The functional requirement of cladding system - essay

Strength and Stability

A wall structure should have adequate strength to support its own weight between points of support or fixing to the structural frame, and sufficient stability against lateral wind pressures. To allow for differential movements, there has to be adequate support to carry the weight of the wall structure, and also restraint fixings that will maintain the wall in position and at the same time allow differential movements without damage to either the fixings or the wall material. Thin sheet wall materials such as GRP, metal and glass suffer rapid changes in temperature and consequent expansion and contraction which may cause distortion and damage to fixings or the thin panel material or both.

In the design of wall structure faced with thin panel or sheet material, the ideal arrangement is to provide only one rigid support fining to each panel or sheet with one other flexible support fixing and two flexible restraint fixings. The need to provide support and restraint fixings with adequate flexibility to allow for thermal movement and at the same time adequately restrain the facing in place and maintain a weather tight joint has been the principal difficulty in the use of thin panel and sheet facings.

Resistance to weather/exclusion of wind and rain

The least thickness of solid wall material necessary to prevent penetration of rainwater to the inner face depends on the degree of exposure to driving rain. Common practice is to construct a cavity wall adequate thermal resistance to the passage of heat, and an attractive finish. Common practice

is to construct solid cladding systems with an outer leaf of light weight block for insulation.

Material used to seal joints is required to be resilient enough to accommodate movement and resist weather deterioration. The ‘ rain screen’ principle is designed to provide a separate outer skin, to screen wall panels from scouring by wind and rain and deterioration by sunlight, and to improve the life and efficient of the joint seals.

Durability and freedom from maintenance

The durability of a wall structure is a measure of the frequency and extent of the work necessary to maintain minimum functional requirements and acceptable appearance. For example, masonry required a little maintenance because the dirt stained due to slow run-off of water from open horizontal joints. Panels of glass will maintain their finish over the expected life of buildings but will require frequent cleaning of the surface if they are to maintain their initial appearance, and periodic attention to and renewal of the seals. Another material that can be used is metal. bronze and stainless steel, both materials, will weather by the formation of a thin film of oxide that is impermeable and prevents further oxidation.

Fire safety/fire Resistance

Primary precautions are the internal spread of fire across the surface materials of the wall and ceilings, external fire spread over the fabric and fire spread such as cavities. The Building Regulations prohibit the use of materials that encourage spread of flame across their surface when subject to intense radiant heat and those which give off heat when burning. Limits of

using thermoplastic materials in roof lights and lighting diffusers set in Building Regulation.

To limit the spread of fire between buildings, limits to the size of ‘ unprotected areas’ of walls. The term ‘ unprotected area’ is used to include those parts of external walls that may contribute to the spread of the fire between buildings such as windows. The Regulations also limit the use of materials of roof coverings near a boundary that will not provide adequate protection against the spread of fire over their surfaces.

Resistance to the passage of heat/thermal property

Addition insulation need to be provided by lining of the cladding material. The interiors of building clad with large areas of glass may gain through large part or the whole of their internal heat from a combination of solar heat gain through glass cladding and from internal artificial lighting. Solar heat gain can be controlled through the use of simple shading devices fixed externally or internally to the building fabric.

Control of internal temperatures

As we know, solar is gain through glass panel. The thermal control can be achieved by deep recessed window used in conjunction with external vertical fins, non-transparent external louvers and used of special solar control glass. Another way is minimized the air leakage in the building. We need to maintain the temperature in the building like the concept of green house effect that can traps the heat in the building in the cool day.

Resistance to the passage of sound/sound insulation

There are several ways to overcome this problem. Firstly, used the resilient pad to prevent sound originating within the structure to be transferred vertically through cladding members. Airbone soung can be prevented by utilizing double glazing panel to window area.

B) A client requires a road that requires little maintenance with reasonable non-skid properties. With the aid of diagramme, suggest a type of road and the construction methodology for the proposed used.

A client requires a road that requires little maintenance with reasonable non-skid properties. With the aid of diagramme, suggest a type of road and the construction methodology for the proposed used.

Type of Road: Flexible Road

Sub-grade: original soil or backfilling soil

Sub base: small aggregates. The surface of the compacted sub-base should be close textured to prevent migration of sand from the bedding course. Example: sand or quarry dust.

Road base: crusher run

Surfacing : pre-mix bituminous. Prime coat as binder of particles.

Construction Methodology

Site Clearing

Right of way

The corridor of the road has to be cleared to the required width (prevention of soil erosion)

Make sure that the accessibility of the road is permitted legally.

Clearing and grubbing of the site

Using dozer or grader for the works.

The hedges and grass roots can be removed by using dozer.

Grader is usually for grubbing works where the topsoil needs not to remove form site

Cut and fill of the road

Cutting: Formation level is lower than original ground level.

Filling: Formation level is higher than original level.

Preparation of sub grade layer

Make sure that the base and subgrade layers must provide adequate and moisture resistant strength and modulus, in addition to durability and stability.

Before subgrade can start, make sure the installation of services has finished such as ground surface drainage, piping for water supply and electrical.

Subgrade is started and compacted until reaching uniform density for the whole width and to falls.

Replaced the unsuitable material such as rock or not useful soil.

Subgrade, and base materials frequently require treatment with additives such as asphalt, cement, fly ash, and lime.

Should have unsoaked C. B. R (California bearing ratio) of 15% in the subgrade.

CBR is a penetration test for evaluation of the mechanical
strength of road subgrades

Preparation of sub base

300mm thick of sand/quarry dust.

Compacted with 8-10 tonne smooth wheeled roller at 125mm layer 12 times.

Rolling start from one side of the road to the center of road in horizontal direction by using roller-compactor.

Road base construction

Constructed into two layers with same thickness with each layer not more than 150mm thick.

Materials (crusher run) leveled following chambers.

Lastly, using compactor to compact the mixing tar of the road.

Surfacing Construction

the graded subgrade or the top granular base layer may be prepared with a prime coat

A prime coat is a sprayed application of a cutback (MC-30 or MC-70) or emulsion asphalt applied to the surface of untreated subgrade or base layers.

The size of the premix: 12. 5mm to 19mm

Compaction should be done quickly

Underseal which is a sprayed application of asphalt binder (emulsion or hot applied asphalt binder) immediately covered by a layer of one-sized aggregate.

The last step is Road surface marking by using white paints.

C) Describe the performance and specify of the material that can be used to fill the void of disused structures e. g. culverts, redundant sewers, cellars and basements and also for soil stabilization, e. g. bridge abutments tunnel stabilization and embarkments.

Describe the performance and specify of the material that can be used to fill the void of disused structures e. g. culverts, redundant sewers, cellars and basements and also for soil stabilization, e. g. bridge abutments tunnel stabilization and embarkments.

Materials used: Autoclaved Aerated Concrete (AAC)

Developed in Sweden in the late 1920s, autoclaved cellular concrete (ACC) is a lightweight precast concrete building material that is cured under elevated pressure inside special kilns called autoclaves. Autoclaved Aerated Concrete (often shortened to ‘ AAC’) is effectively concrete with lots of closed air pockets in it. It is lightweight and energy efficient, and is produced by adding a foaming agent to concrete in a mould, then wire cutting blocks or panels from the resulting ‘ cake’, and ‘ cooking’ it with steam (autoclaving).

Performance

Appearance

It contains many small voids (similar to those in aerated chocolate bars) that can be clearly seen when looked at closely.

The closed air pockets contribute to the material’s insulating properties and also its aerated nature.

Although there is no direct path for water to pass through the material, an appropriate coating is required to prevent water penetrating into the AAC material.

AAC can be sculpted with wood working tools, but its softness means that it is rarely used as an exposed finish owing to its need for surface protection.

Structural Capability

The compressive strength of AAC is very good and load-bearing structures up to three storeys high can be safely erected.

Entire building structures can be made in AAC from walls to floors and roofing with reinforced lintels, blocks and floor, wall and roofing panels available from the manufacturers.

AAC panels and lintels contain integral steel reinforcement to ensure structural adequacy during installation and design life.

Thermal mass

With its mixture of lightweight concrete and air pockets, AAC has a moderate overall level of thermal mass performance.

The temperature moderating thermal mass is most useful in climates with high cooling needs.

Sound insulation

With its closed air pockets, AAC can providevery good sound insulation.

As with all masonry construction, care must be taken to avoid gaps and unfilled joints that can allow unwanted sound transmission.

Combining the AAC wall with an insulated asymmetric cavity system will provide a wall with excellent sound insulation properties.

Fire resistance

AAC is inorganic and incombustible and is thus especially suited for fire-rated applications.

Depending on the application and the thickness of the blocks or panels, fire ratings up to four hours can be achieved.

AAC does not harbour or encourage vermin (ulat).

Durability and moisture resistance

The purposely lightweight nature of AAC makes it liable to impact damage.

With the surface protected to resist moisture penetration it is not affected by harsh climatic conditions and will not degrade under normal atmospheric conditions.

The porous nature of the material can allow moisture to penetrate the material to a depth but appropriate design (damp proof coarse layers and appropriate coating systems) prevents this happening.

AAC will not easily degrade structurally when exposed to moisture.

Toxicity and Breathability

There are no toxic substances and no odour in the final product.

If low toxic, vapour permeable coatings are used on the walls and care is taken not to trap moisture where it can condense, AAC may be an ideal material for homes for the chemically sensitive.

Environment Impact

AAC has manufacturing, embodied energy and GH emission impacts similar to those of concrete, but can be up to one quarter to one fifth that of concrete based on volume.

It’s much higher insulation value reduces heating and cooling energy consumption.

As an energy and material investment it can often be justified for buildings intended to have a long life.

Buildability, availability and cost

AAC is relatively easy to work, is light and easily carved, cut and sculpted.

Very large block sizes may require two-handed lifting and be awkward to handle but can result in fewer joints and more rapid construction.

Low waste component, as the offcuts can be re-used in the construction of the wall.

*Figure show the principle of heat insulation and sound insulation

D) Briefly describe the activities involved in external works at the start of the contract.

Briefly describe the activities involved in external works at the start of the contract.

External work is means by the work or the construction is carried out outside of the building or the work generally done externally from main building. At

the contract commencement, there are many types of external work can be carry out such as drainage, temporary access, temporary storage, temporary car parks, temporary site facilities, and public utilities such as water, electricity and telecom. Those external works must be prepared before the construction can be started.

Most of the activities will span the whole contract period but bulk of activities will fall under early stages of construction and toward the end of the construction. In early stages of construction, there are many external work s need to prepare. For examples, drainage main runs, access arrangement, storage facilities, car parks, place to settle the machinery for foundation construction, and services to the construction sites.

The first activities involves in external works at the start of the contract is drainage system. There are two categories of drainage which are surface drainage and sub-surface drainage. Surface drainage is the removal and disposal of water from the surface of the pavement. Whereas sub-surface drainage is the use of underground pipes and other fittings to corect the flow of water from where it is not wanted to some other place. This includes land drainage that removing and disposing of surplus groundwater from gardens, fields and other plots of open land. A subsurface drain is a perforated conduit, such as tile, pipe or tubing, installed below the ground surface to intercept, collect or convey drainage water.

*The picture show the surface drainage and sub-surface drainage

Besides drainage that need to take consider in the early stages of external work, temporary access also an importance in construction site. Ususally, a

geotextile is used as a temporary road access. A geotextile is a synthetic permeable textile material used with soil, rock, or any other material. Geotextiles extend the service life of roads, increase their load-carrying capacity, and reduce the incidence of ruts. These benefits are accomplished by separating aggregate structural layers from subgrade soil while allowing the passage of water. Geotextiles should be considered for use on any section of road requiring an aggregate (rock) layer for surfacing. Geotextiles can reduce the amount of aggregate required, thus reducing the cost of the road, as well as providing the benefits described in the previous paragraph.

* The picture show how the geotexile work.

Next, temporary site storage and car park (empty area) also consider as external work that need to prepare in construction site. The uses of the temporary site storage is to keep important material or the expensive material. For example, the cement which cannot put outside space, it must be covered by the roof to avaid raining. The cement also need to keep in a dry place because it is easily chemically react with water. Car park or empty area also need in construction site because it is for the lorry to loading or unloading the things for the construction. Car parks also need for the site manager or outsides visitor to keep their vehicle.

* The picture show the temporary car park at the site of construction

Apart from that, at the commencement for external works, public utilities such as water supply, electricity and telecom also need to prepare in the site of construction. The piping work must be installated at early stage of external work in order to easy the work. The electricity supply need for the

lighting, and machinery used. Telecom is used for the communication purposes.