

successful
Management of
Architectural C O N C R E T E

2nd NMMU Construction Management Conférence

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By

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MANAGEMENT

“The organization
and coordination
of activities
(including
design)... in order
to achieve
defined
objectives”

[business directory.com](http://businessdirectory.com)





Liquid stone
for the
21st century

arch017

OBJECTIVE of concrete management:
good quality , cost effective & within deadline

DESIGN AND PLANNING

co-ordination and collaboration



SPECIFICATION OF FINISHES



- **by performance;**
class of finish , colour, test panels and tie-rod pattern
- **by prescription (method)**
method or technique which is to be used -off-shutter finishes-textured, tooled or abraded
- **by a combination of performance and prescription**-the least satisfactory

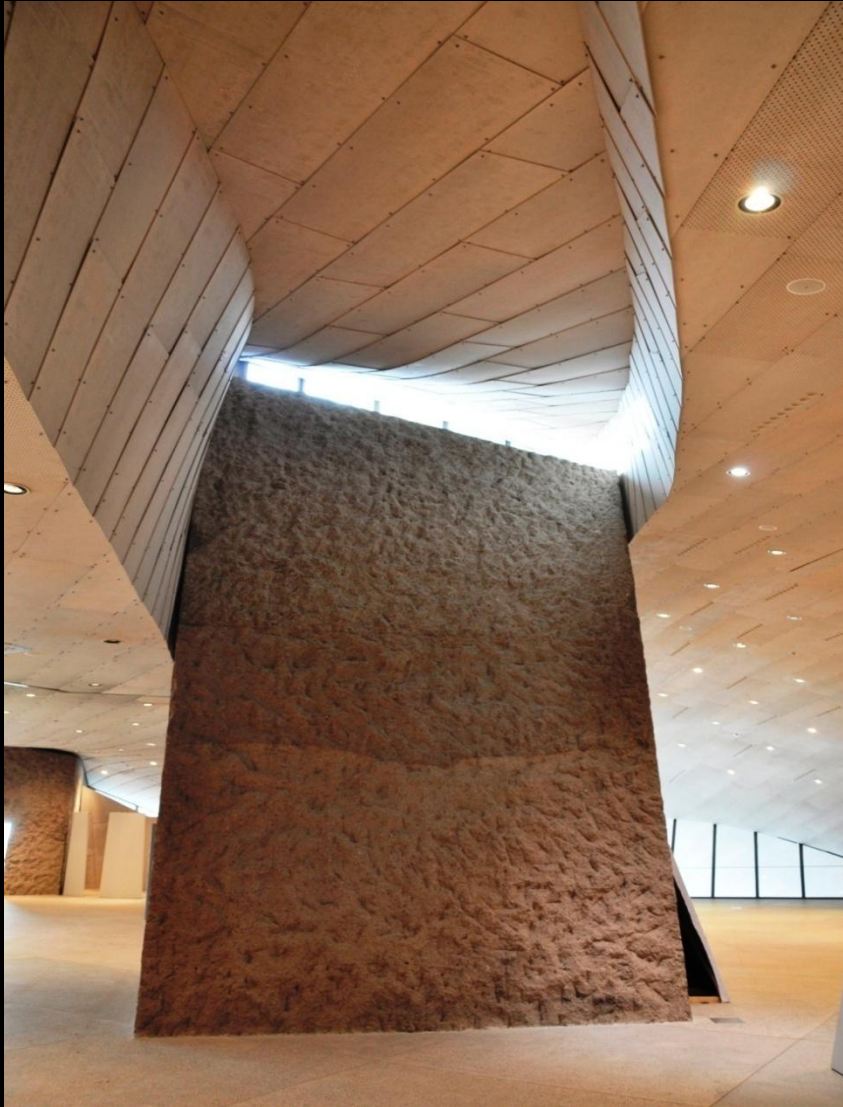
DESIGN AND PLANNING design and specification



- **detail** issues that will impact on the **placement** of the concrete
- **acceptance criteria** for concrete are defined in SANS 2001-CCI: 2007, *Construction works Part CC 1: Concrete Works*.
- allow **specifications** to **define the standard** of the intended finish.

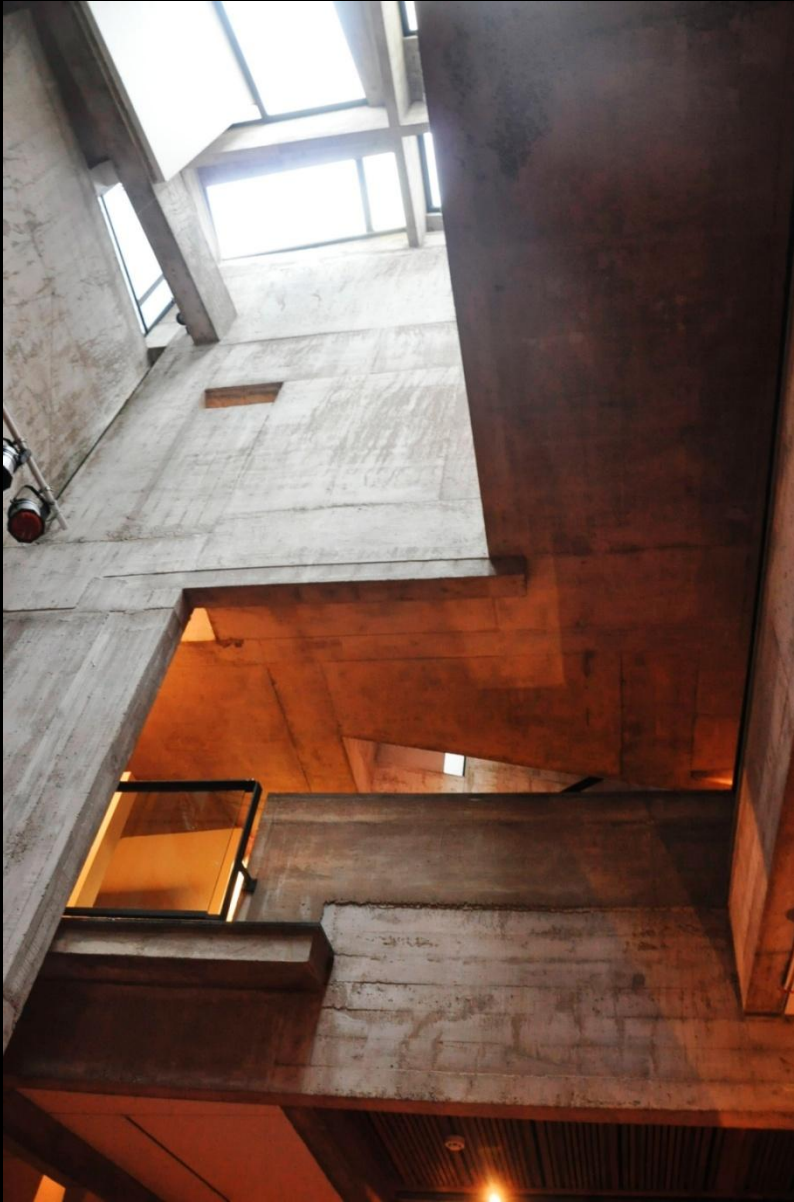
SPECIFICATION OF FINISHES

Checklist : Assessment



- What are measurement criteria.
- By comparison to test panels.
- Allowable variations.

DESIGN AND PLANNING **Formwork**



- 35-60% of the **cost** of in-situ concrete
- **speed** of erection and striking = rate of construction
- Absorbency & watertightness = **appearance**

DESIGN AND PLANNING **Formwork**

Requirements

- Strength
- Stiffness
- Tolerance
- Absorbency
- Water tightness
- Robustness
- Ease of stripping
- Design comply to SANS 2001-CC1:2007 and SANS 10100-2:1992

DESIGN AND PLANNING **Release Agents**

Affects the quality and colour of the surface finish



Two main categories of release agent:

1. barrier
2. reactive

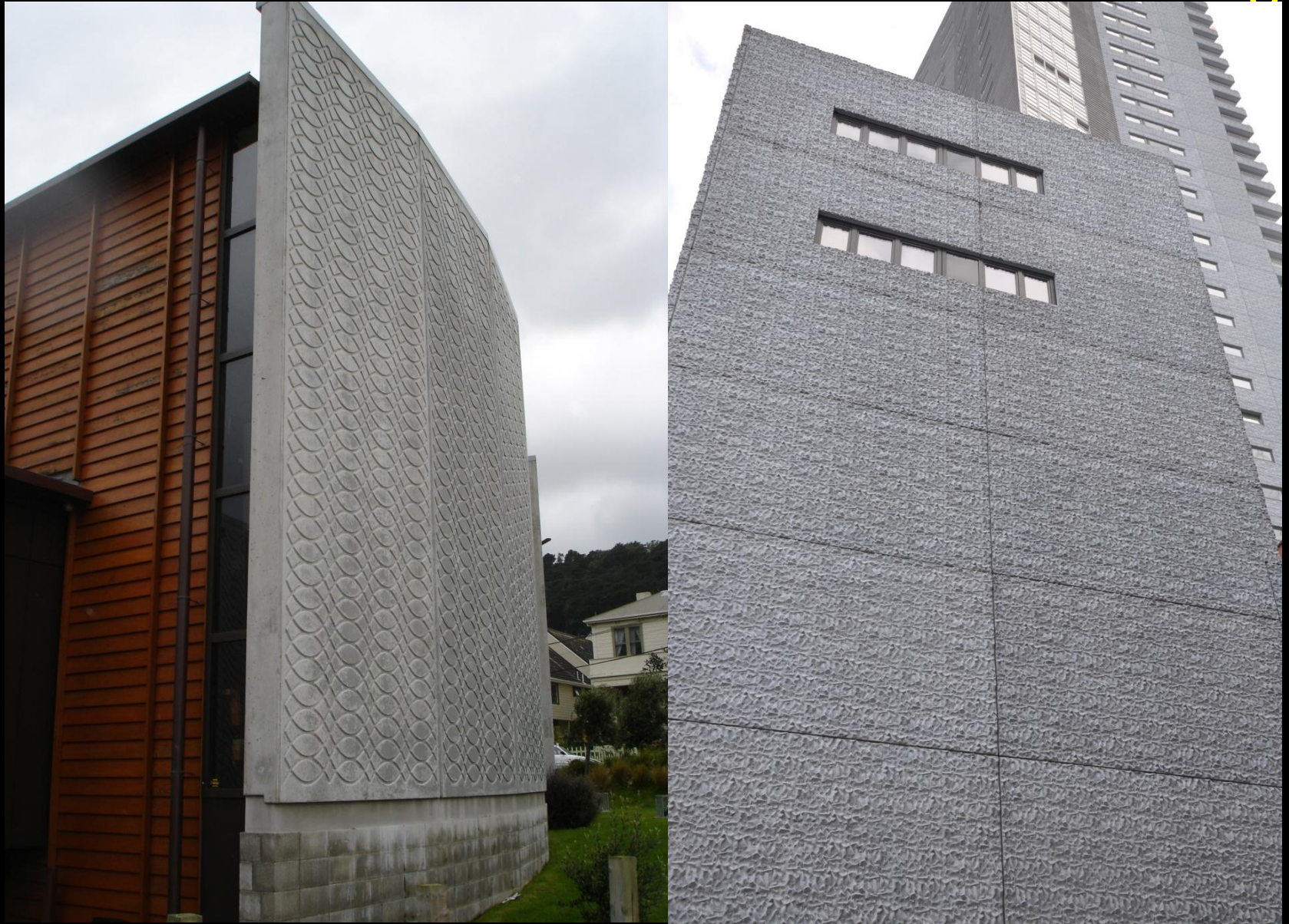
DESIGN AND PLANNING **formwork**

Design considerations

- jointing
- sheeting type - and porosity
- planning of joints and corners
- formwork anchors and spacers



FORMWORK: custom made steel shuttering



Formwork sealed plywood



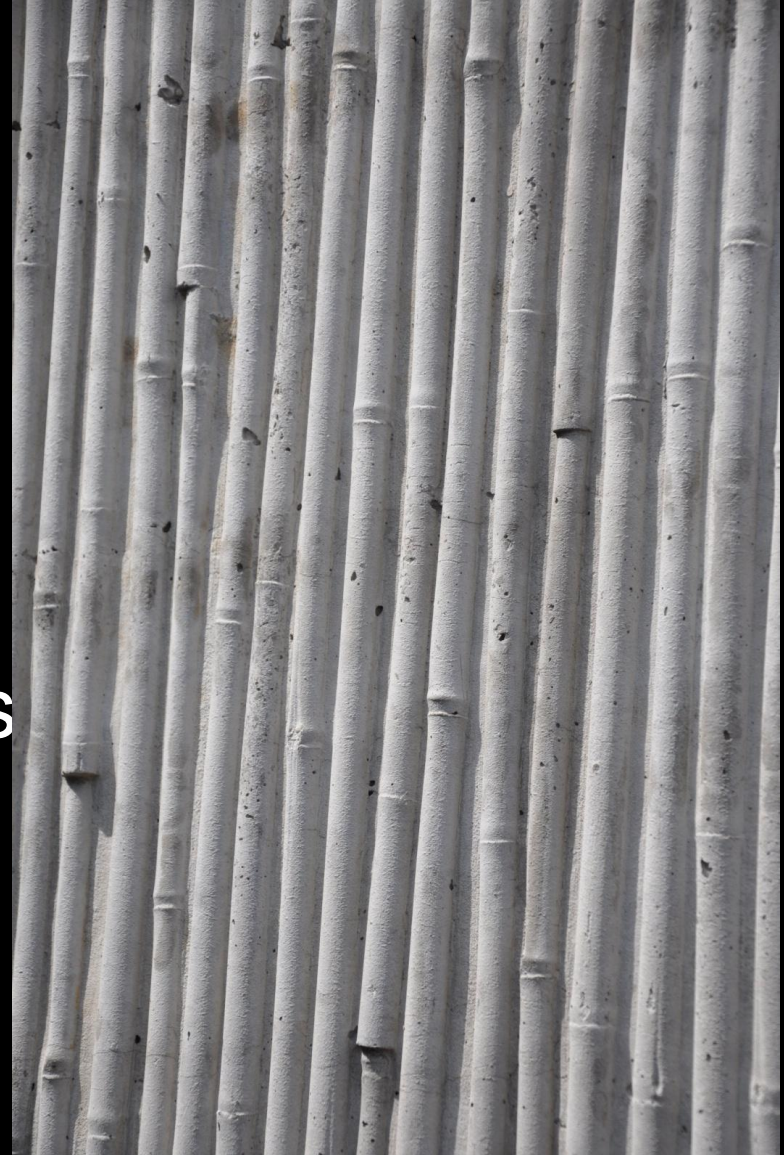
casar de caseares bus station, spain, 2005



Plywood formwork

DESIGN AND PLANNING off-shutter finishes

Textured finishes can created by attaching materials to the formwork such as **form liners** or other materials



DESIGN AND PLANNING **Off-shutter finishes**

- **Smooth finishes** are typically achieved by using smooth form-face materials such as steel or plywood with a phenolic film on the surface
- **SANS 2001-CC1:2007** describes a smooth surface finish
- **Release agents-** barrier or reactive type

SELF LEVELING composite

CONCRETES

18 Kloof Str, CT, FreeSpace Architects, 2012-







...or a heap of **HAY**



Timber as liner



DESIGN AND PLANNING Timber formwork



SPECIFICATION OF FINISHES

Formwork Design



- Concrete elements **wide enough** to allow placement and compaction of concrete without damage to the form face.
- Formwork design should allow for concrete pressures without excessive **deflection** of form face.
- **Joint** details and locations.
- **Sufficient cover** to allow for subsequent treatments such as tooled finishes

SPECIFICATION OF FINISHES

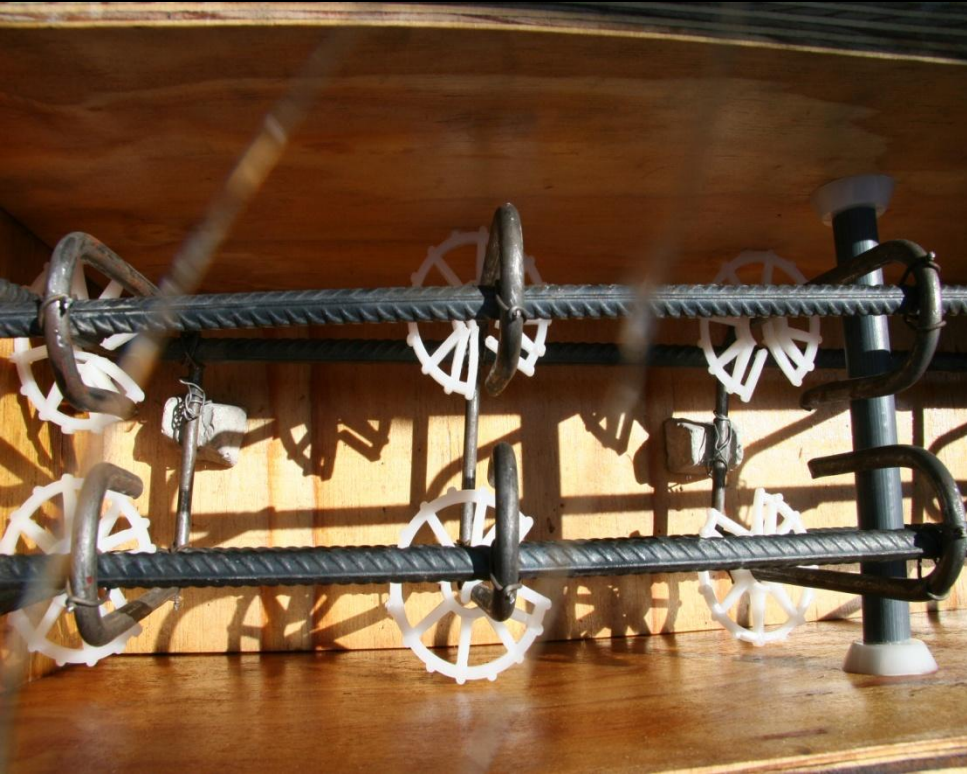
Checklist : Formwork



- **Liner details and accuracy**
rebate, details for patterns or at control or construction joints (shape, depth, width), locations and the accuracy.
- **Surface texture pattern details.**
- **Repairs**

SPECIFICATION OF FINISHES

Checklist : Reinforcement



- sufficient **cover** to formwork
- spacers or chairs used to provide required cover do not affect **appearance of finish**
- Avoid areas **of congested reinforcement** to facilitate placement and compaction of concrete.

SPECIFICATION OF FINISHES **Concrete supply**



- Concrete **strength** grade, e.g. 30 MPa
- SANS 2001-CC1:2007
- Cement **colour** – grey or white
- **Pigments** – manufacturer and colour
- **Placement** method – pump or chute
- Specify **aggregate** types and quantities for treated surfaces
- specify **bleed** characteristics, e.g. low bleed
- Each batch to be **consistent**, particularly slump if colour control has been specified-**Test slump** on site

SPECIFICATION OF FINISHES

Checklist : Concrete compaction etc



- Method of concrete **compaction**
- Particulars of formwork **stripping**
- **Curing** method; Application method and time
- Specify **protection** of finishes
- **Sealing**: Specify sealer type to be used & extent of sealed area.

SPECIFICATION OF FINISHES **Repairs**

- **Criteria** for acceptance/rejection, e.g. colour match, finish.
- **Trial repairs** to test panel for approval.



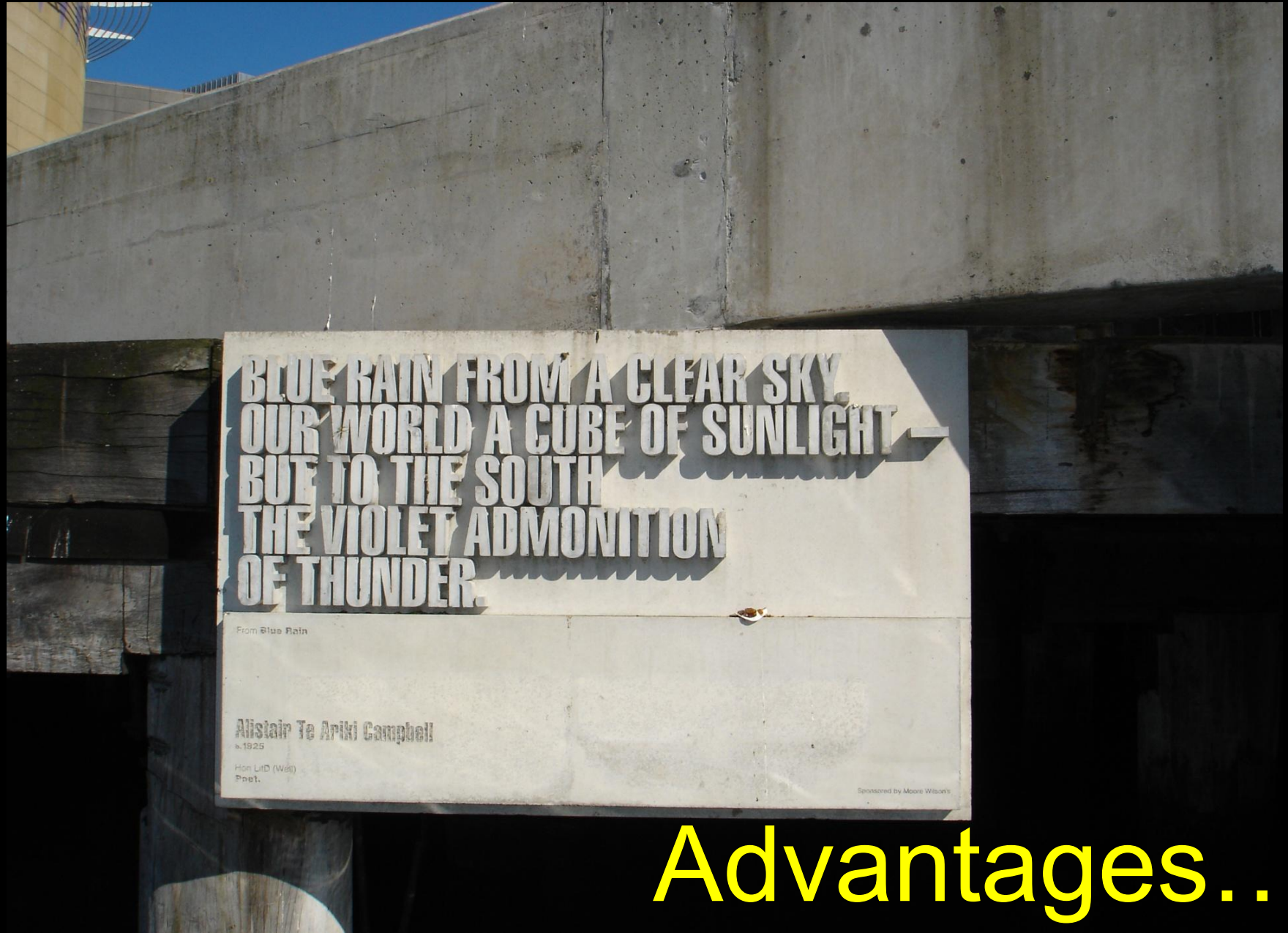
SPECIFICATION OF FINISHES **Cleaning**



Methods:

- water,
- acid,
- abrasive

DESIGN AND PLANNING pre cast CONCRETE



Advantages....



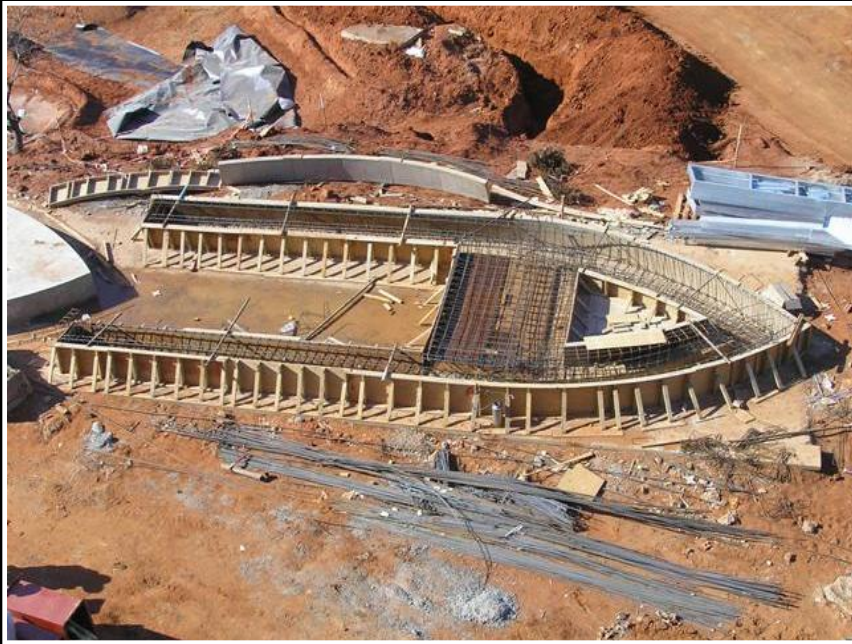
Tinfoil form liner

jesuit church, merida, roberto reista, 2009





TILT Up **on site horizontal precast**



Sibaya Casino Panels







WAF: Apartment block, Sydney, Jackson Teece.2011



Structural, decorative, lightweight

GLASS RE-INFORCED precast CONCRETE PANELS

MEDIA HQ MELBOURNE, 2008 ,CHARLES RYAN ARCHITECTS



DESIGN AND PLANNING

Post-shutter tooled finishes



- will provide colour and texture by exposing the coarse aggregate
- bush hammering, point tooling, abrasive blasting and hammered nib.

SPECIFICATION OF FINISHES

Checklist : Subsequent surface finishes

- Tooled.
- Abrasive blasted
- Acid etched





FERNANDO MENIS, CHURCH OF OUR REDEEMER, TENERIFFE. Under construction





DESIGN AND PLANNING

Concrete performance parameters

normal-class concrete:
SANS 878:2004

To minimise colour variations:

- type/colour of **cement**
their source and relative proportions
- coarse **aggregates**
- **sand**, and its source
- water:cement **ratio**

CONSTRUCTION reinforcement

spacers and chairs supporting the reinforcement allow adequate space between formwork





Pigmented

CONCRETE: PRECAST & READY-MIX

DESIGN AND PLANNING

Coloured Concrete

- using **white** cement
- adding a colour **pigment**
- applying a coating to the form face
- a surface **stain** or coating after shutter removal
- **tooled** to expose coloured aggregates



Irvington Place. David Adjaye. 2010



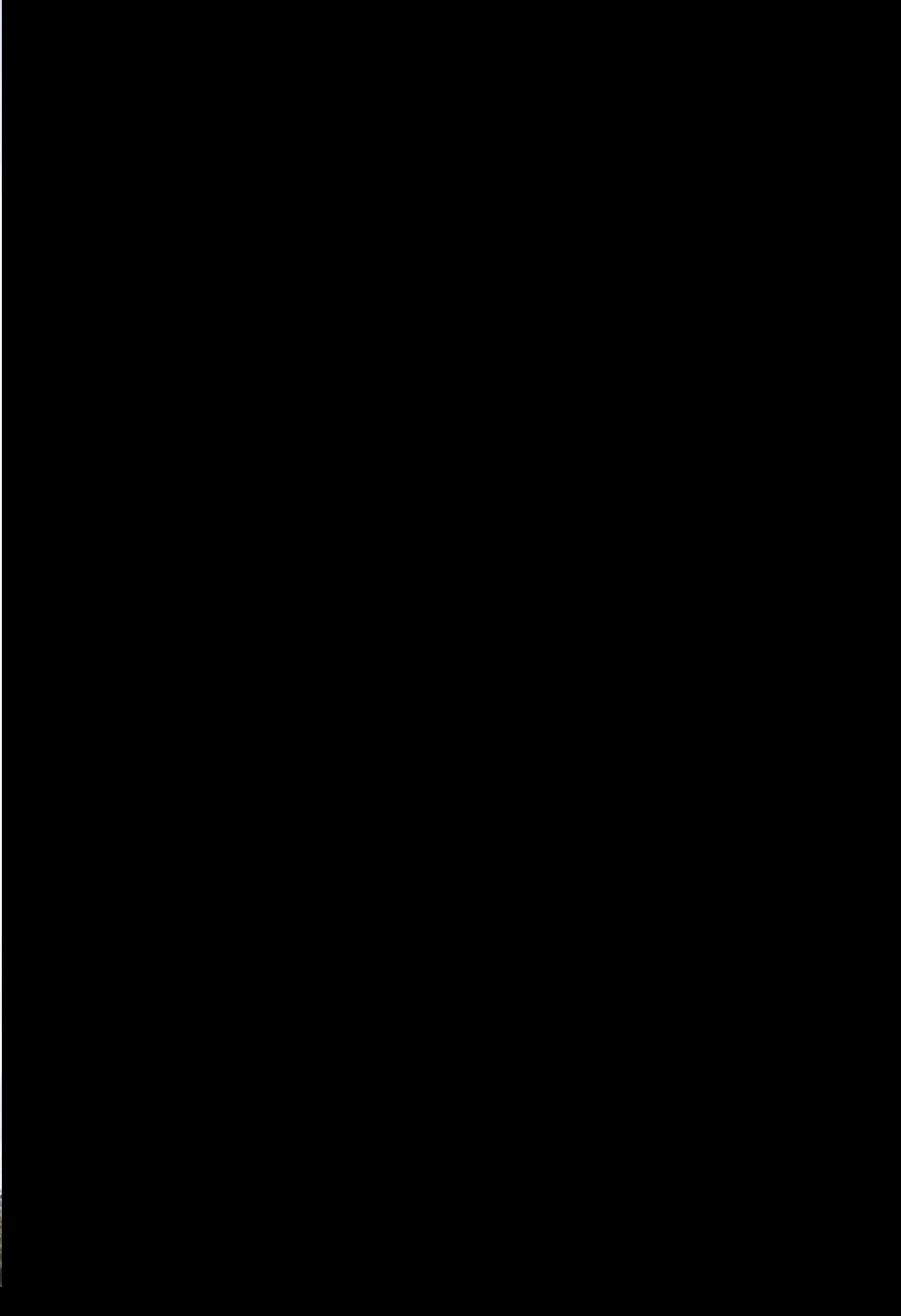


Subelextrica, Barcelona, Victor Rahola, 2009









Soccer city

boogertman urban edge



Soccer city: calabash pot



Soccer city

colored fiberglass concrete precast paneling



Diagonal 197, Barcelona, b720 arch, 2008



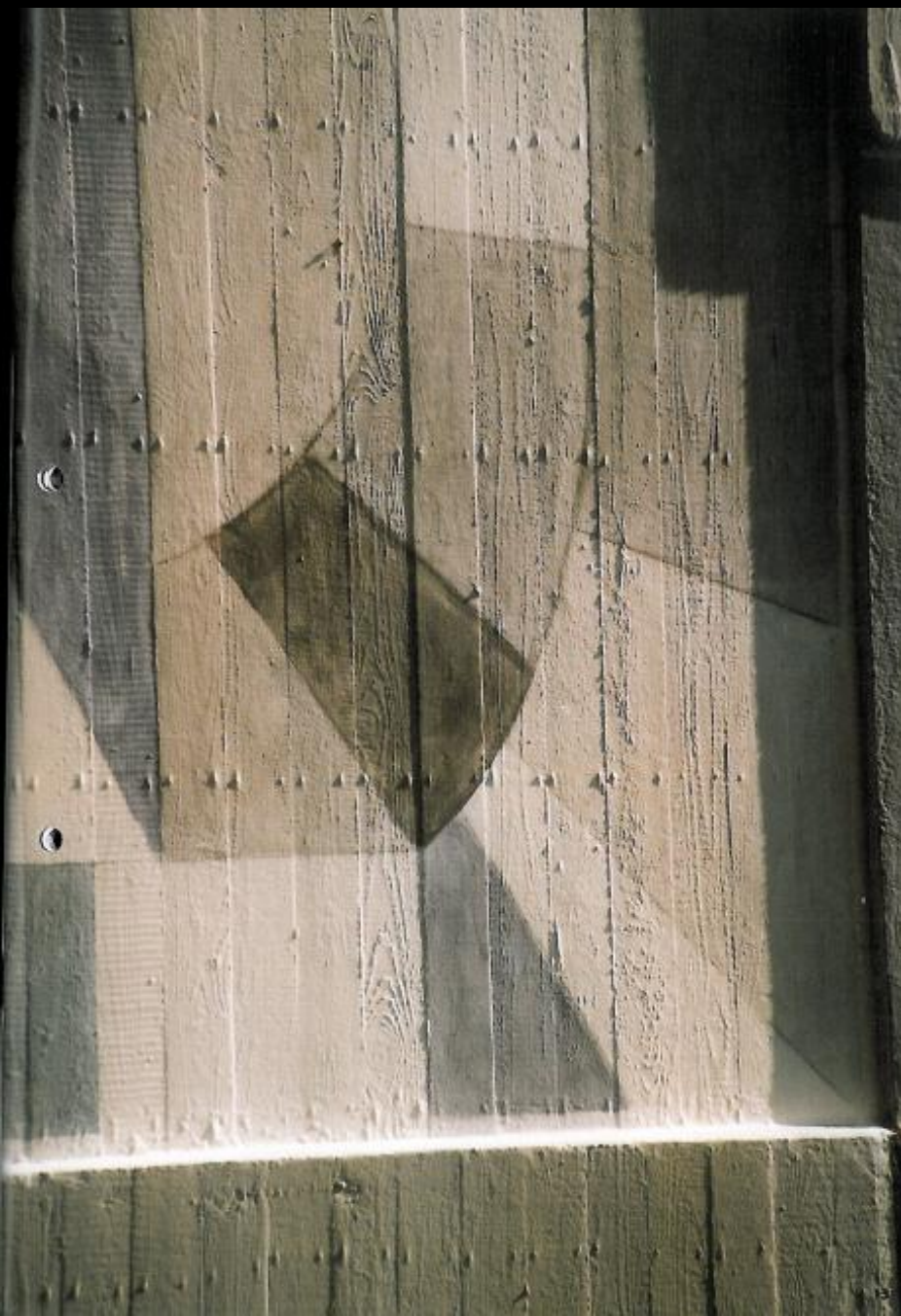




post shuttering chemical staining



Protective mineral based concrete stains & glazes



SPECIFICATION OF FINISHES

Checklist : Colour

- **Cement type:** Grey or white
- **Pigment**
- **Aggregate** for subsequent treatments such as heavy abrasive blasting, bush hammering or tooling that will expose the stone (and its colour), spec the type and source
- **Stains** Colour, method of application, timing, preparation
- **Tolerances** SANS 2001-CC1: 2007

ASSESSMENT OF FINISHES **project documentation**

- Compare with specification (type of finish, colour, etc) directly.
- Use reference matters (tolerances, etc) by other documents (e.g. standards).
- Construction and approval of test panels as standard.

a succesful project

House Katz, Cape Town, Greg Wright Architect, 2011





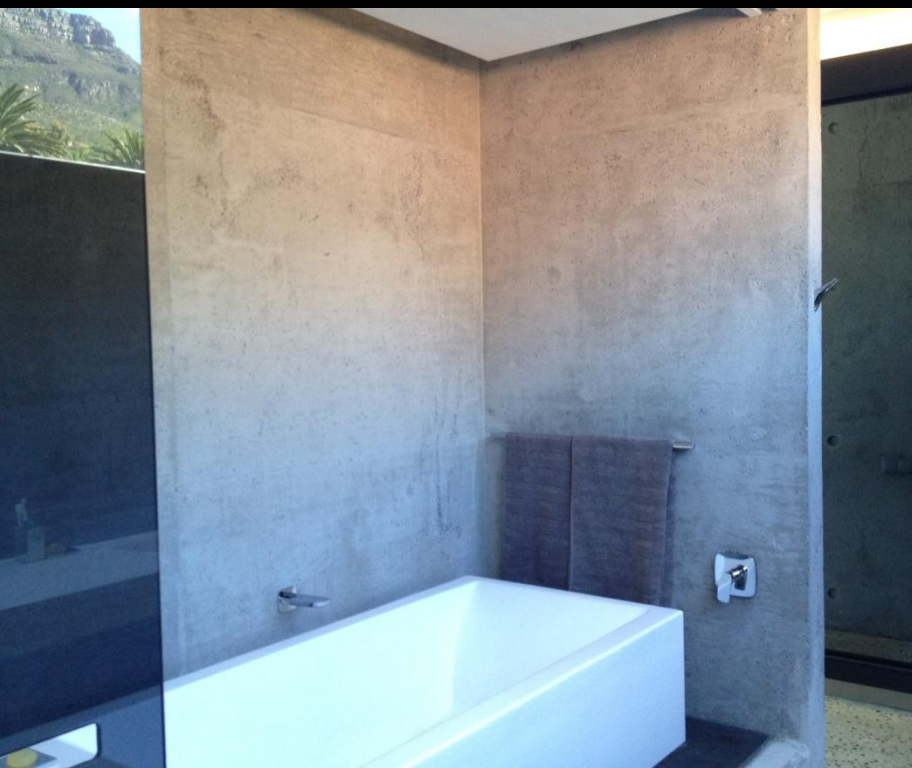












CONCRETE

THE MATERIAL **OF THE FUTURE**