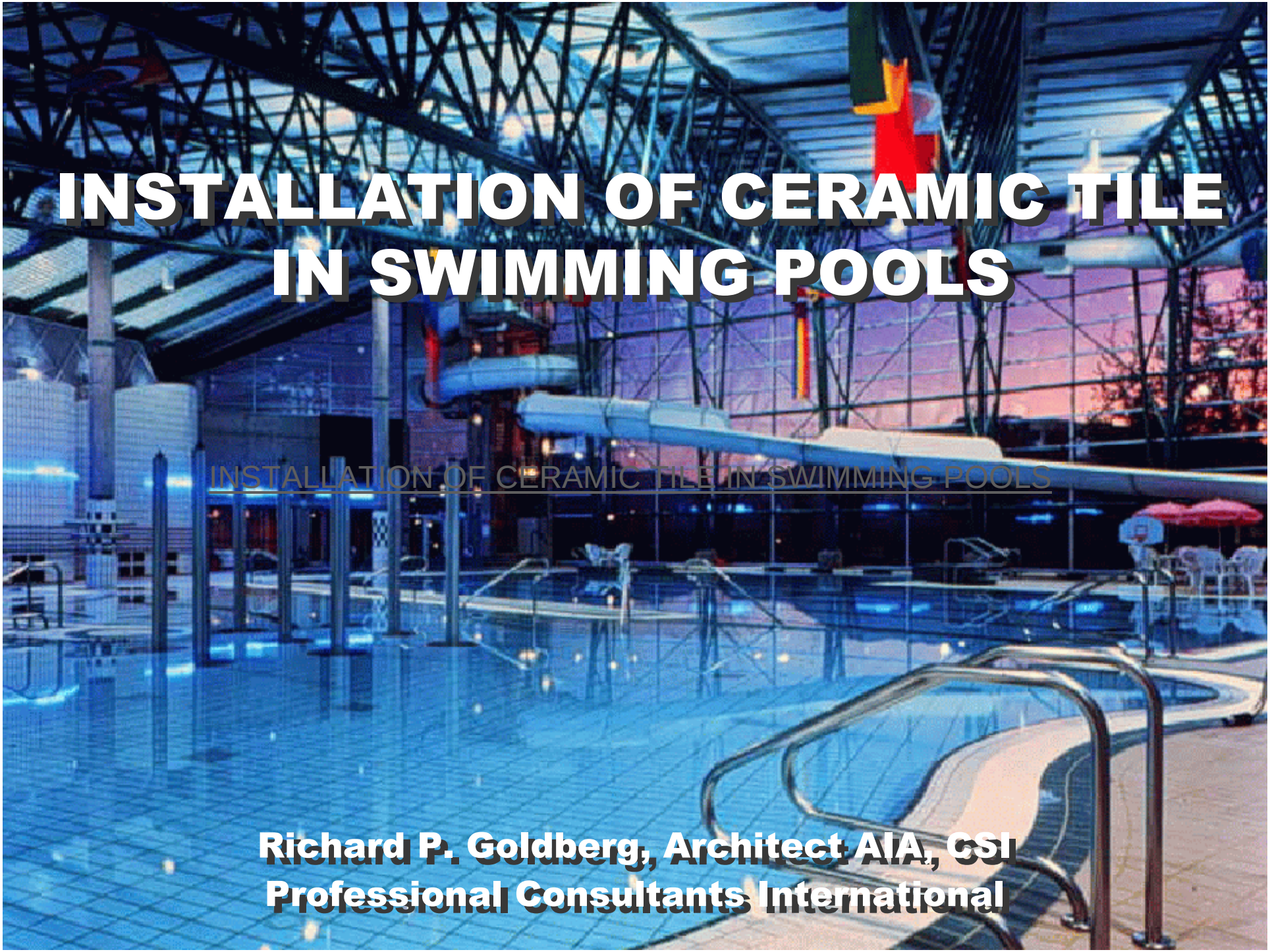

INSTALLATION OF CERAMIC TILE IN SWIMMING POOLS

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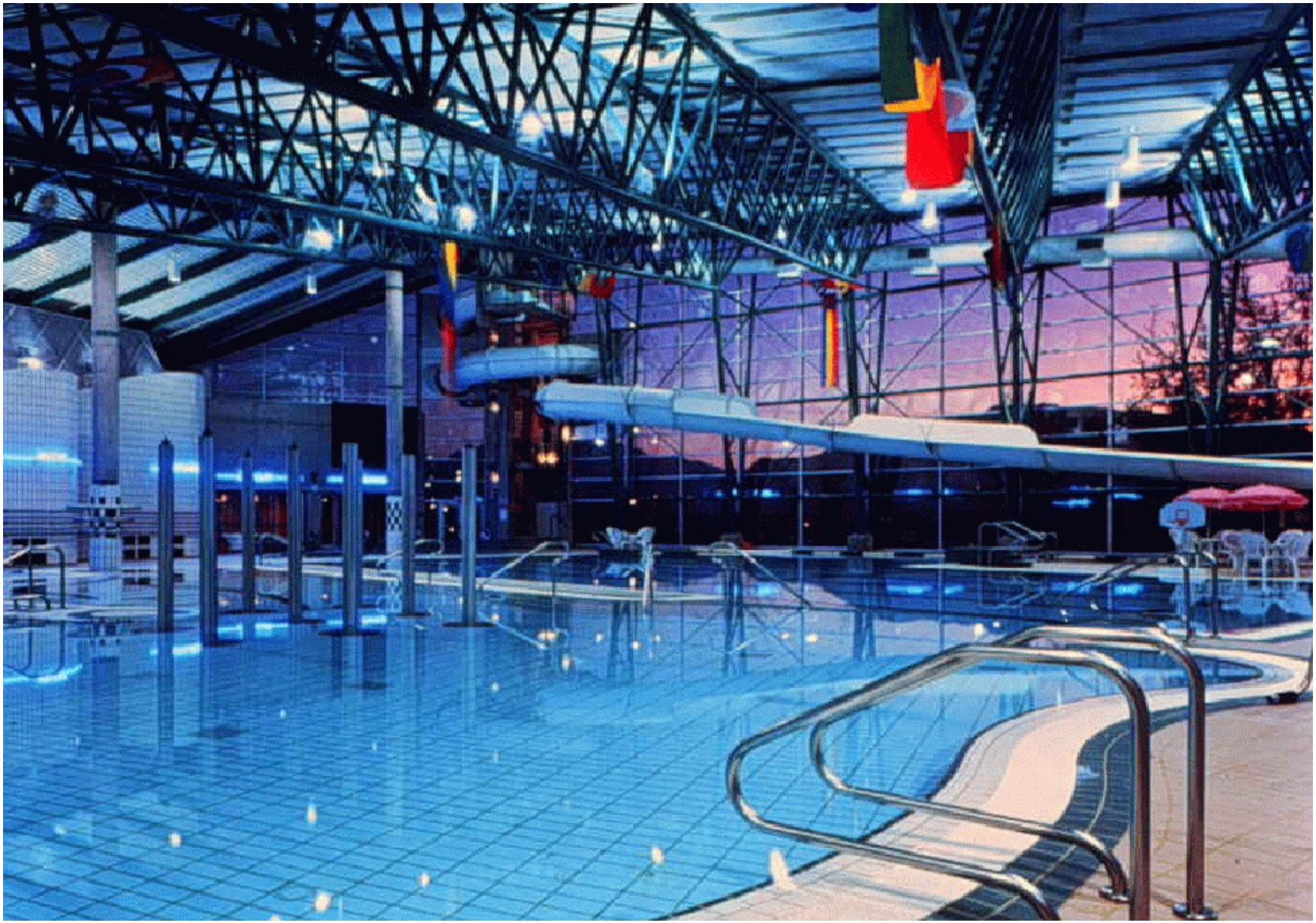

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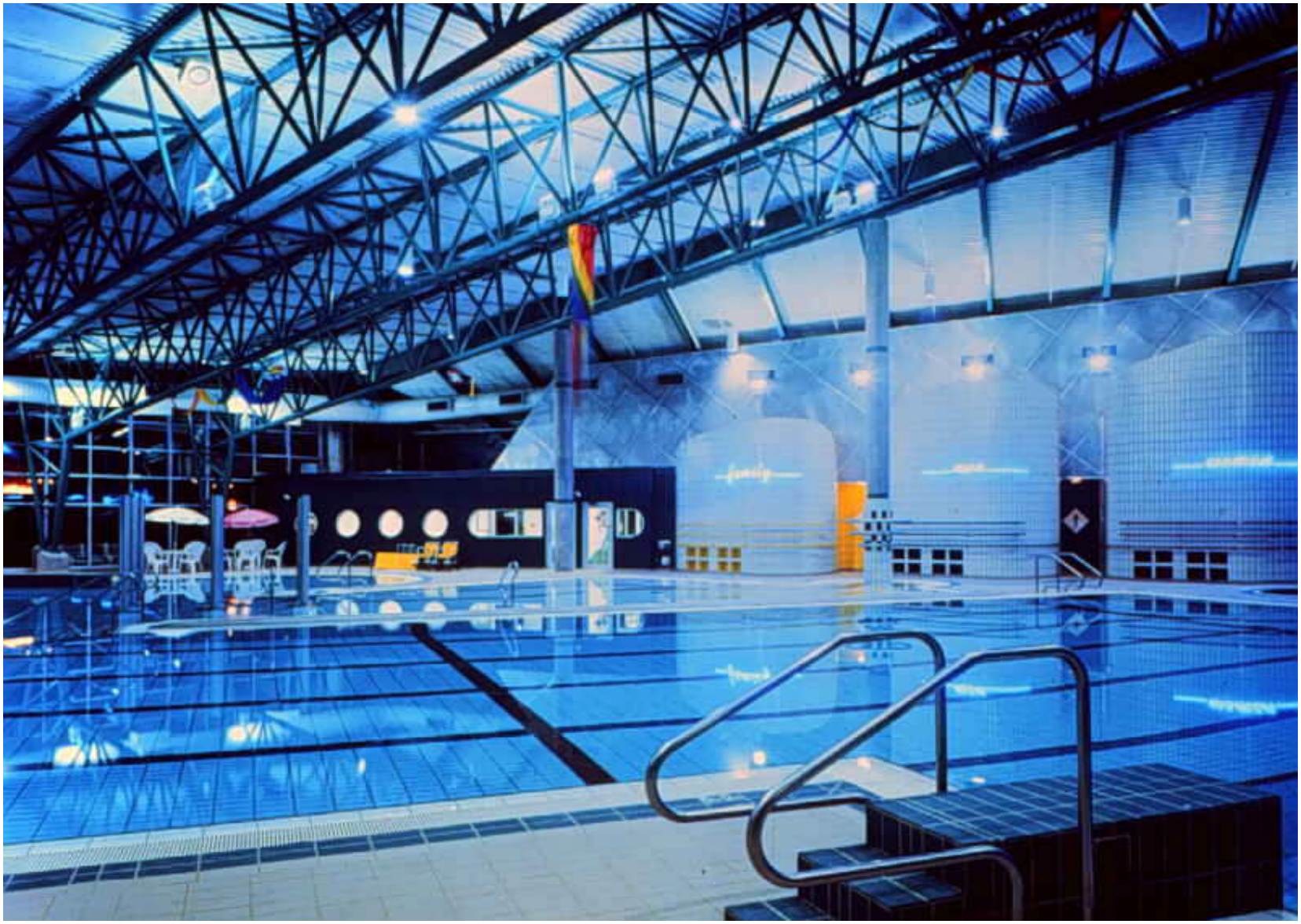

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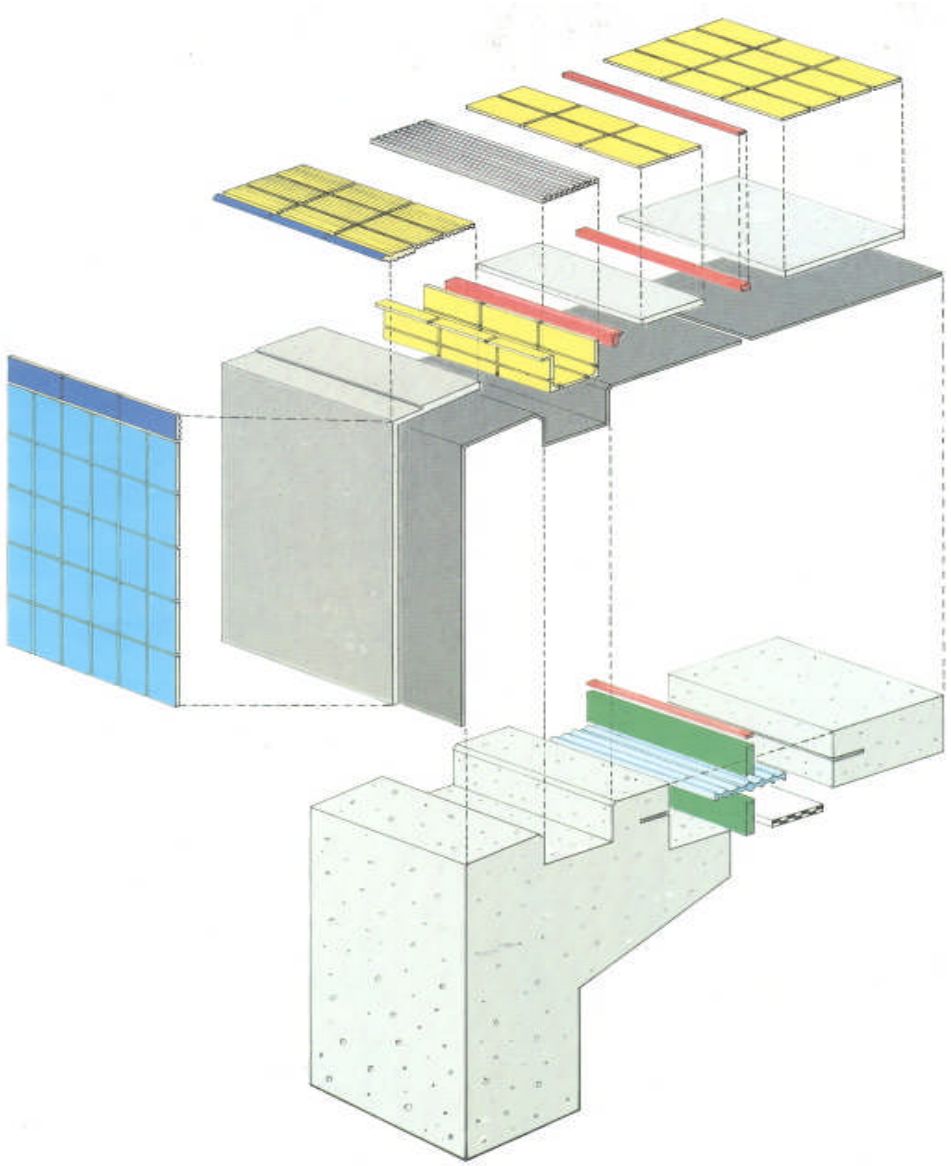

Outline of Presentation

- Types of pool structures- how do they differ?
- Movement joints- why and where are they needed?
- Surface preparation- what are common defects?
- Waterproofing- tile pools not inherently waterproof !

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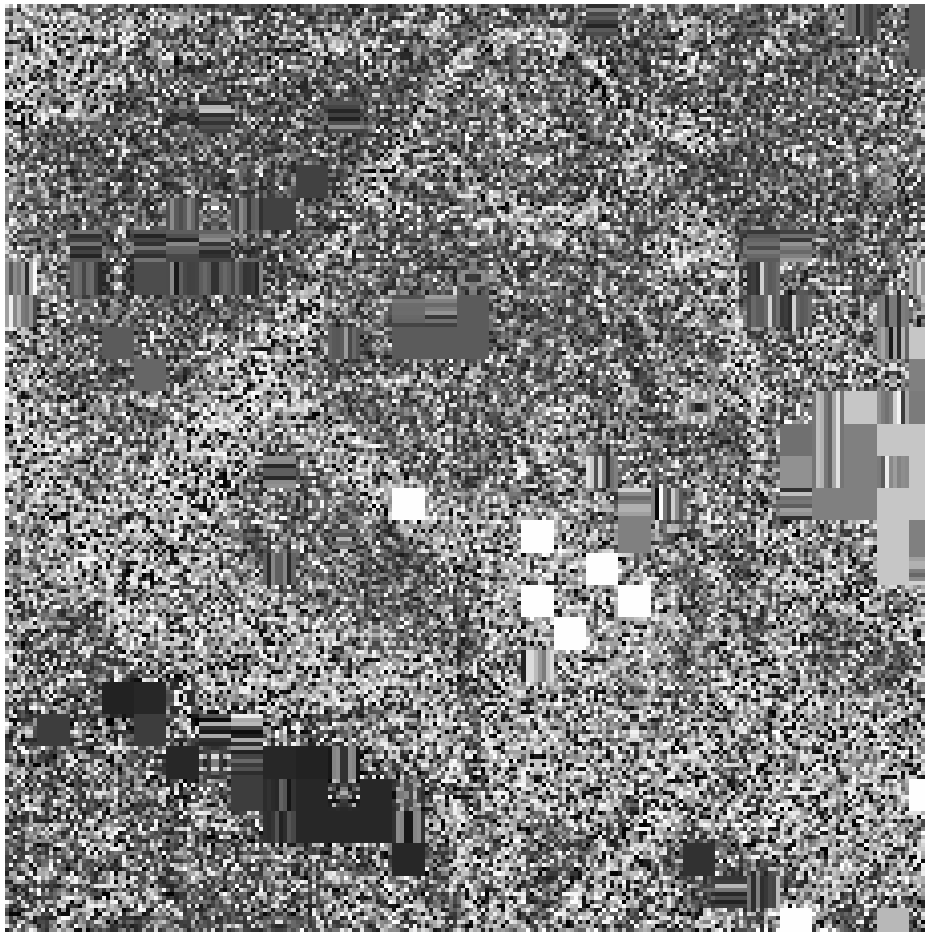
Outline of Presentation

- Selection of tile- type of tile & mounting system ?
- Installation of tile- facts of latex cement mortars
- Grouting- cement, latex cement, or epoxy ?
- Maintenance- what are effects of water treatment ?

Types of Pool Structures

- Cast-in-Place Concrete
  - shrinkage control- 8in (200 mm) slab only 40% total shrinkage in 12 months (50% RH)
  - cold joints- if floor/walls not monolithic
  - surface defects- forming & finishing
- Gunite (pump / spray)
  - minimal shrinkage-thin section, high tensile
  - monolithic- free-form configuration



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Types of Pool Structures

- **Size & shape of pool**
  - **Olympic size- 50m (164 ft)**
    - » **large area with complex phasing of construction (construction joints)**
    - » **movement (shrinkage/ expansion)**
  - **Spa**
    - » **small, monolithic**
    - » **thermal movement (hot water)**
    - » **intense water treatment for concentrated bather load**
    - » **agitation - CO^2 loss > pH acidity**

December 2001 **Installation of Ceramic Tile in Swimming Pools**

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Movement Joints

- **Movement Joints- why ?**
  - **control shrinkage of concrete shell**
  - **thermal movement- prior to & during filling**
  - **moisture movement- after filling or emptying**
- **Movement Joints- where?**
  - **over existing structural joints in shell**
  - **changes in plane or restraining surfaces at screed / render**
  - **12-16 ft (4-5m) each direction**

Movement Joints

- How to design?
  - extend down to substrate- adhesive mortar & thick mortar/ screed bed must expand & contract
  - waterproof membrane- continuous over joints
  - waterstop at joints in concrete shell

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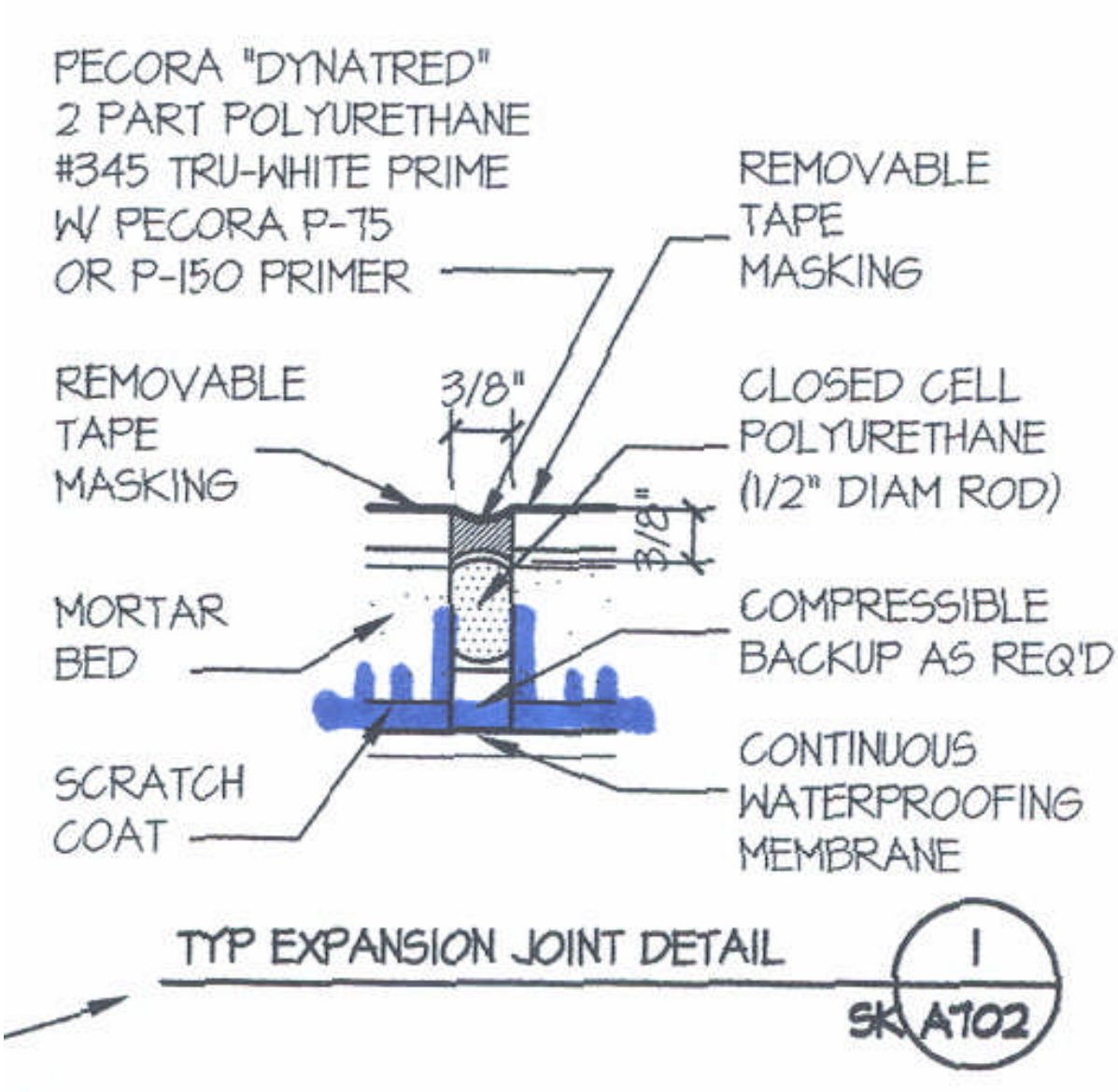
Waterstop - maintains waterproof condition at concrete shell & mortar bed construction & structural expansion joints


PECORA "DYNATRED"
2 PART POLYURETHANE
#345 TRU-WHITE PRIME
W/ PECORA P-75
OR P-150 PRIMER
REMOVABLE
TAPE
MASKING
3/8"
CLOSED CELL
POLYURETHANE
(1/2" DIAM ROD)
REMOVABLE
TAPE
MASKING
3/8"
MORTAR
BED
COMPRESSIBLE
BACKUP AS REQ'D
SCRATCH
COAT
CONTINUOUS
WATERPROOFING
MEMBRANE
TYP EXPANSION JOINT DETAIL
1
SK A702

Surface Preparation

- Common surface defects
  - floor level & wall plumb tolerances
    - » typical concrete shell requires patching, plastering, mortar bed leveling
  - finishing & forming defects
    - » form release & curing agents (walls & floors; bond breaking vs. reactive/ dissipating)
    - » honeycombing, laitance
    - » over-troweling, shrinkage cracking

Surface Preparation Remedies

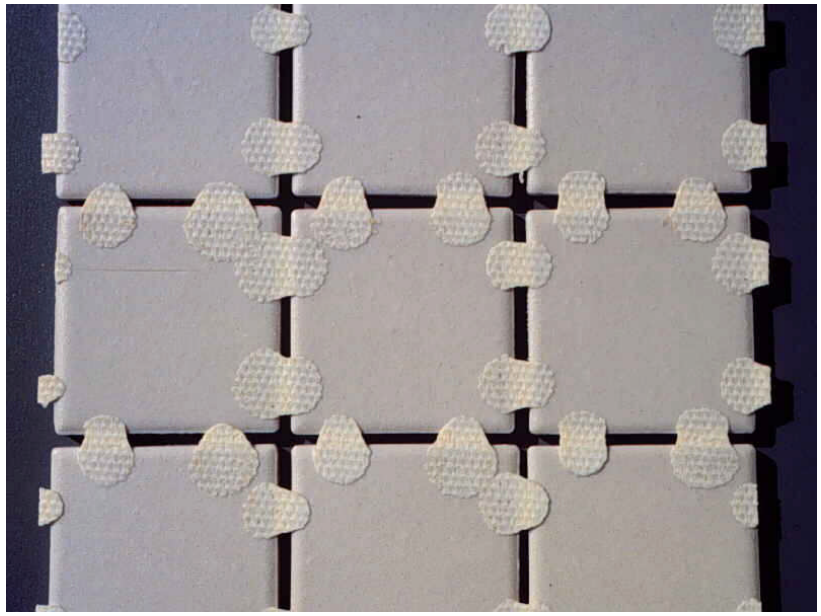
- **Recommended cleaning methods**
  - low pressure water- hose & scrub brush w/ detergents & degreasers
  - high pressure water 1,000 psi (7MPa)
  - high pressure water blast 5-35,000 psi (34-240 MPa)
  - grit or shot blasting- pressurized steel pellets w/ vacuum, water soluble grits
- **Not Recommended**
  - acid cleaning- > risk of improper application & rinsing (failure to saturate or rinse/ neutralize soluble salts)

Types of Waterproofing

- direct bonding to tile (internal)
  - simple design & installation
  - prevents saturation of mortar bed/ concrete; no sulphate/chloride attack of concrete, render or reinforcing
  - not for negative ground water pressure
- sandwich slab (external)
  - inexpensive material; costly labor
  - good for negative water pressure
  - does not prevent saturation of mortar bed/ concrete to resist deterioration

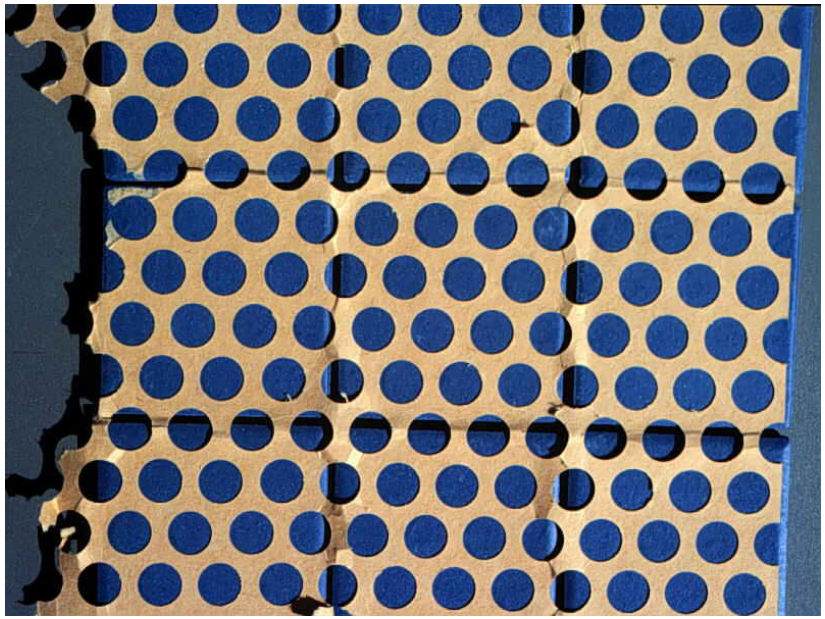
Tile Selection Critieria

- impervious or vitreous (Group I) .5- 3% absorption; insignificant moisture expansion, frostproof
- semi-vitreous (Group II) 3-6% some permanent expansion from long term moisture exposure
- slip & chemical resistance
- Mounting System (mosaics)
- Face mount - paper recommended
- back mount - PVC dot or mesh- variable quality



NOT RECOMMENDED for continuous water submersion

PVC dot back-mounted mosaic tiles - silicone residue



Paper back-mounted tile water soluble glue

Before – Paper back mounted mosaic tile

After – 24 hr. water soak; PVA glue soluble in water

Installation of Tile

- **Benefits- latex cement mortars**
- **>bond strength to impervious tiles (porcelain, glass mosaics)**
- **>flexibility resist differential thermal & moisture movement**
- **<absorption -protects cement from water treatment chemicals**
- **curing- proper latex will not re-emulsify in water when cured; critical cure period 12-24 hours- 14 days conservative recommendation**

Grouting

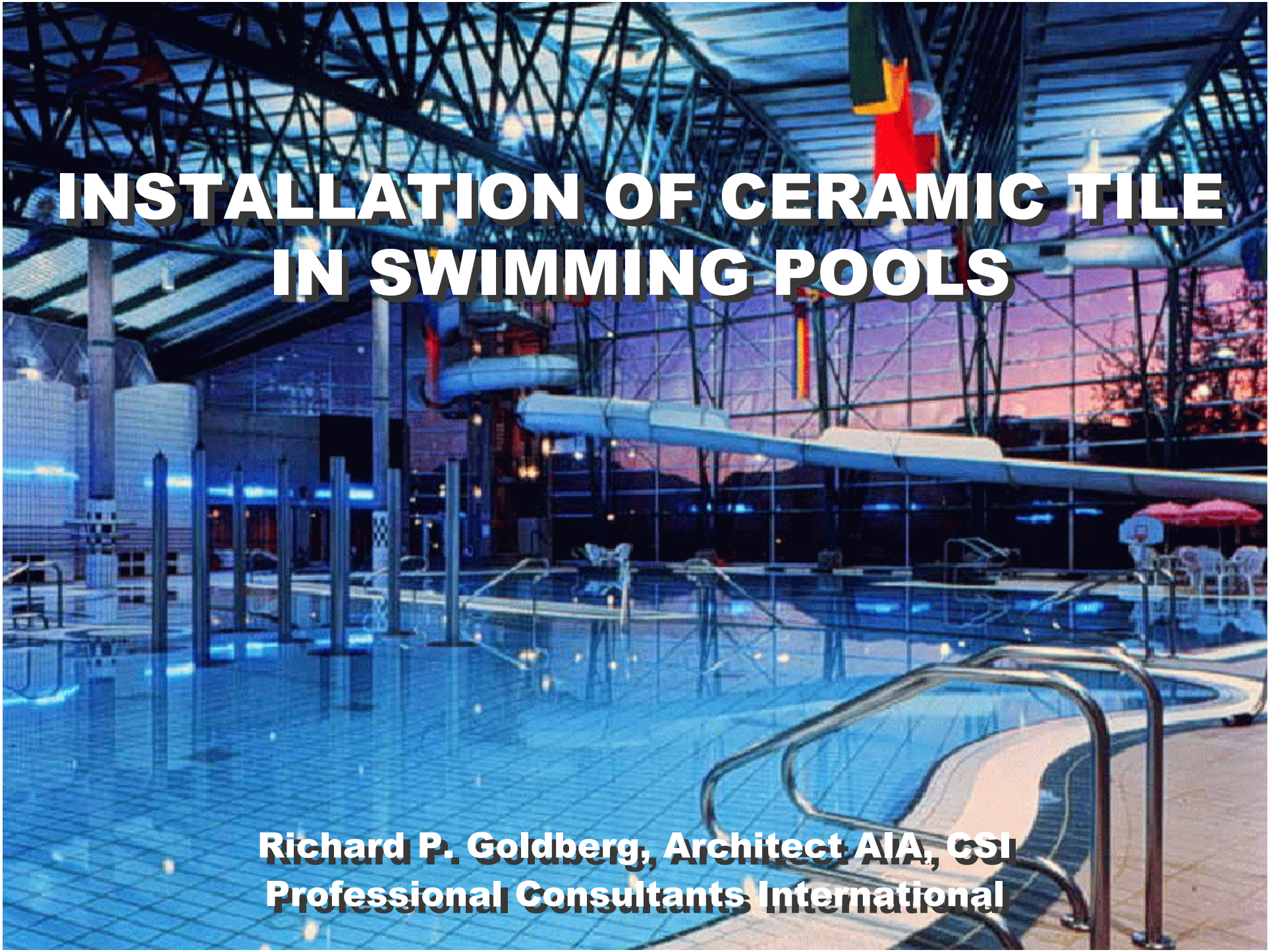
- Portland Cement grout (w/ water)
- limited resistance to deterioration- requires constant maintenance from effects of chemicals
- Latex Portland Cement
- good resistance - latex protects cement particles & pigments, > bond,> flexibility, < absorption
- curing no latex migration with proper cure (14 days)

Grouting

- **Epoxy Grout (100% solids)**
  - **no deterioration- immune to water treatment chemicals & agitation, hygenic**
  - **pH balance- no effect on alkalinity of water**
  - **exterior use possible color fade from UV; no effect on performance**
  - **flexible -similar to latex cement**
  - **superior adhesive bond- resists thermal/ moisture movement & vapor pressure; movement joints critical**

Maintenance

- **Effects of water treatment on Portland cement mortars & grouts**
  - **Chlorine disinfection not responsible for deterioration of cement grouts & mortars**
  - **pH balance measure of acidity / alkalinity (scale 1-14) pools pH 7.2-8.0; acidic condition will deteriorate (sulphate and chloride attack)**
  - **Calcium balance (hardness)- if low, free calcium depleted from cement leading to deterioration; if high mineral deposits on tile & grout**



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