

Chapter 7:

ROOFING TECHNOLOGY:

This is the outline version of the Powerpoint presentation used in class.

A. ROOFING TYPES:

THE TWO PRIMARY TYPES OF ROOFING WE MUST CONSIDER ARE FLAT AND PITCHED:

- Flat roofs are those slope is less than 1 in 4 and use waterproof membranes (also called Low Slope)
- Pitched roofs have slopes of 1 in 4 or greater and generally use shingles

B. PITCHED ROOF MATERIALS:

SHINGLES: asphalt, sawn wood, shakes, slate, clay tiles or concrete tiles

THATCH: bundles of leaves, reeds or grasses

ARCHITECTURAL SHEET METAL: lead, copper and terne (stainless steel or sheet steel) with flat or standing seams

C. FLAT OR LOW SLOPE ROOFS:

PRIMARY COMPONENTS:

- structural roof deck
- thermal insulation
- vapour retarder (and air barrier)
- waterproof membrane

Structural Roof Deck:

-must be designed to minimize deflection to reduce ponding and minimize drainage

-either slope roof deck or taper insulation to drain roof

-usual materials are:

- plywood
- wood decking
- cast or hollow core concrete
- steel decking

Thermal Insulation:

Can be installed in THREE positions:

- BELOW the deck
- BETWEEN the deck and the membrane
- ABOVE the membrane

Insulation BETWEEN the Deck and the Membrane:

Traditional location for insulation:

- use low density rigid panels to support the loads on the roof membrane without allowing puncture of membrane
- any water vapour trapped in insulation will cause deck to rot so use topside vents to relieve pressure

Insulation ABOVE the Membrane:

New concept offering major advantages:

- membrane protected from extremes of heat and cold, is on the warm side of the insulation
- membrane protected from UV radiation
- membrane protected from puncture
- insulation must be extruded polystyrene foam board which is water resistant and covered with a filter layer to prevent migration of ballast

D. VAPOUR RETARDERS FOR LOW SLOPE ROOFS:

- membrane in a protected membrane roof is also the vapour/air barrier
- other types of low slope roofs use two layers of asphalt saturated roofing felt bonded together and to the roof with hot asphalt
- polyethylene film not used as it melts
- situated on the warm side of the insulation

E. ROOFING MEMBRANES:

THREE PRIMARY TYPES:

- conventional (bituminous built up roofing or BUR)
- prefabricated sheets
- cast in situ

THE BUILT UP ROOF (BUR):

- constructed of 3 to 5 layers of bitumen impregnated felts, layered on the roof deck with heated asphalt
- may be located either over or under the rigid insulation
- top layer of gravel ballast to protect asphaltic materials or insulation from UV rays, and to weight roofing materials against wind uplift forces
- *Prefabricated Sheets:*

THERMOPLASTIC SHEETS:

- PVC and blends
- EP (ethylene interpolymer)
- CPA (copolymer alloys)
- ELASTOMERIC (SYNTHETIC) RUBBER SHEETS:
- vulcanized, EPDM or neoprene
- non vulcanized
- MODIFIED bituminous SHEETS:
- polymer modifiers

a. EPDM:

- the most widely used material for single ply roofs
- low in cost
- synthetic rubber made in large sheets
- joined with adhesive, laid loose, adhered, mechanically fastened or used in a protected membrane roof

b. Polymer Modified Bitumens:

- sheets of bituminous material to which polymeric compounds have been added to increase cohesion, toughness and resistance to flow
- reinforced with fibrous mats
- some self adhere, or loose laid or laid in hot asphalt
- seams sealed by torching or hot asphaltic adhesive

c. PVC:

- commonly known as vinyl
- seams are sealed either by solvent welding or hot air welding
- may be laid loose, mechanically attached, adhered or used as a protected membrane

d. Neoprene:

- high performance synthetic rubber compound
- applied in sheets and joined with an adhesive
- vulnerable to UV rays so coated with a protective layer
- may be adhered, mechanically fastened or laid loose and ballasted
- can be used in a protected membrane roof

CAST IN SITU MEMBRANES:

-HOT APPLIED RUBBERIZED ASPHALT

-COLD APPLIED LIQUID COMPOUNDS: various polymeric and bituminous materials

-POLYURETHANE FOAM ROOF WITH PROTECTIVE COATING

PREFABRICATED SHEETS:

Installation and Attachment

-require less on site labour

-less prone to cracking

-affixed to roof by:

- adhesives
- the weight of ballast
- fasteners concealed in seams between the sheets
- with ingenious mechanical fasteners that do not penetrate the membrane (if it is flexible enough...)

Fluid Applied Membranes:

- used primarily for domes, vaults and complex shapes
- applied with a roller or spray gun in several coats and cure to form a rubbery membrane
- used as a spray on waterproofing layer over sprayed on polyurethane foam insulation

F. *REQUIREMENTS OF ROOFING MEMBRANES:*

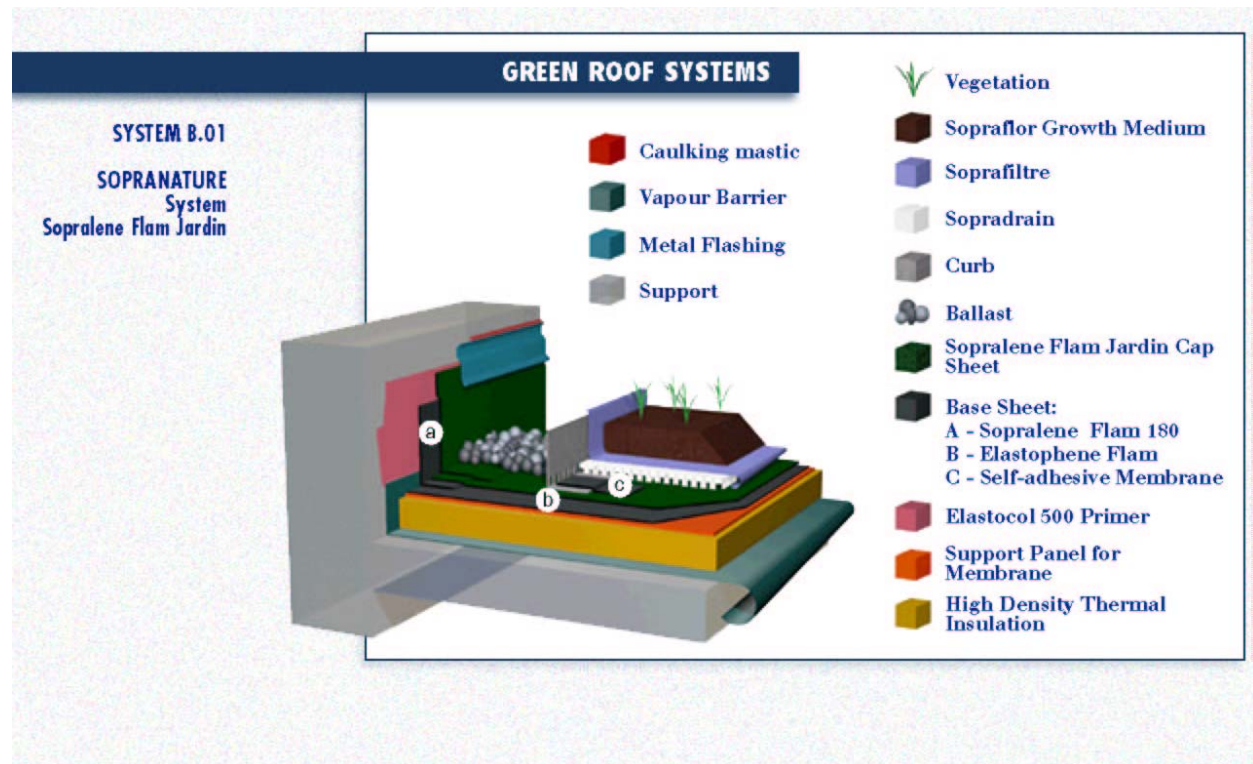
- tensile strength
- elongation
- crack bridging
- fatigue resistance
- thermal shock
- tear resistance
- abrasion resistance
- lap joint integrity
- static puncture
- impact resistance
- low temp. flexibility
- weatherability
- heat aging
- dimensional stability
- granule embedment
- membrane attachment
- flashing attachment
- materials compatibility
- wind uplift resistance

These requirements apply to conditions during manufacture, during installation and in the field in service.

G. *ENVIROMENTAL ROOFS (GREEN ROOFS)*

An increasing number of roofs are being installed that are attempting to decrease the “heat island” effect and absorb excessive water runoff. Green roof systems are manufactured by Soprema (for one example). They use a combination of an inverted roof system that is surmounted by a special drainage system, growing compound (of

varying depths depending on what the intended plant material may be) and plants. These must be chosen to be hardy so that they do not require watering.



Some web based links that show some good roofing details and general information are:

- <http://www.jm.com/roofing/ug/epdm/details/index.shtml>
- http://www.jm.com/roofing/ug/pvc/adhered_details/index.shtml
- http://www.jm.com/roofing/ug/pvc/mf_details/index.shtml
- <http://66.70.87.112/>
- <http://www.soprema.ca/HOMEANG/INDEXEN.HTM>
- <http://www.firestonebpco.com/roofinghome.htm>
- <http://www.iko.com/commercial/chapter1.html>
- http://www.archrecord.com/CONTEDUC/ARTICLES/1_00_1.asp
- http://www.archrecord.com/GREEN/GREEN_13.ASP
- http://www.perkspub.com/archive/roofing_octnov00/7.html
- <http://www.peck.ca/>

These links were last updated June 2002.