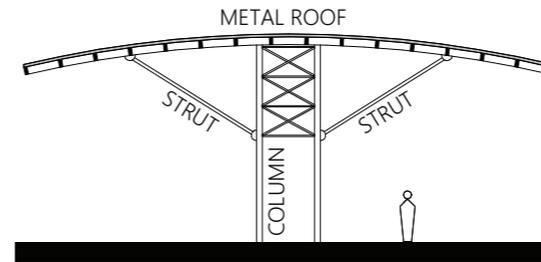
Unknown

Darwin City, NT

 *Hot Humid Summer*

Car park steel structure provides massive span over thermally massive car park.

Central truss-column providing cantilever to both sides and passage below is structurally efficient.





Territory Wildlife Park Train Stop

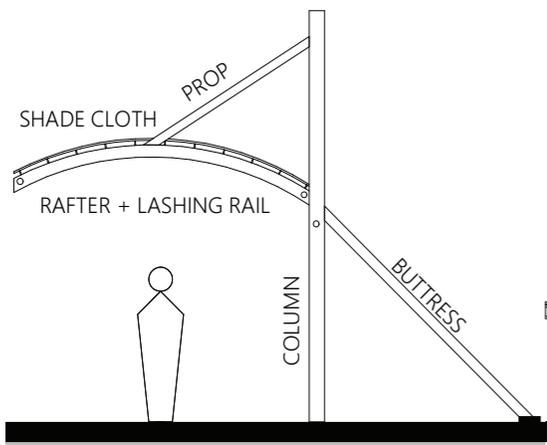
Unknown

NT

 *Hot Humid Summer*

Shade sail support structure provides open-sided access to road-train.

Utilises adjacent garden space to place buttress structure.



Solar Panel Shade

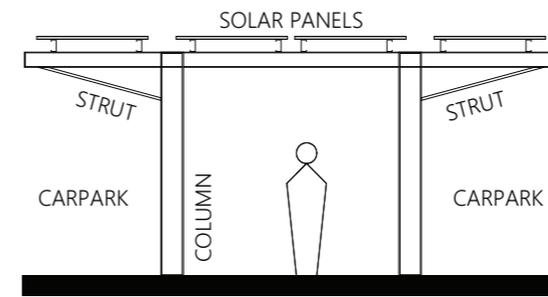
Unknown

Mt Isa Airport

 *Hot Dry Summer*

Solar panel car shade in airport car park. Shades thermally massive bitumen space while also providing power to the airport.

Steel construction shades pedestrians with solar panels. Due to desert environment prioritises cost over making a weatherproof shelter. Allows airflow through solar panels.





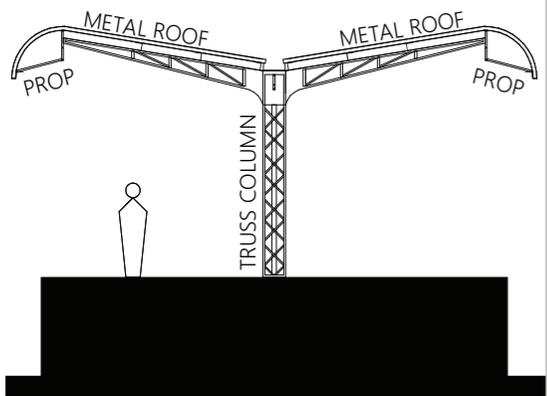
Townsville Train Station

Unknown

Townsville QLD

 Hot Humid Summer

Steel truss cantilever structure with bull-nosed edges. High roof allows airflow and radiant heat to disperse.



Castletown Shopping Center Car park

Unknown

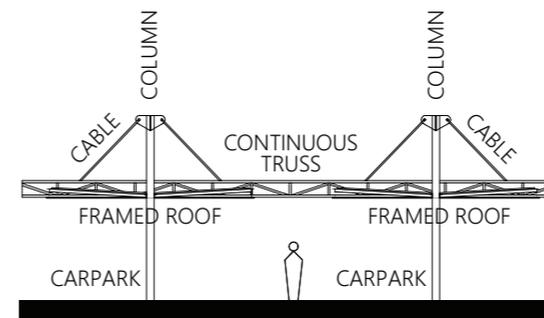
Townsville QLD

 Hot Humid Summer

Continuous truss structure supported by tensile members from the tops of columns provides shade to thermally massive car park.

Efficient structural system for large spaces where a continuous beam member can be utilised.

Flat soffit presumably insulated, though low-ness may allow radiant heat to affect pedestrians and cars.



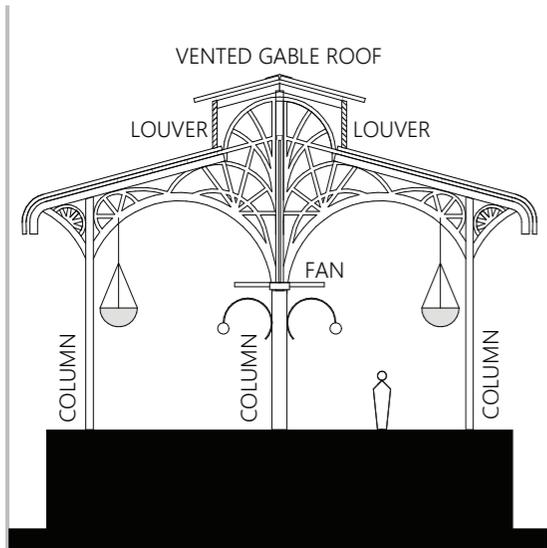


Kuranda Line Train Station

Unknown

Cairns

 Hot Humid Summer



Beautiful ornamented structure with a vented gable high roof to allow air circulation and reduce radiant heat affecting inhabitants.

Vented gable also provides excellent indirect natural lighting to the space.

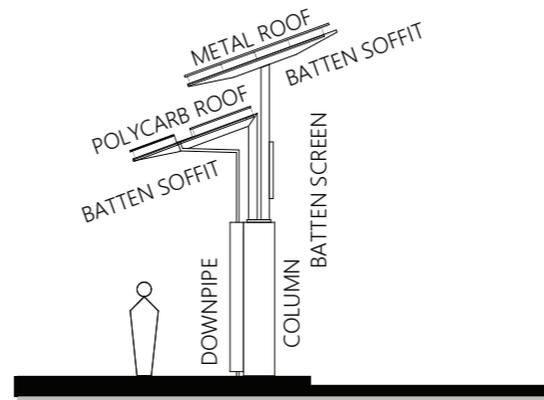


Bus Stop Shelter

Troppo

Darwin City, NT

 Hot Humid Summer

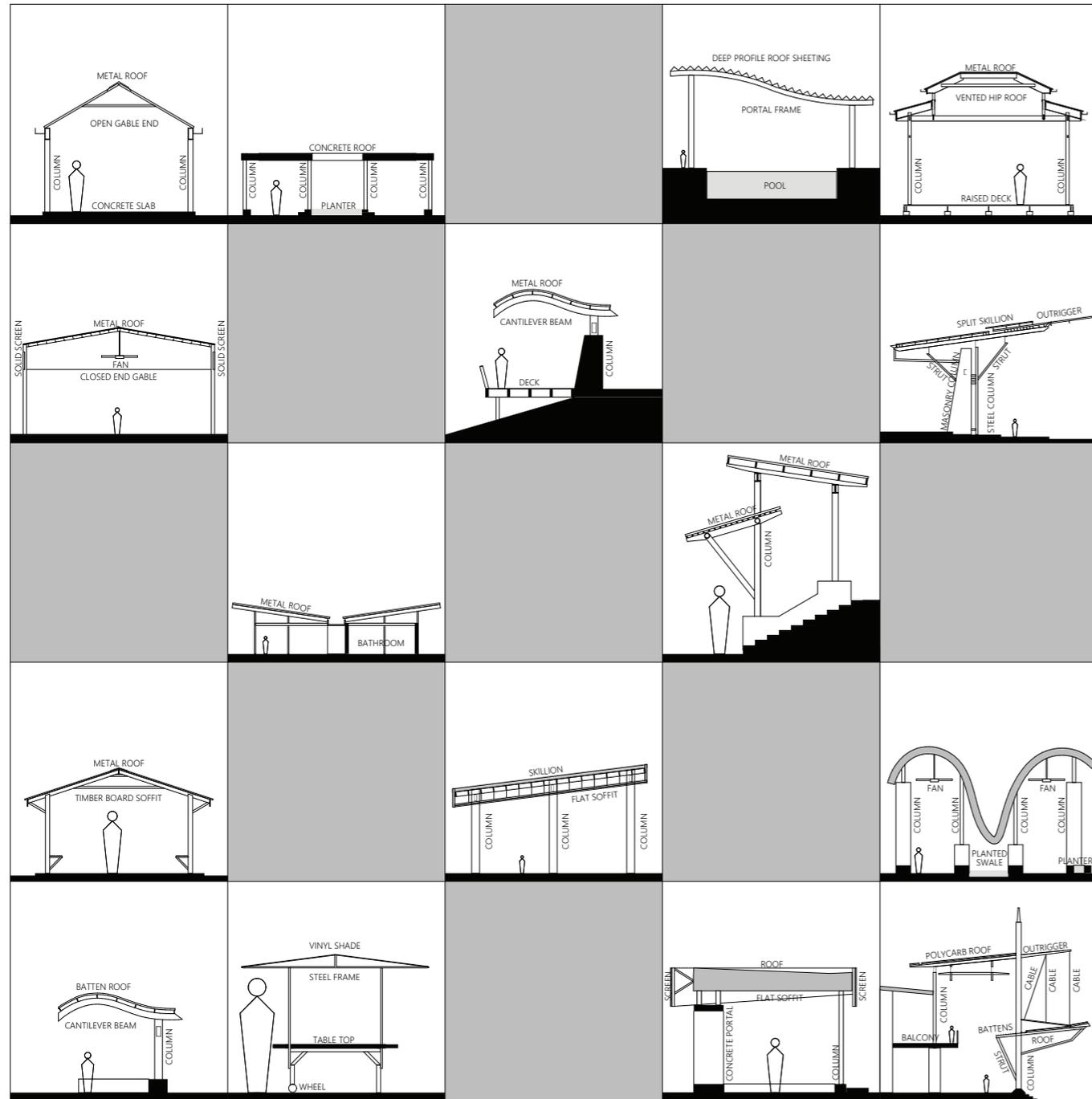


Interesting split skillion roof structure providing airflow and shelter to the bus stop.

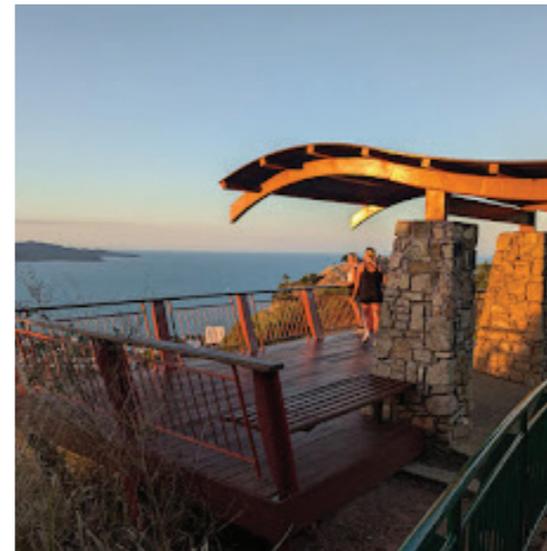
Single masonry column supporting steel structure minimises ground work.

Battened edges and polycarb sheet provides natural light and dappled shadow throughout the day.

PAVILION



Pavilions are standalone structures that define a less transient space than awnings or covered paths. There is usually seating and possibly planting beneath and they typically define a space where people congregate in small groups such as park benches and rest stops. Typically they are inserted into parks and open spaces to provide shelter.



Their open nature means they ventilate well, though their height and extension past the boundary of any thermally massive concrete beneath them should be considered to prevent heat buildup in the early and late times of the day when the sun is at a low angle.



Shade Structure

Vernacular

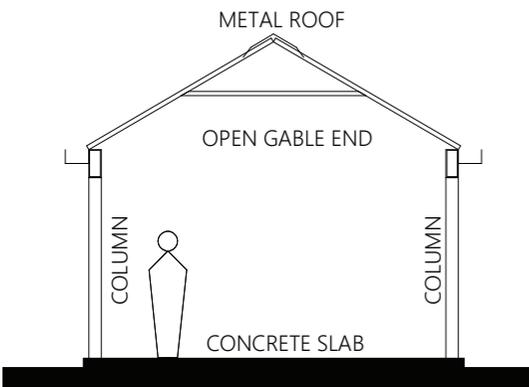
Cloncurry State School QLD

Hot Dry Summer

Open gable to allow hot air to escape.

Insulated panel roof resists heat transfer to underside.

Slab exposed to sun may store excessive heat for climate.

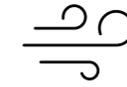


Basketball Shelter

Unknown

Cloncurry QLD

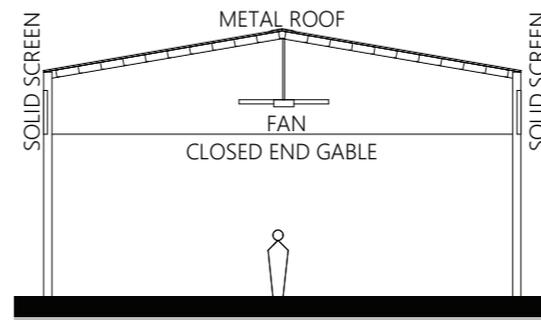
Hot Dry Summer



High roof with closed end gable and screen along high edge prevents sun ingress at low levels.

Gap between screen and roof edge allows hot air to escape.

Mechanical fans provide airflow to cool down occupants.





Townsville Palmetum

Unknown

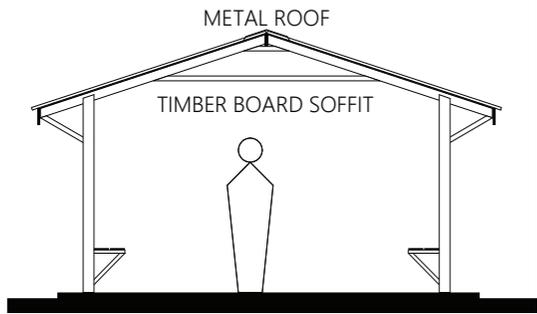
Townsville

 *Hot Humid Summer*

Open to breezes from parkland to extract hot air that may be trapped under low pitched hip roof.

Low fascia prevents much of low level sun ingress onto slab.

Timber soffit resists conducting heat from metal roof.



Castle Hill Shade

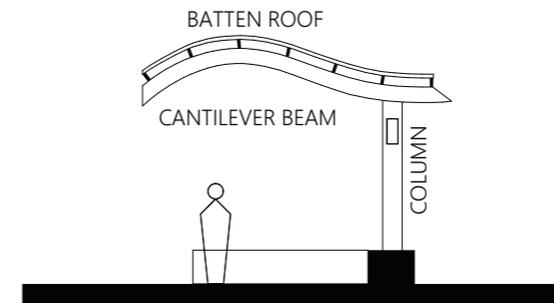
Unknown

Townsville QLD

 *Hot Humid Summer*

Steel frame structure with curved batters overhead.

Batters create light shade and remove some of the intensity of the sun while allowing air to circulate.



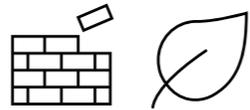


The Oasis central shade

Counterpoint Architecture and Phorm

Townsville QLD

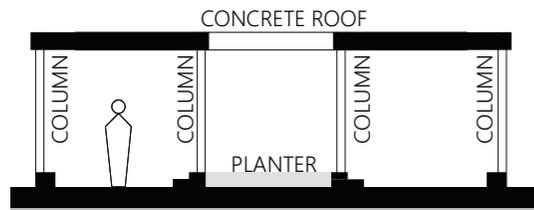
 Hot humid summer



Thermally massive shade of approximately 200mm to lag heat transfer. Unsure if thermal mass is suitable shade for climate zone.

Planting to provide evapotranspiration cooling.

Shaded thermally massive seating.

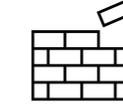


Comfort Stop

Unknown

Home Hill QLD

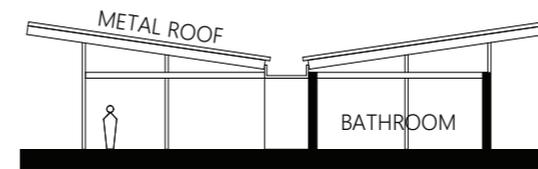
 Hot Humid Summer



High roof shaped to allow hot air to escape.

Wide spanning completely shades masonry walls under for cooling thermal mass.

Undercut to wall and gap between screening and roof to maximise airflow.





Portable table shade

Unknown

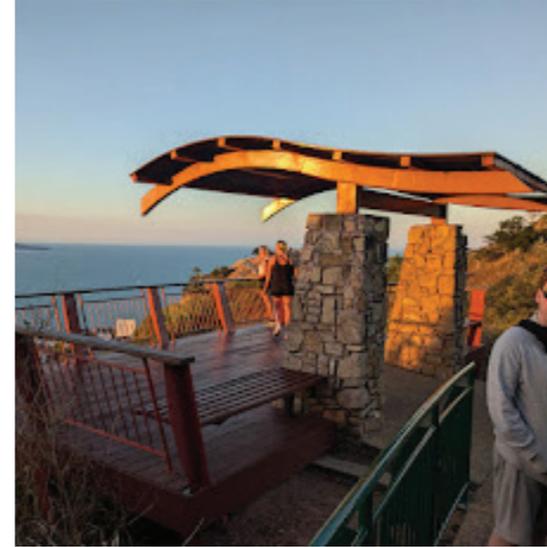
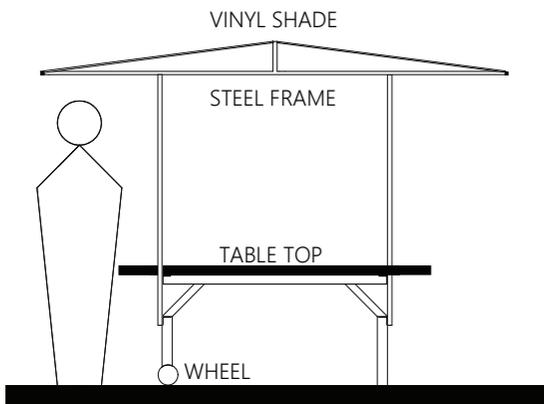
NT

 *Hot Humid Summer*

A shade sail attached to a portable table.

Portability allows for orientation and placement as sun moves throughout the day.

Lightweight canvas construction allows wide spans over table.



Castle Hill Lookout

Unknown

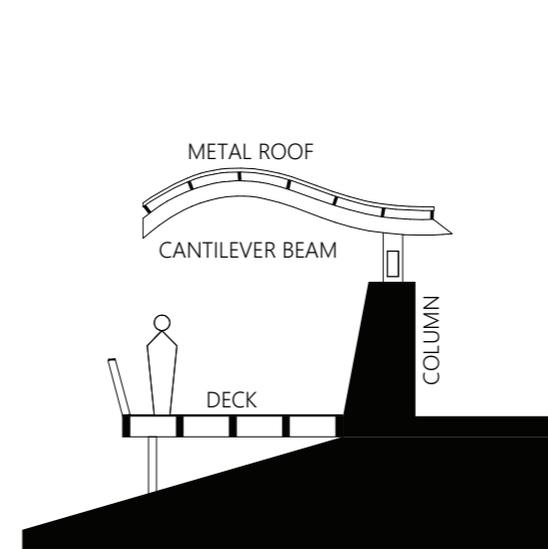
Townsville QLD

 *Hot Humid Summer*

Lookout structure deck allows for air circulation from below.

Metal roof sheet creates solid shade.

Open structure, facing the sea maximises airflow through to prevent hot air buildup.



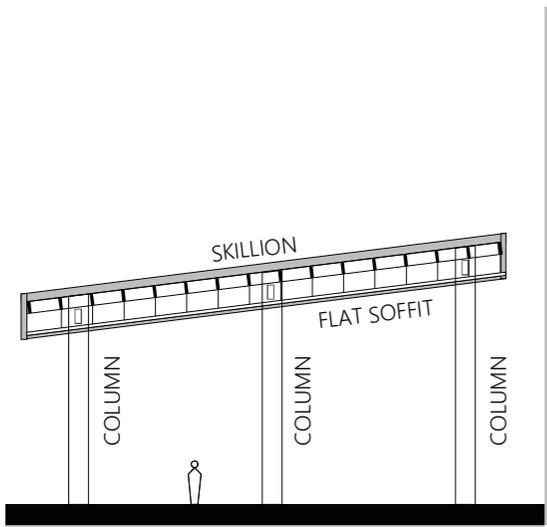


Centennial Park Main Shade

Tract Consultants

Mt Isa, QLD

 *Hot Dry Summer*



Simple yet large scale civic structure.

Flat soffit allows hot air to escape.

Thick framed roof structure insulates from sun's heat in the middle of day however form and orientation do little to prevent low sun angles.

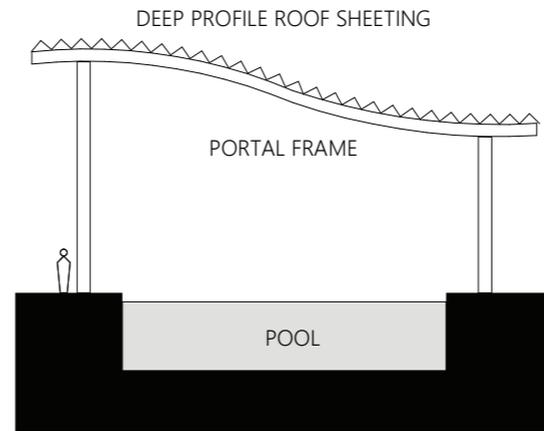


Aramax Pool Shade

Unknown

Casuarina, NT

 *Hot Humid Summer*



Portal frame and deep profile roof sheeting showcase simple and long-spanning structural capability over pool.

High level roof allows for airflow.

Form and orientation allow for the sun to enter at low levels in winter while the curved form that lowers to the east would keep summer sun off much of the pool from midday onward.

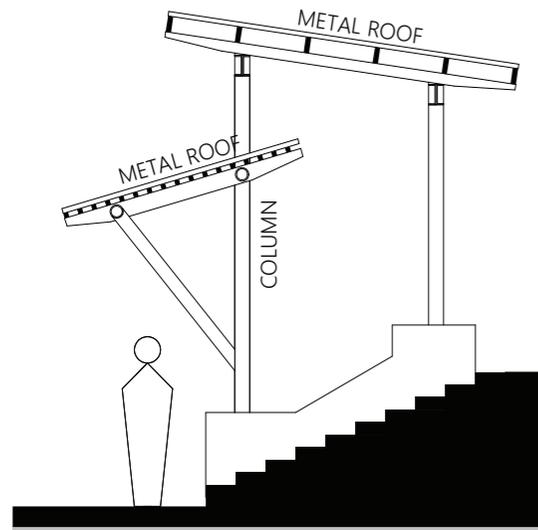


Road Crossing Shelter

Unknown

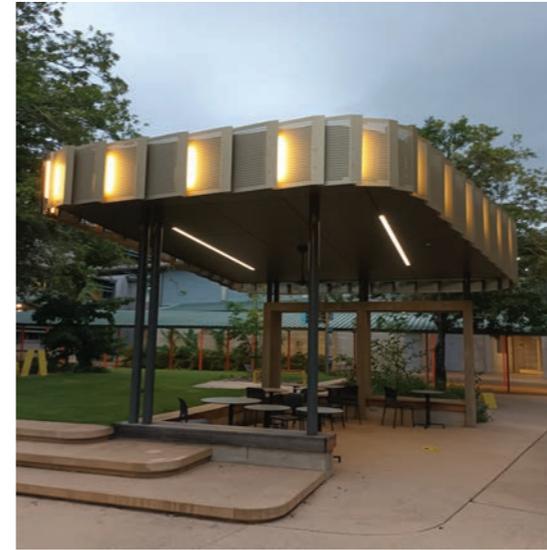
Atherton QLD

Warm Summer Cold Winter



Forked columns for structural efficiency - less column footing to shelter width ratio.

Split skillion ventilates hot air.

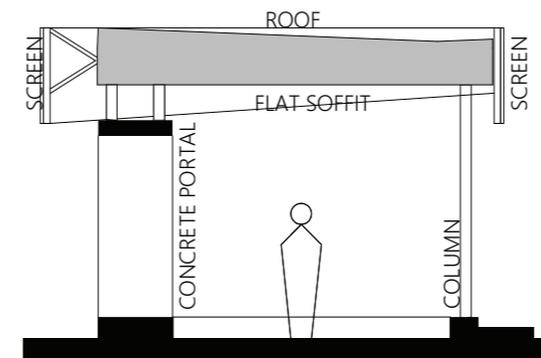
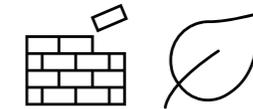


JCU Health Peer-to-Peer Shelter

Counterpoint Architecture

Townsville

Hot Humid Summer



Flat soffit allows hot air to escape.

Shaded thermally massive concrete portal.

Screening allows ventilation while protecting from low level sun.

Adjacent garden provides evaporative cooling.



Atherton Chinese Temple Entry

Unknown

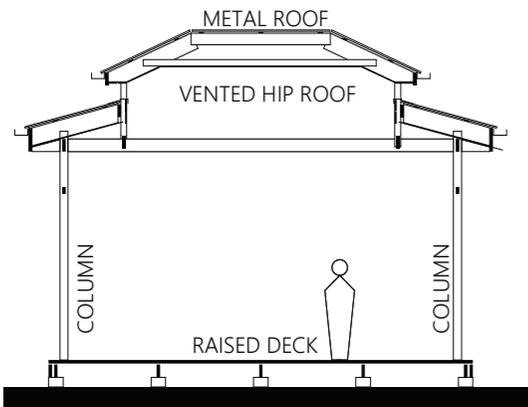
Atherton QLD

Warm Summer Cold Winter

Vented roof allows hot air to escape.

Roof allows indirect natural light to enter.

Deck allows full shade of thermally massive ground and ventilation of cool air from ground.



Darwin Entertainment Center Entry Pavilion

Tropo Architects

Darwin NT

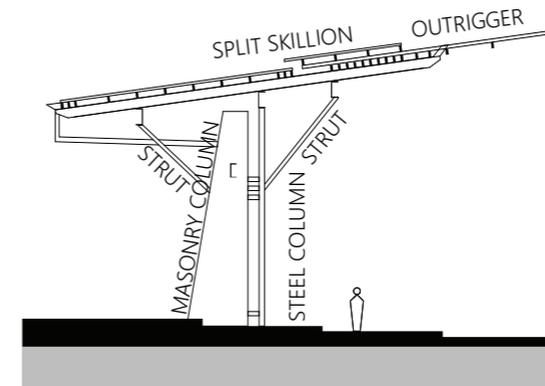
Hot Humid Summer

Sophisticated cantilever structure using only one two columns.

Split skillion allows for increased airflow.

Cantilever creates deep shade with reduced columns.

Battening and polycarb roofing creates pleasant dappled shade variation throughout day.



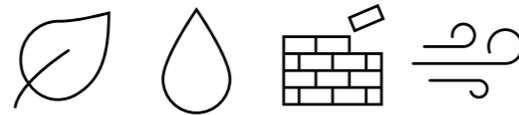


JCU Central

Cox Architecture

Townsville

 *Hot Humid Summer*

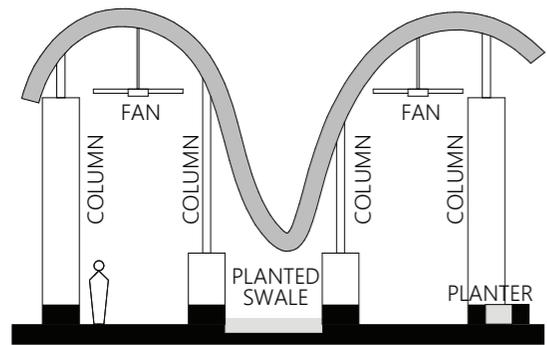


High roof shaped to catch airflow and allow hot air to escape.

Mechanical fans provide airflow to cool down occupants.

Planting and water feature to provide evapo-transpiration cooling.

Shaded thermally massive seating.



Darwin Entertainment Center Entry

Tropo Architecture

Darwin NT

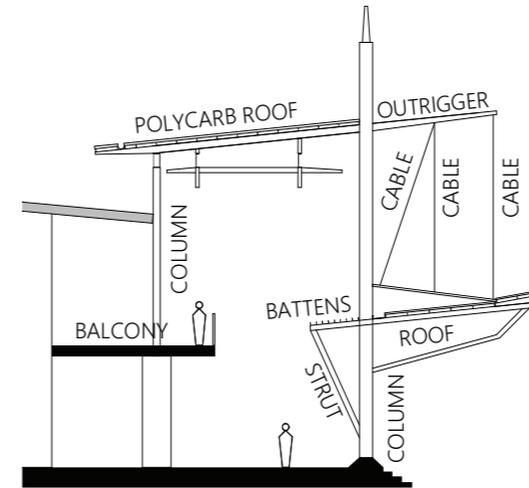
 *Hot Humid Summer*

Sophisticated skillion roof structure with multiple layers of shade.

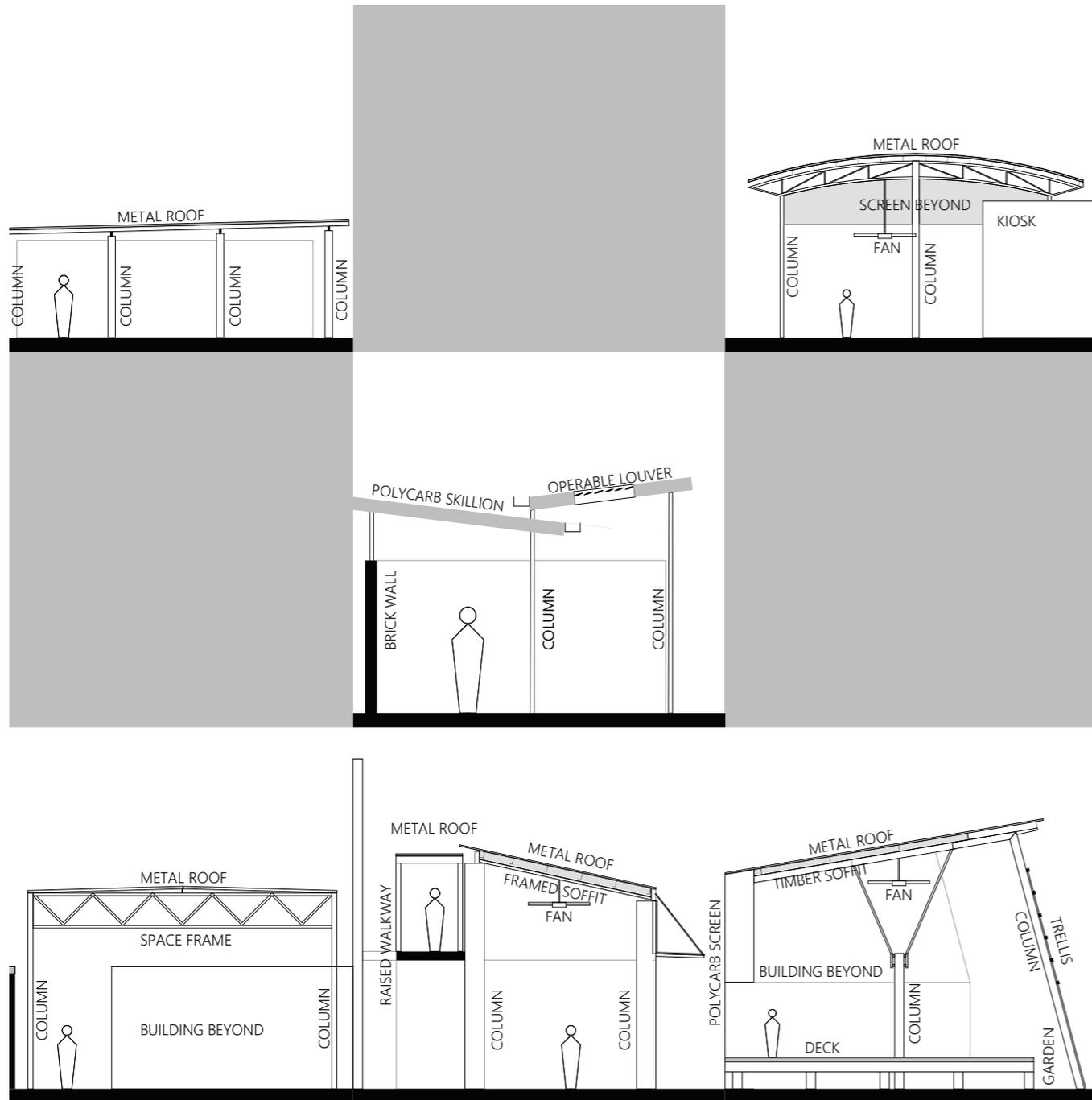
Form allows for deep sun ingress in winter while keeping the space shaded throughout summer.

Split skillions allow for airflow.

Cantilever structure creates seep shade while reducing columns and earthworks.



COURTYARD



Courtyards could be considered as a combination of awning and pavilion types, usually a shaded space defined by walls and buildings. These spaces need to be ventilated adequately and typically have openings to allow prevailing breezes to enter and exit as well as mechanical fans.

Depending on orientation they can prevent heat load on adjacent buildings and provide a large social gathering space if properly designed for hot climates.



As they typically define a space where many people may gather, ventilation and evaporative cooling should be considered.



Campsite Amenities Shelter

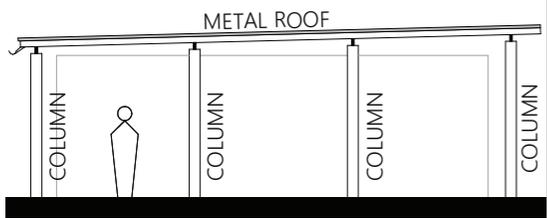
Unknown

Mt Fox QLD

 Hot Humid Summer

Simple timber structure spanning over cheap demountable dwellings.

Fly-roof blocks direct solar radiation and though uninsulated is high and open enough to allow hot air to circulate.



Shaded court

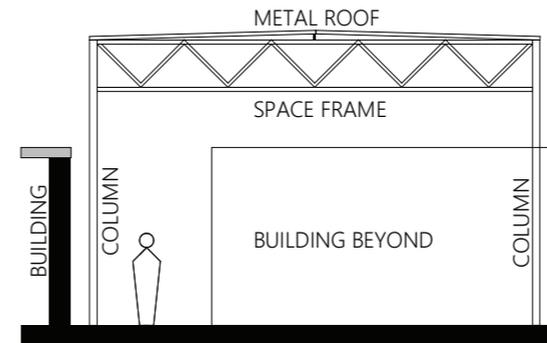
Unknown (RPA?)

Cathedral School, Townsville QLD

 Hot Humid Summer

Space frame roof structure between buildings shading large, thermally massive concrete court.

Space frame sometimes provides a space for birds to roost and make mess, which often prompts owners to frame over them with soffits. This one had no evidence of birds roosting, possibly indicating birds of prey lived nearby. Some establishments will rent birds of prey from local handlers to attend their premises routinely to ensure no pigeons roost.



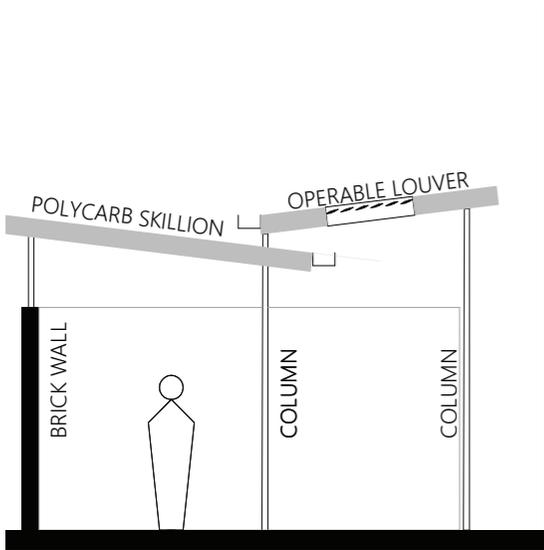


Mitchell St Beer Garden

Unknown

Darwin NT

 Hot Humid Summer



Operable louver structure built into roof of beer garden courtyard. Split skillion would allow air-flow, and the louver would increase this when in the open position. May also mediate natural lighting in the space.

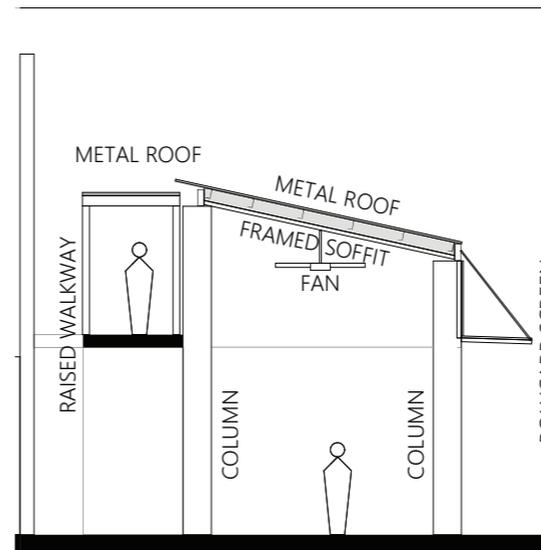
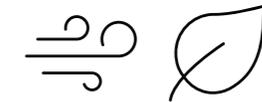


Townsville Youth Foyer

Counterpoint Architecture

Townsville QLD

 Hot Humid Summer



Courtyard space with mechanical fans for circulation and screening to prevent sun heating concrete floor in the afternoon- often an issue with high-roofs.

Open on top of skillion slope to allow hot air to escape.

Adjacent planting in path of prevalent breeze to add evapotranspirative cooling.

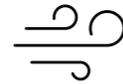


Territory Wildlife Park Center

Unknown

NT

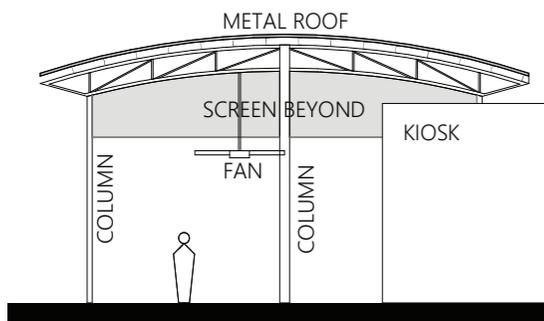
 Hot Humid Summer



Massive span truss fly roof structure over kiosks and staff spaces as well as courtyard.

Prevents direct solar radiation on habitable spaces while allowing air to freely circulate over any walls and screens.

Fans promote air circulation in a space so large it may not be able to ventilate with only natural breezes.



Darwin Botanic Gardens Visitor Center

Tropo Architecture

Darwin NT

 Hot Humid Summer

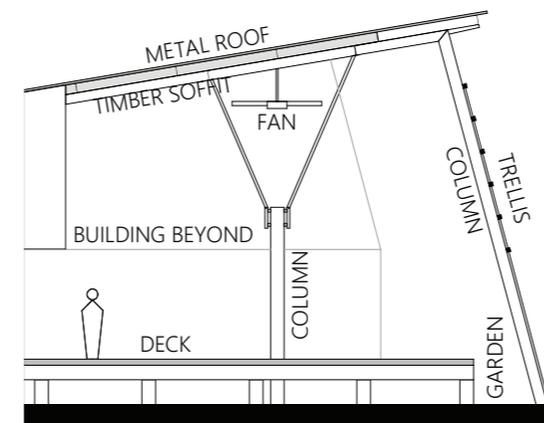


Beautiful double height courtyard space that uses trellising to block sun. Forked column allows for maximal spaces of roof with minimal groundworks.

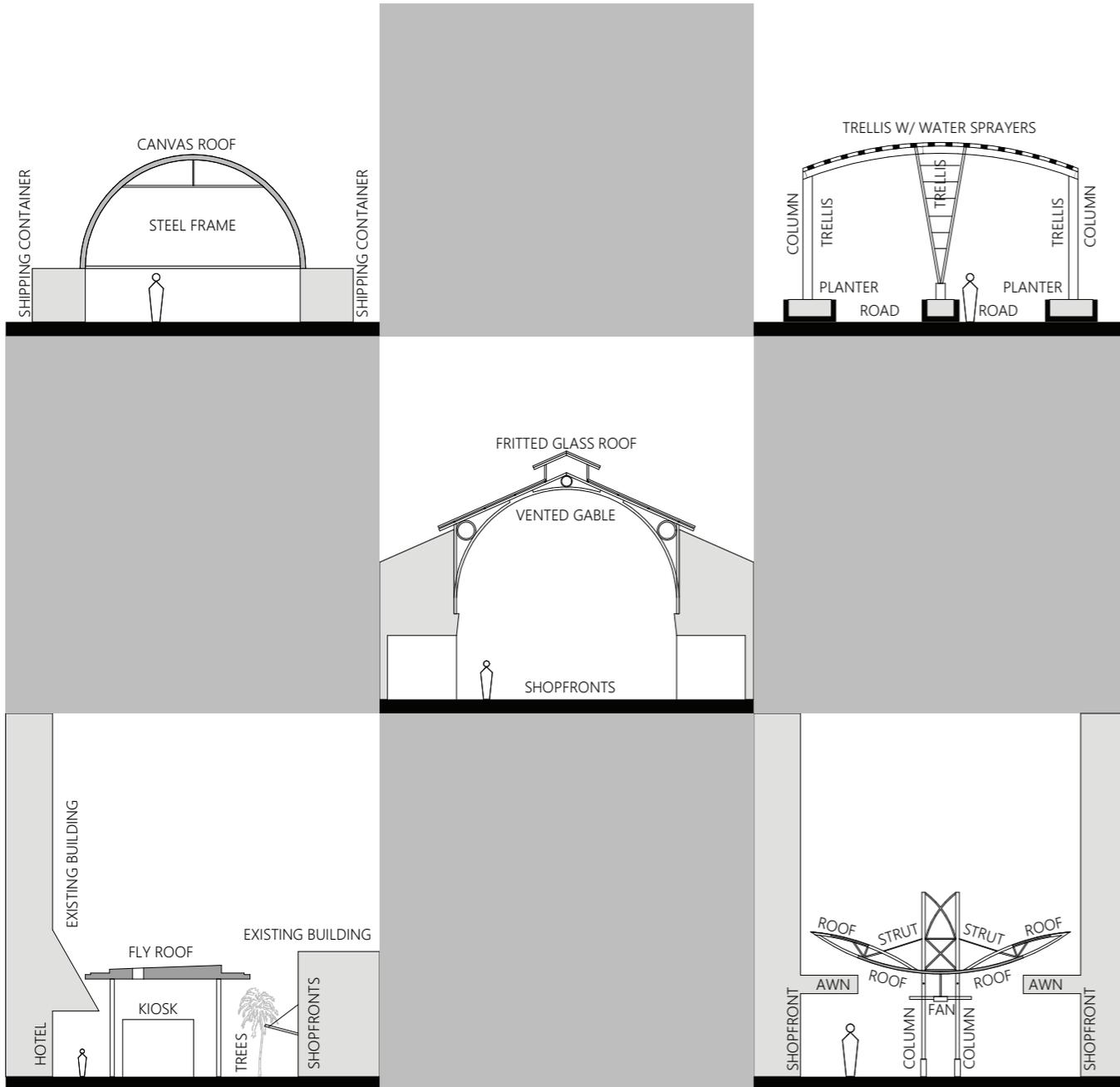
Deck floor is thermally resistive while shading the ground and allowing air to circulate from cool undercroft.

Evapotranspiration from adjacent planting cools the space.

Large fan circulates air.



MALL



Open-air malls are the largest type of shade discussed. They are usually linear, shading both pedestrian movement and stationary inhabitation. There are fewer examples of this type as they usually form part of the civic center of a town.

Malls are made up of shade between buildings along a linear route, this type is typically used in commercial areas of CBD's to encourage inhabitation and economic activity. They are usually designed to passively cool their spaces, while also taking heat load off adjacent buildings.

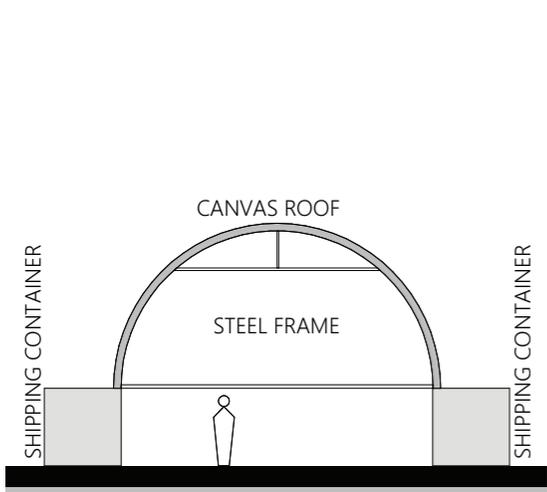
While orientation may be defined by the urban plan of streets and less to capture prevalent breezes, their design typically incorporated evaporative cooling in sprayers and fountains, their high roof meant that convection could remove hot air and some (see Darwin) incorporated large fans as well. They can work in tandem with adjacent awnings to create a type that both shades a large habitable area and allows hot air to escape.



Shipping Container Igloo

Unknown Vernacular

Photo: Rick Cucanic Photography



Cheap, ubiquitous shade structure provides a high roof structure for excellent airflow and dispersal of radiant heat.

Cheap, efficient structure and semipermanent. Could likely be adapted for permanent structures.

Excellent structure for creating shaded space.

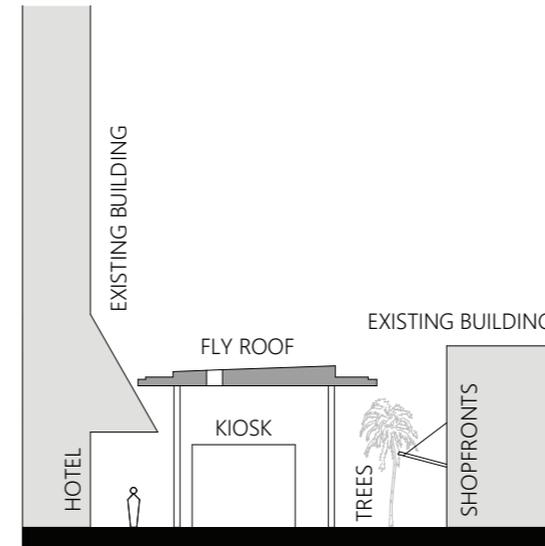


Stokes St Square

Cox Architecture

Townsville City, QLD

 *Hot Humid Summer*



High fly-roof with flat soffit utilises adjacent buildings to provide an excellent shaded space.

Fly roof reduces load on internal spaces below.

Skylights allow for natural light to illuminate space.

Adjacent planting and fountain provide evaporative cooling.

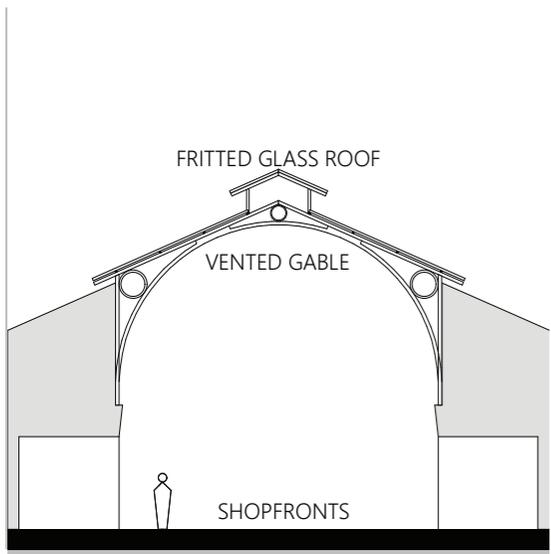


Stock Exchange Building

Unknown

Charters Towers QLD

 *Hot Dry Summer*



Vented gable fly roof made of fritted glass.
Shades thermally massive floor and masonry structure.

Prevailing breeze goes through mall space.

Fritted glass might improve convection of hot air - the space is remarkably cool compared to the street.





Cavanaugh St Shade Structure

Lawrence Neild

Darwin City, NT

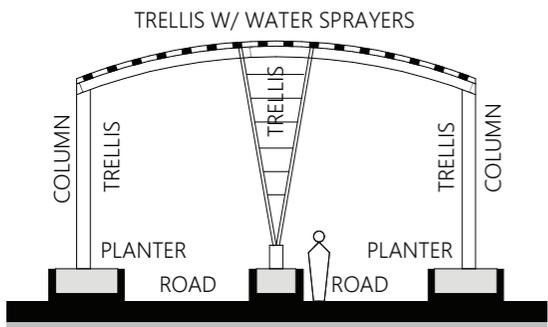
 Hot Humid Summer



Hardwood lattice over steel structure provides trellis to vines in planters. Also supports evaporative water sprayers for use in dry season.

Provides dappled shade to thermally massive road and car park.

Allows circulation of hot air through lattice and large scale non-tree planting in a cyclonic area.



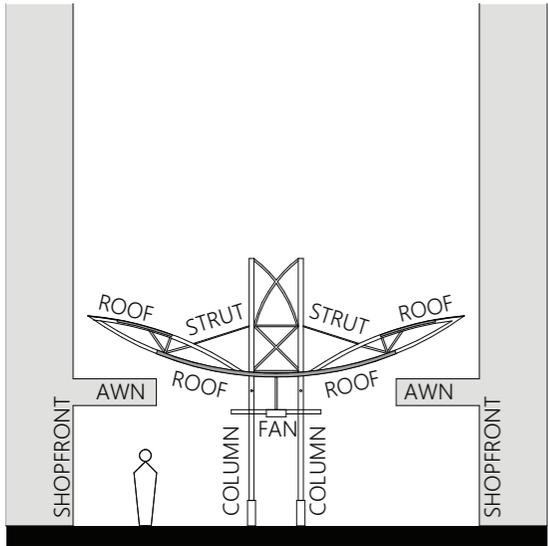


Darwin Mall Shade

Tropo

Darwin City, NT

 *Hot Humid Summer*



Sophisticated cantilever structure, that utilises adjacent shop awnings to completely shade a public space while providing indirect natural light and ventilation through a split roof system.

Expressive structure has no outer columns that might be an obstacle to shopfront access.

Mechanical fans circulate air while planting and a fountain provide evaporative cooling.



