

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

**2nd NMMU Construction Management Conférence**

**TUESDAY 27<sup>TH</sup> NOVEMBER 2012**

By

**Daniel van der Merwe, Architect, C&CI**

# 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

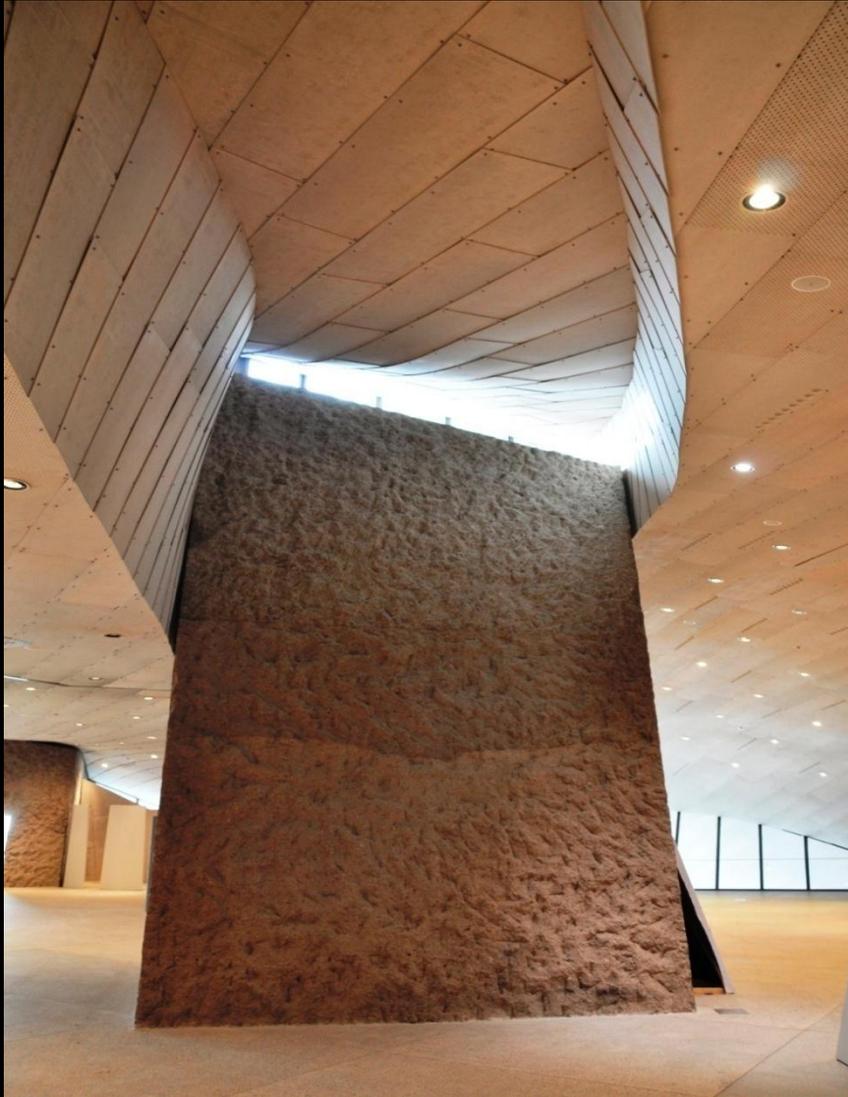
# DESIGN AND PLANNING design and specification



- **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.

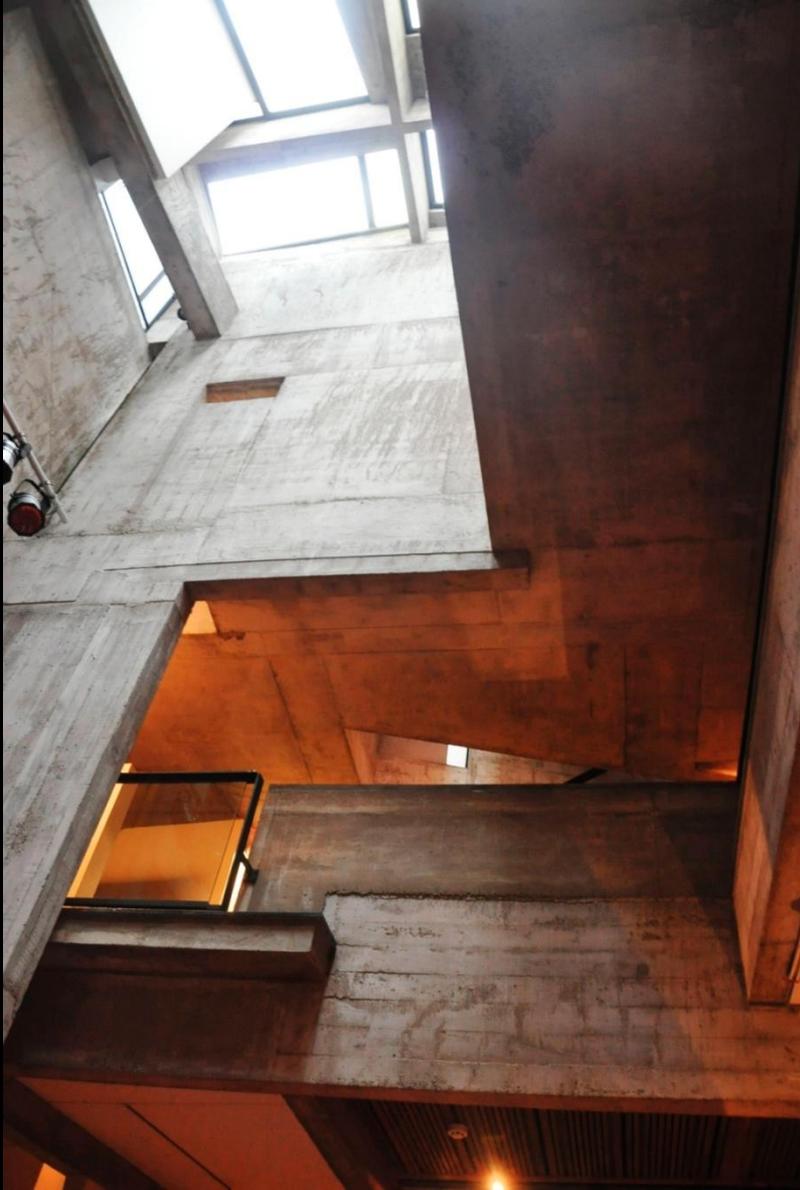
# SPECIFICATION OF FINISHES

## 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**



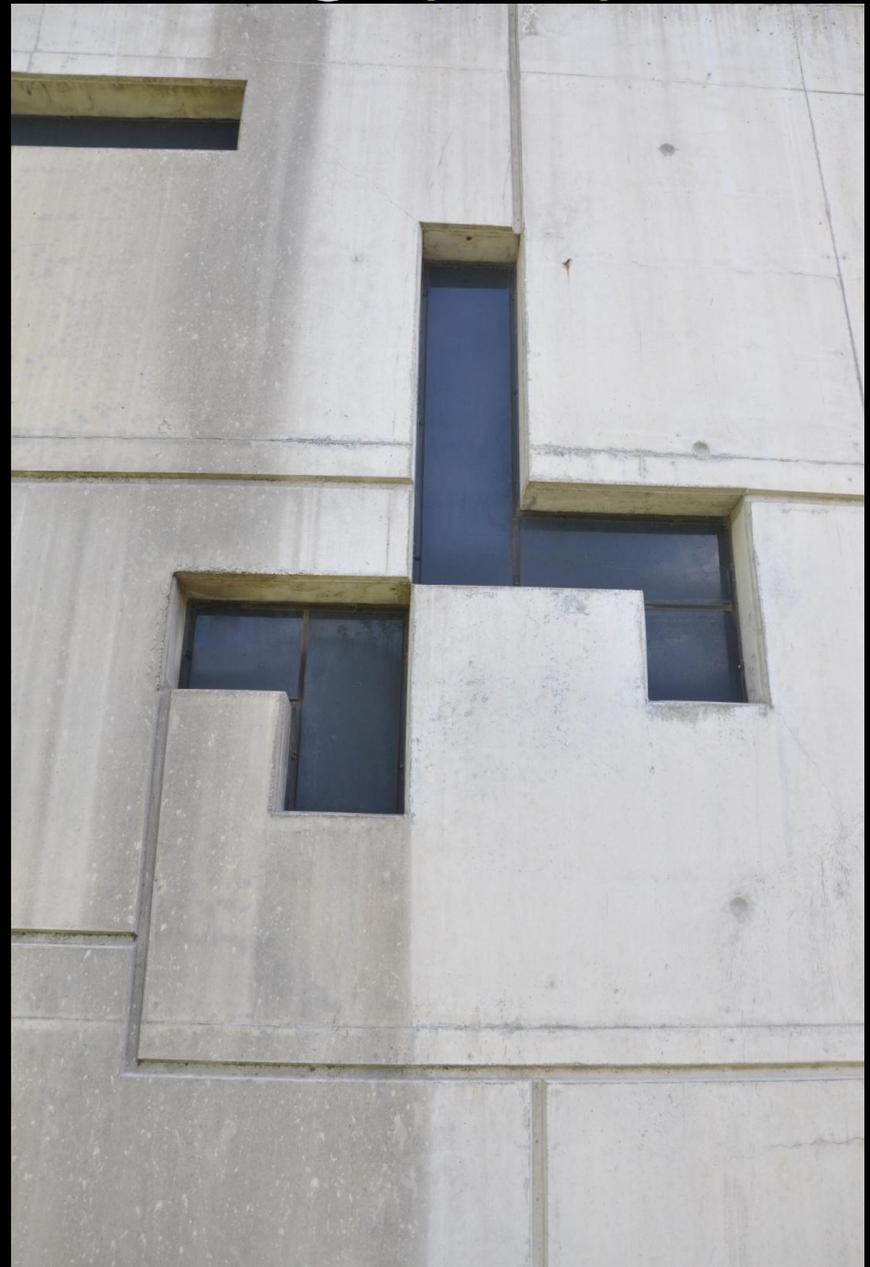
Two main categories of release agent:

1. barrier
2. reactive

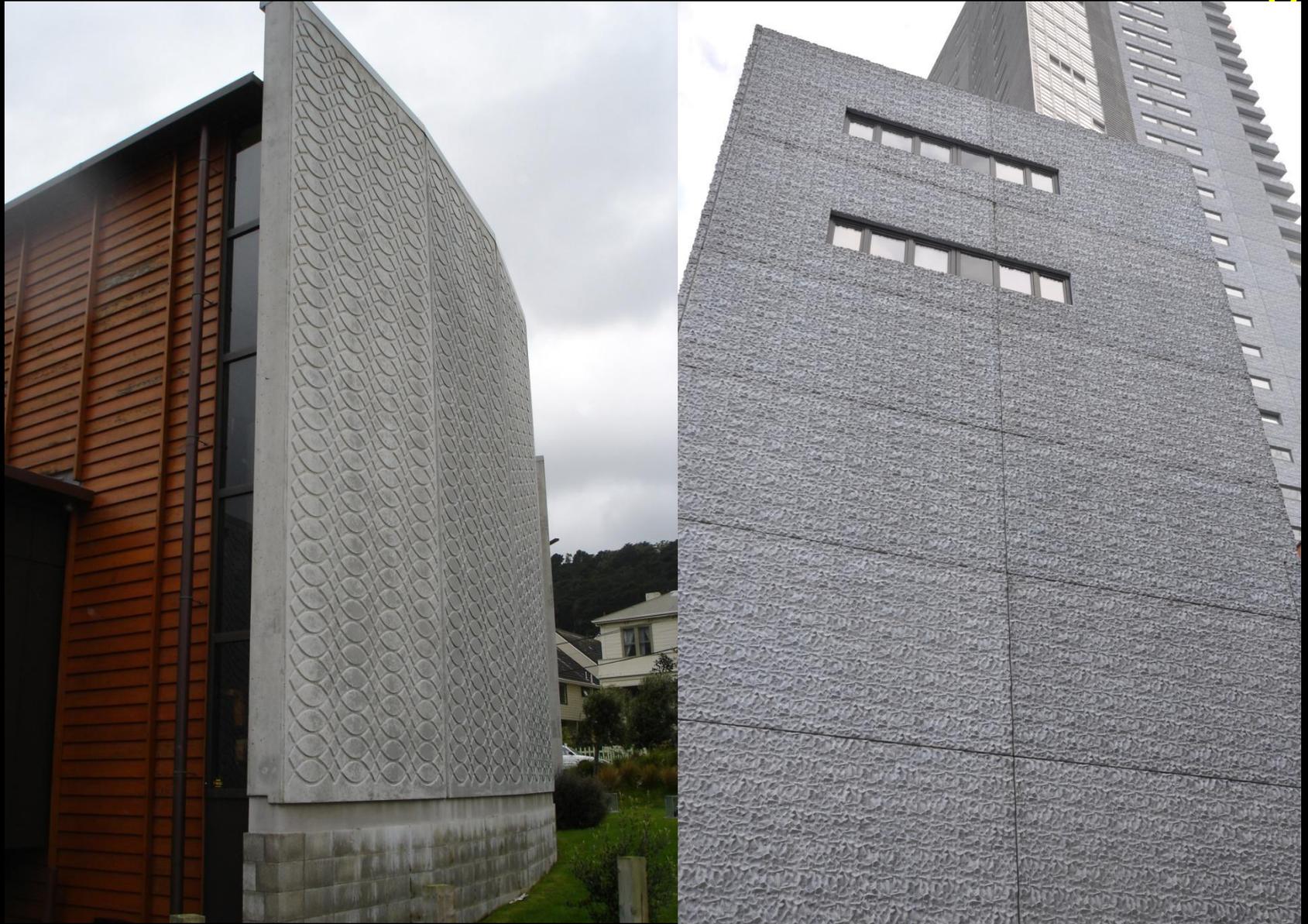
# DESIGN AND PLANNING **formwork**

## Design considerations

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



# FORMWORK: custom made steel shuttering



# Formwork sealed plywood



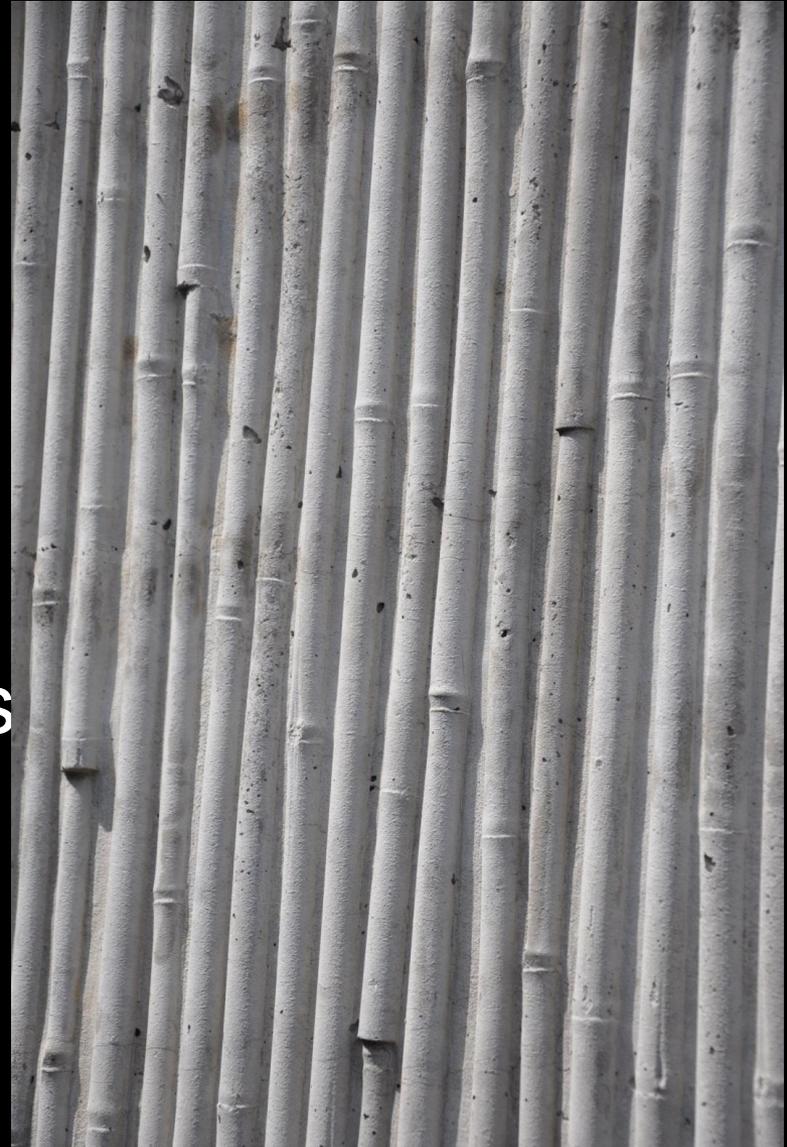
# casar de caseares bus station, spain, 2005



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

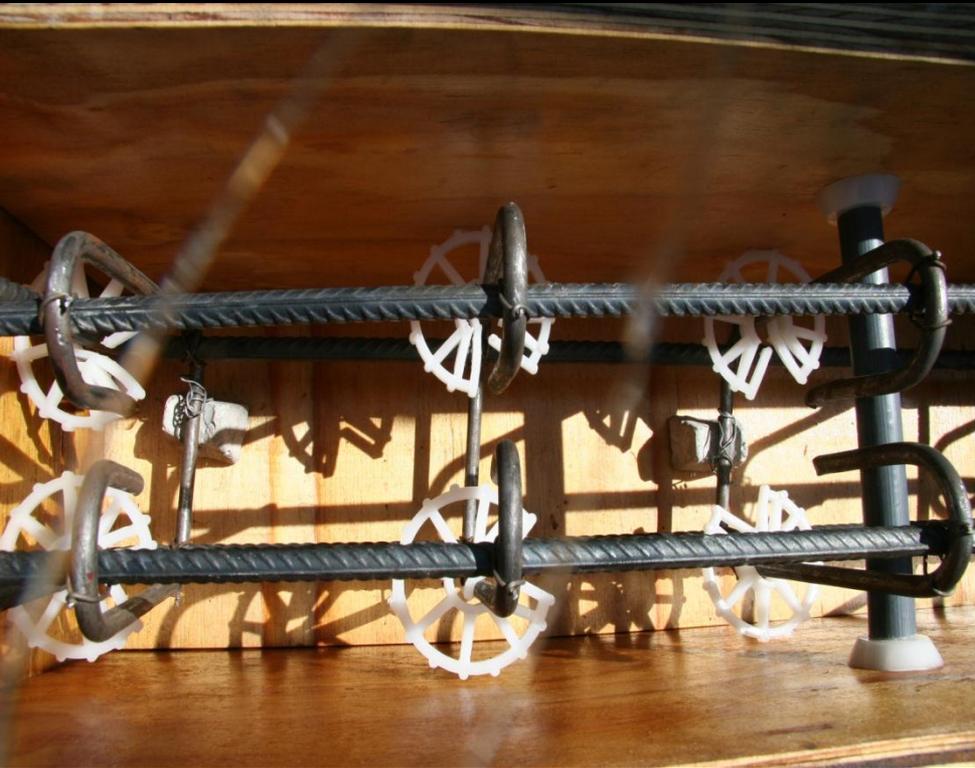
## Checklist : Formwork



- **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.



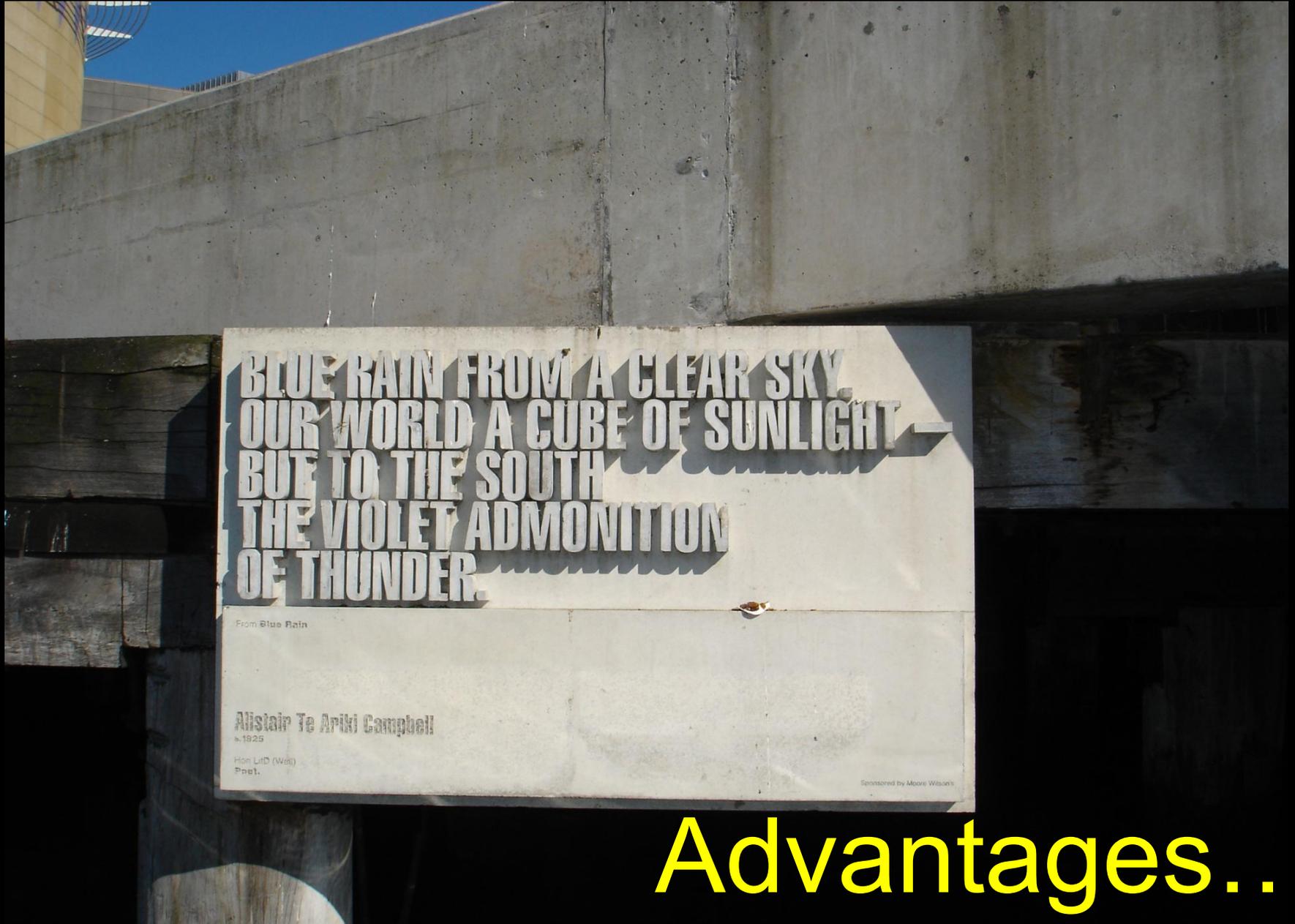
# SPECIFICATION OF FINISHES **Cleaning**



## **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

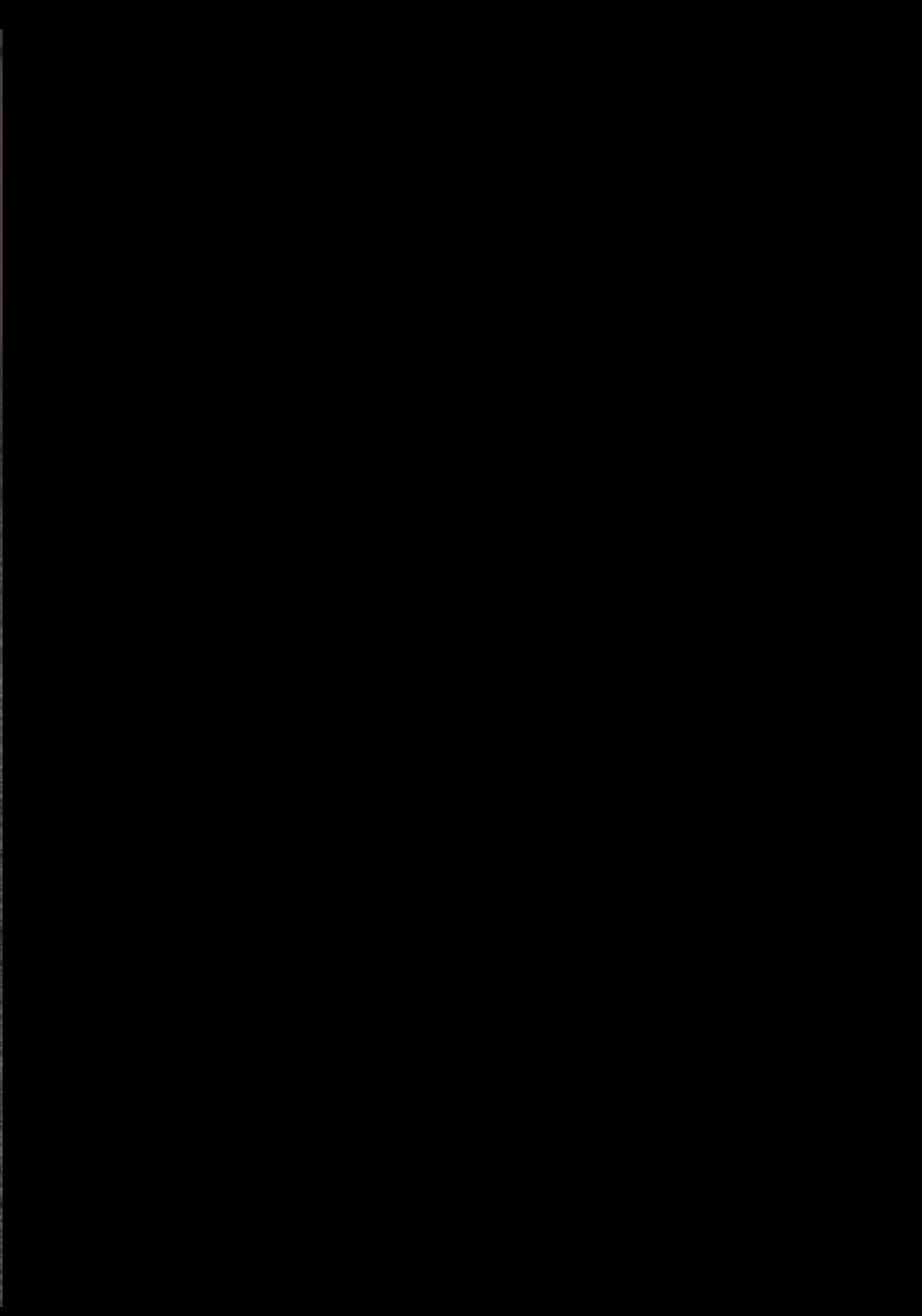
- Tooled.
- Abrasive blasted
- Acid etched





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





# DESIGN AND PLANNING

## Concrete performance parameters

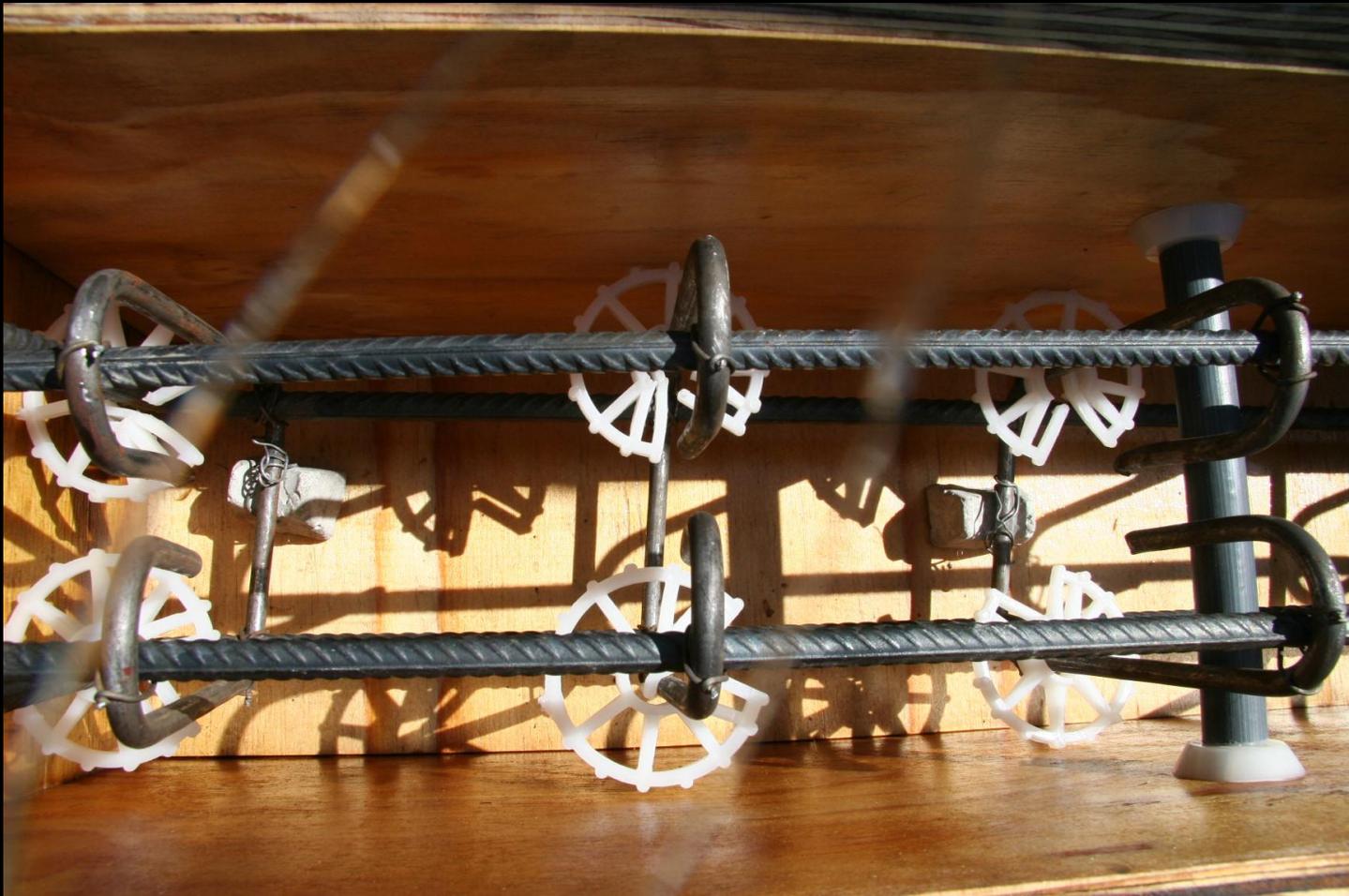
normal-class concrete:  
SANS 878:2004

### 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



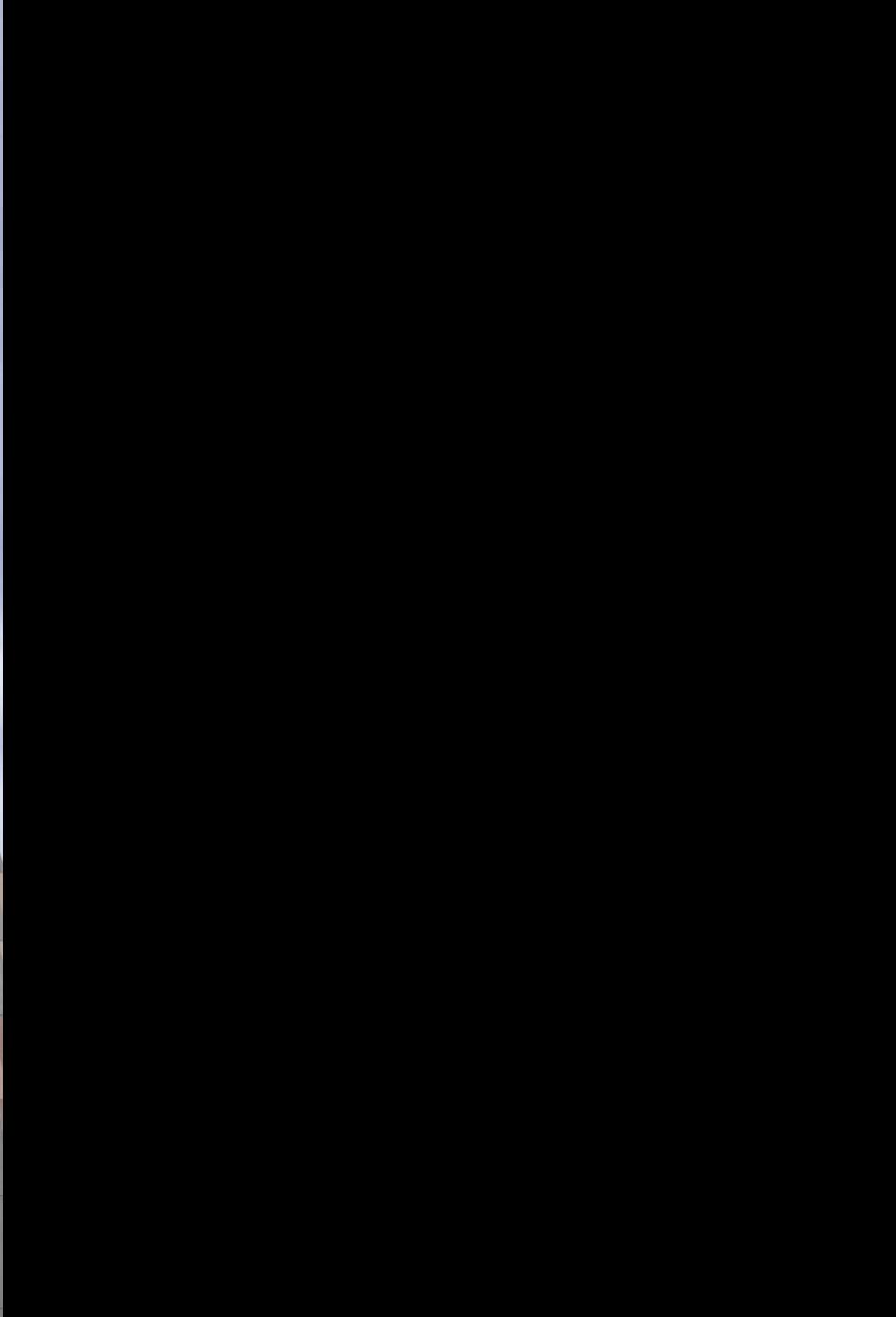
# Soccer city

colored fiberglass concrete precast paneling



# Diagonal 197, Barcelona, b720 arch, 2008



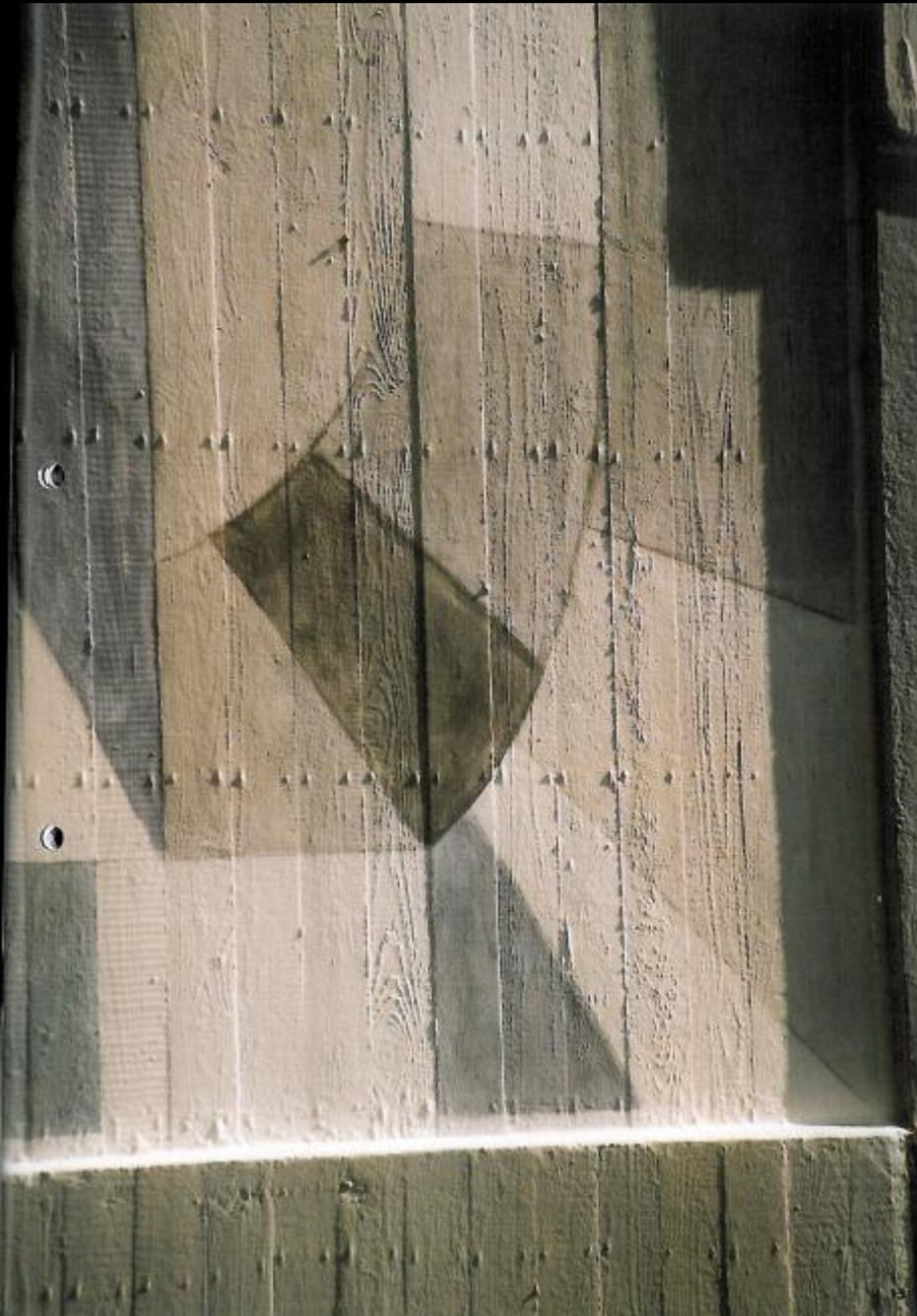




# post shuttering chemical staining



# 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 successful project ....

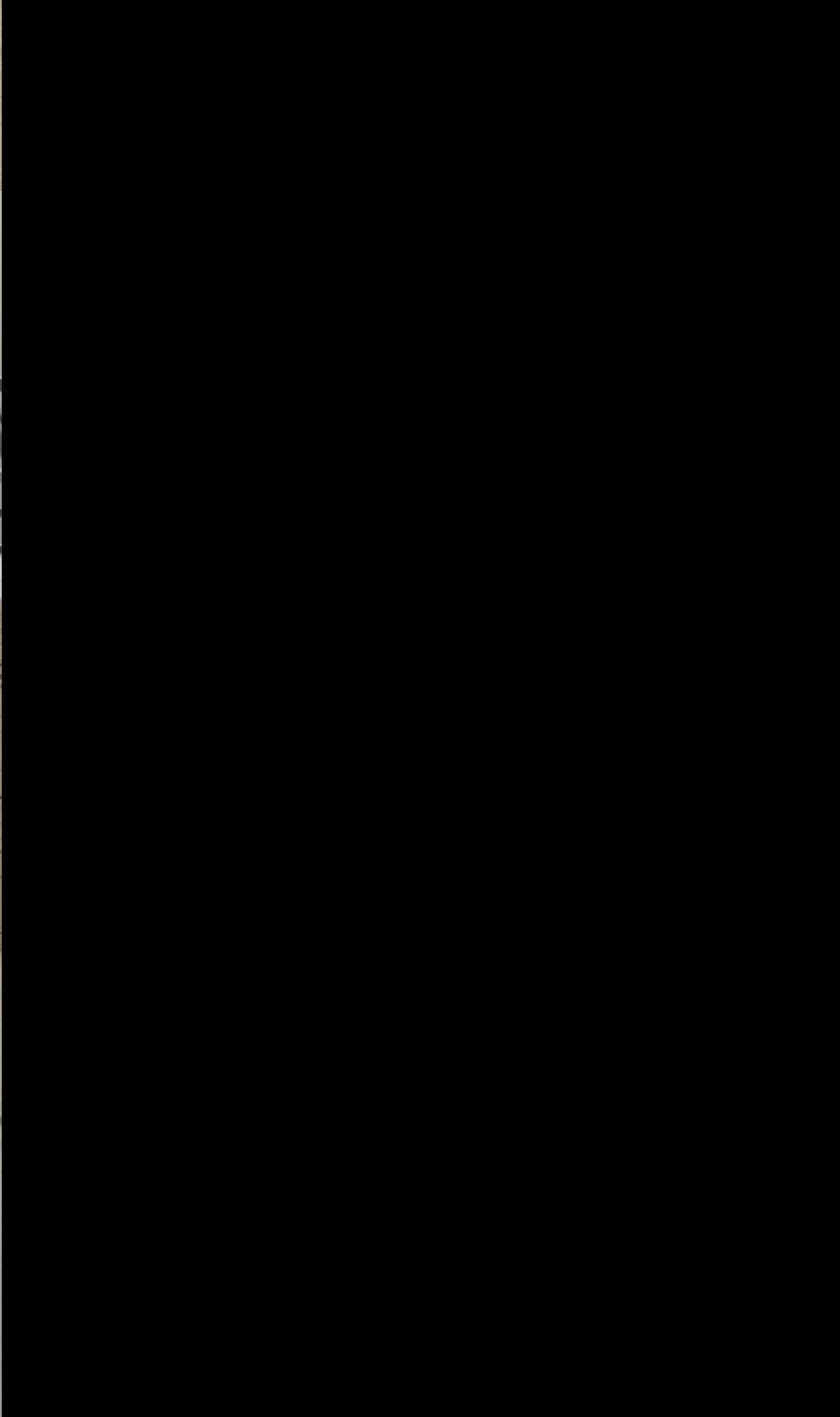
House Katz, Cape Town, Greg Wright Architect, 2011

















# CONCRETE

THE MATERIAL OF THE FUTURE