Crystal Palace Lighting Simulation

Sponsored by

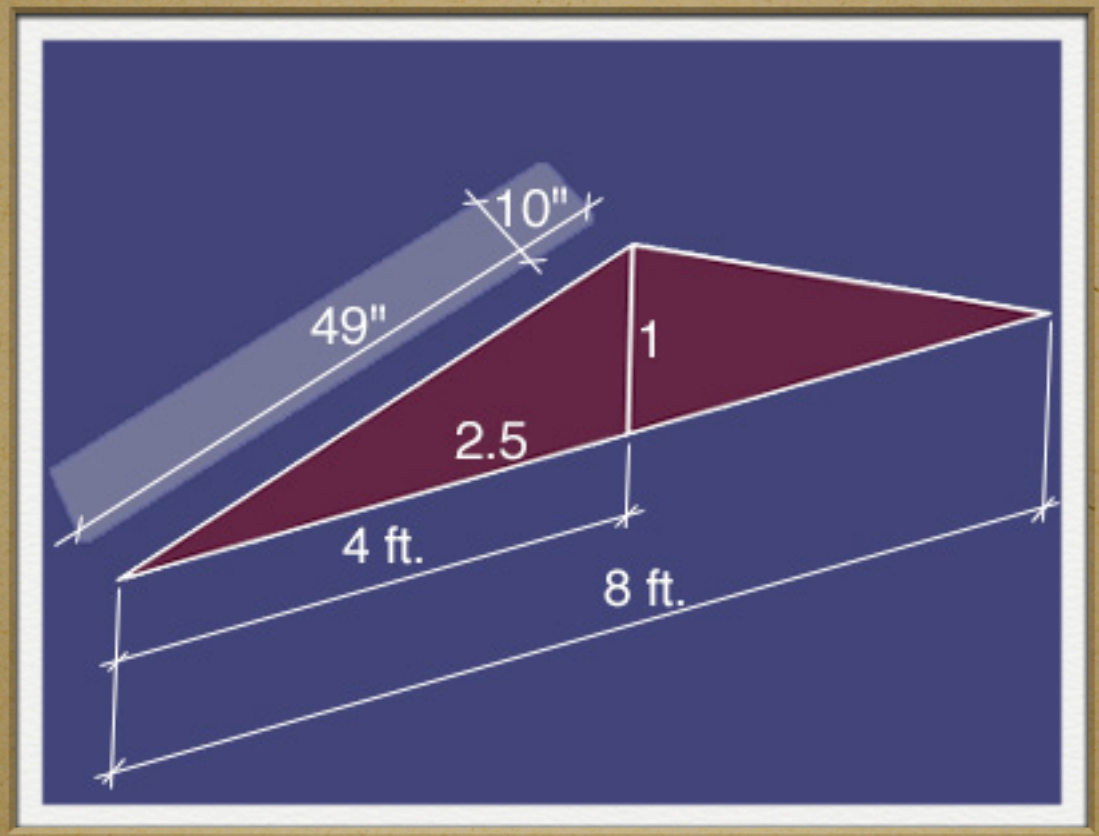
The Institute for Advanced Technology in the Humanities
at the University of Virginia

Crystal Palace
facts and figures

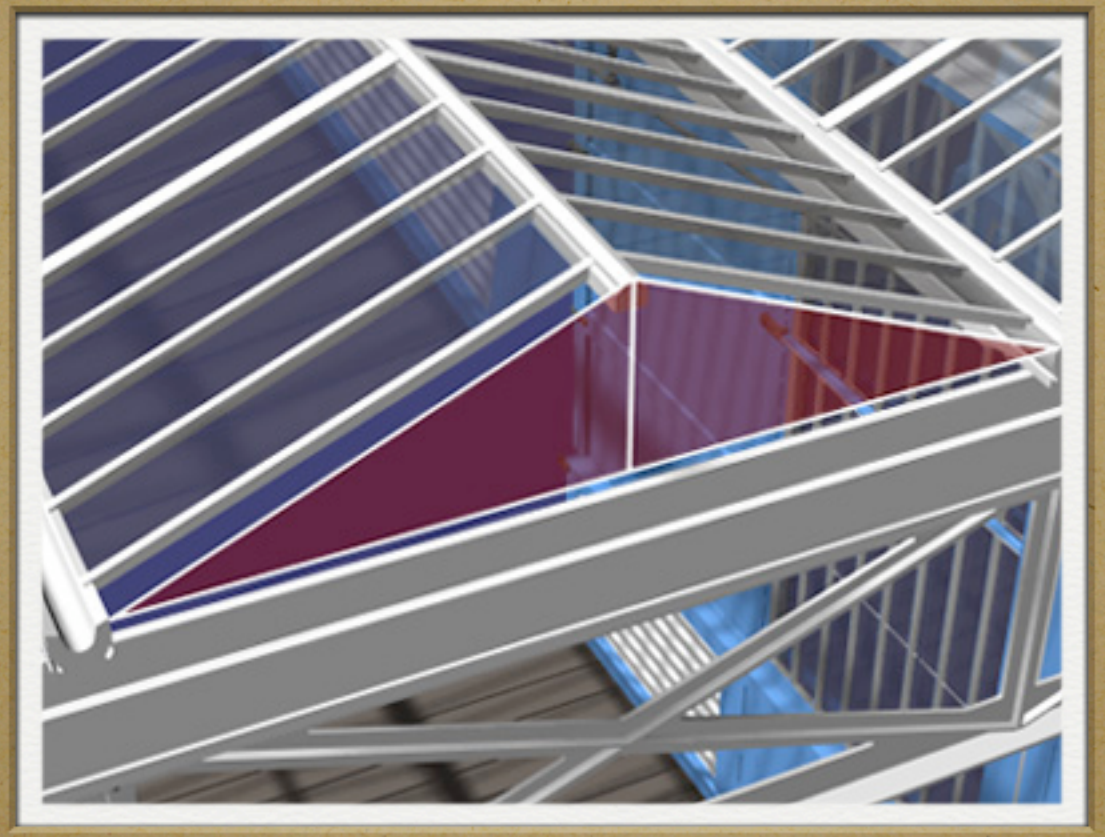
- Designed by Joseph Paxton
- Erected for The Great Exhibition of the Works of Industry of All Nations (Worlds Fair)
- Completed May 1, 1851 in Hyde Park, London
- Largest building in the world, 19 acres under roof
- Housed 13,973 exhibitors
- Destroyed by fire in 1935

Crystal Palace
historical significance

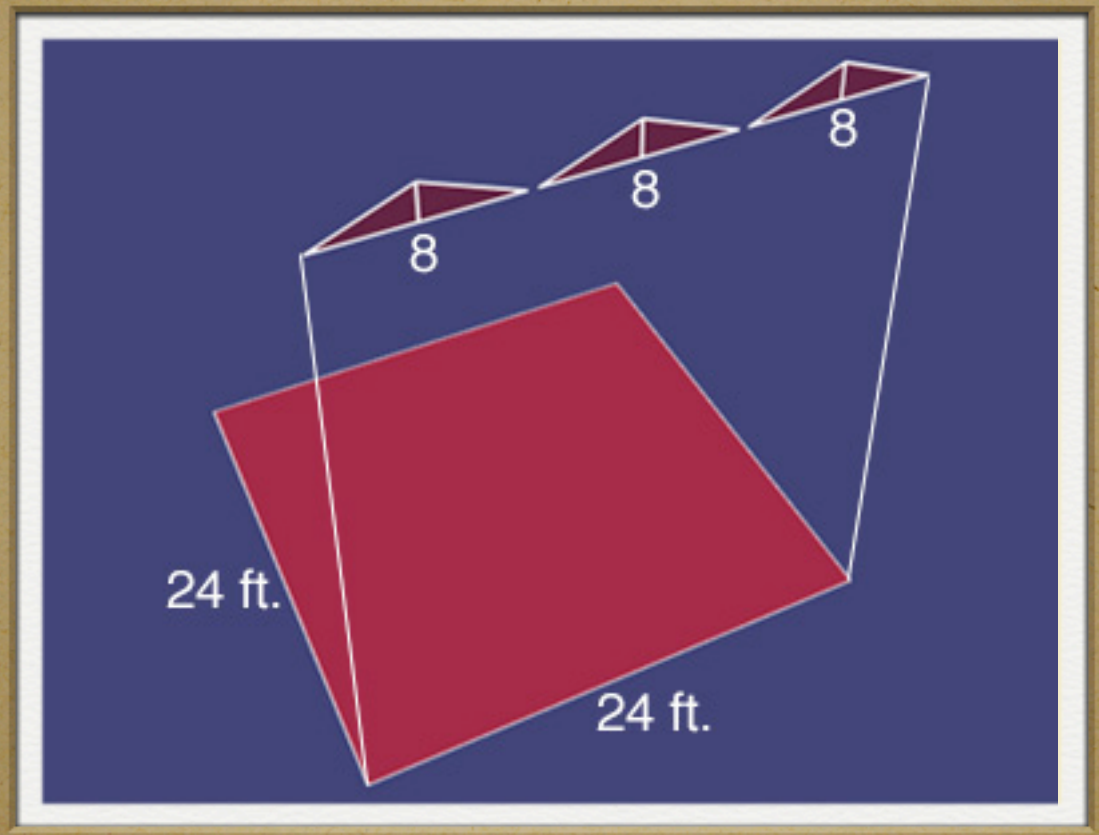
- Integrated Building Systems
- Manufactured Kit of Parts
- Cultural shift from value on ornate and hand crafted to mass produced manufactured goods



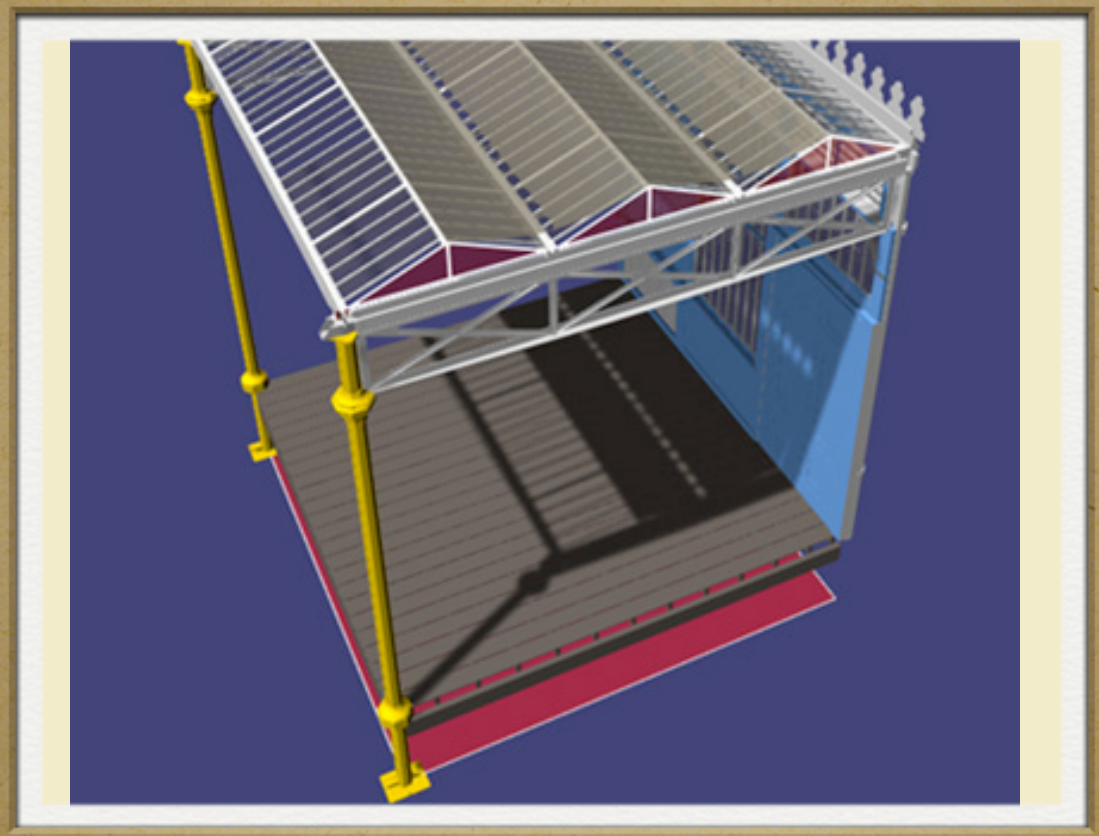
proportions derived by available glass size



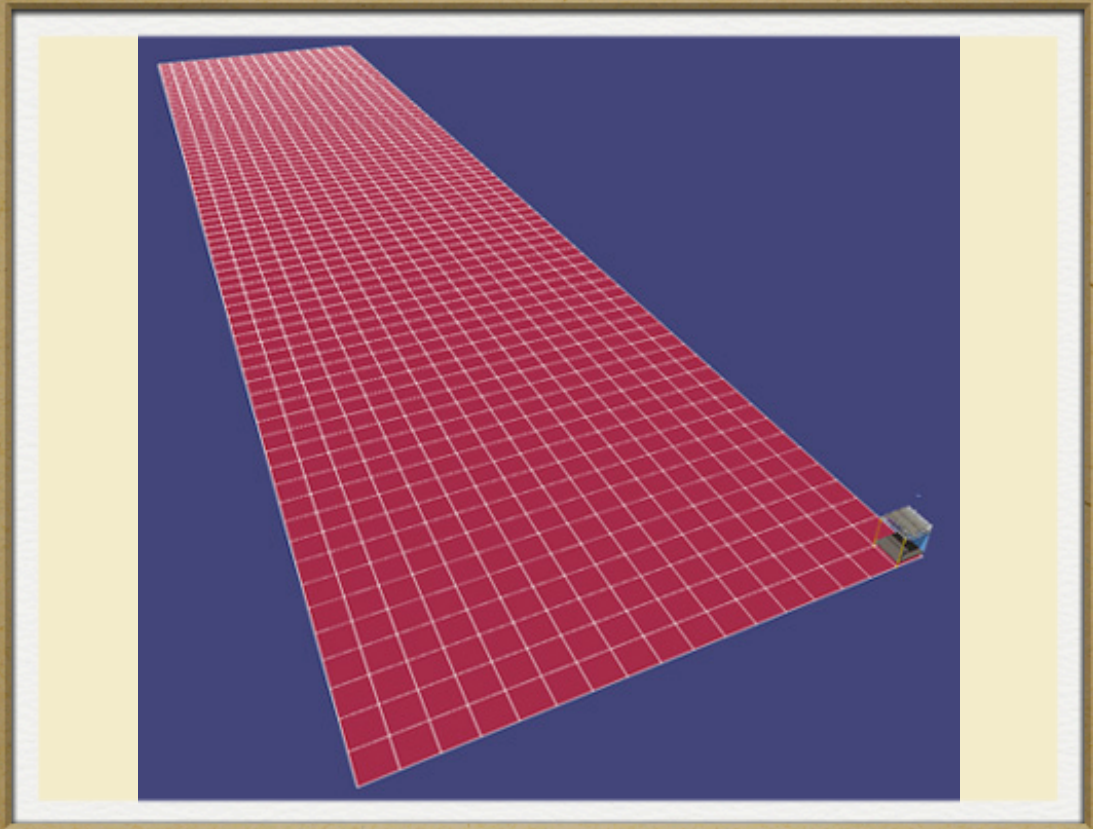
typical roof bay



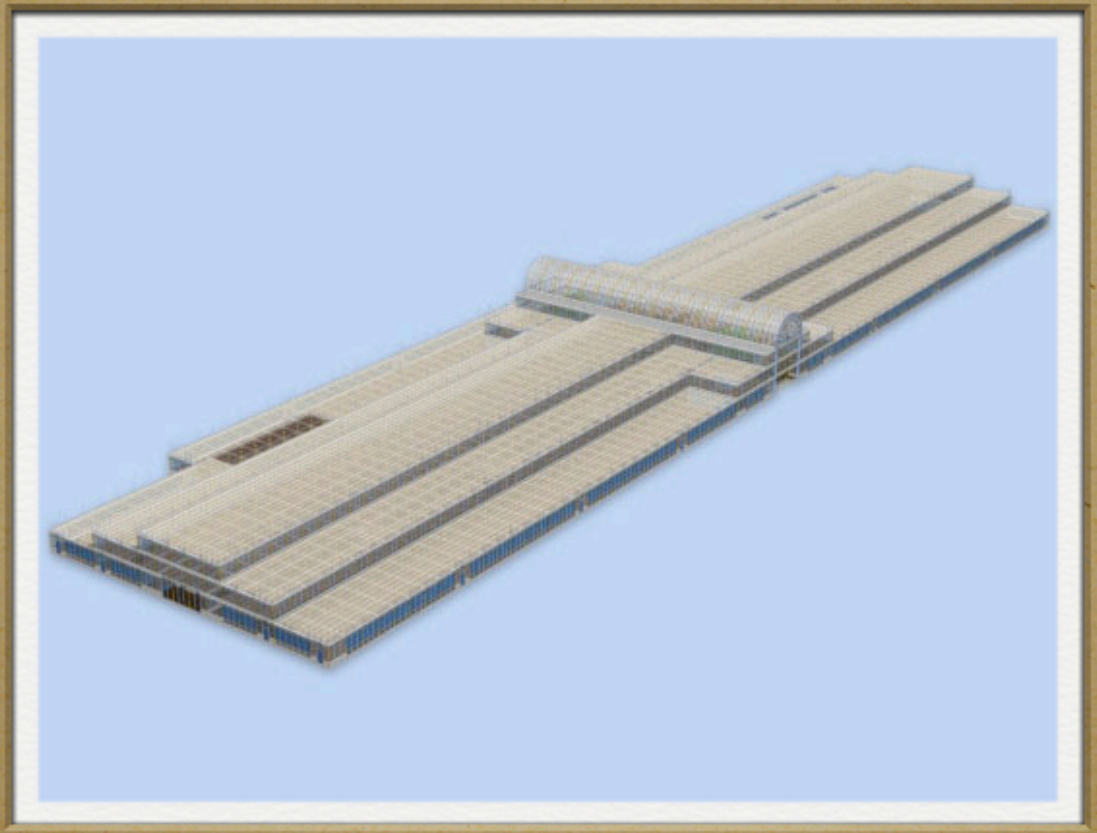
typical bay dimensions



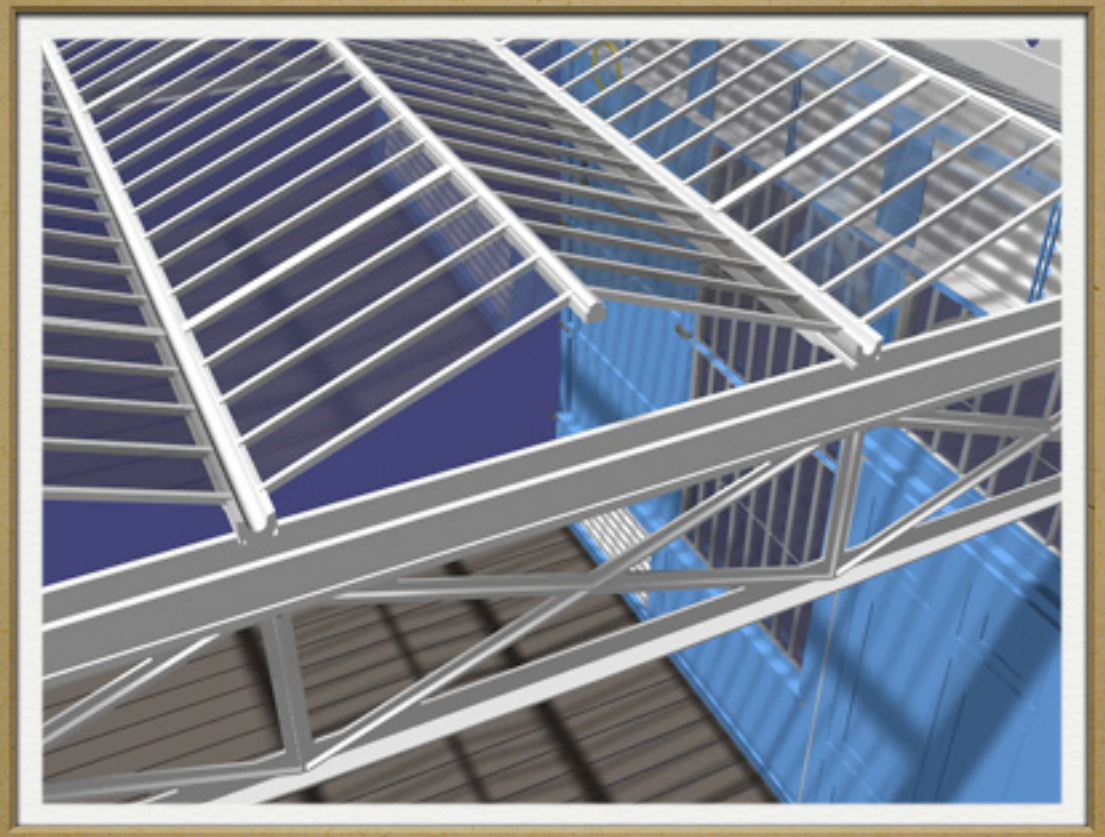
typical building bay



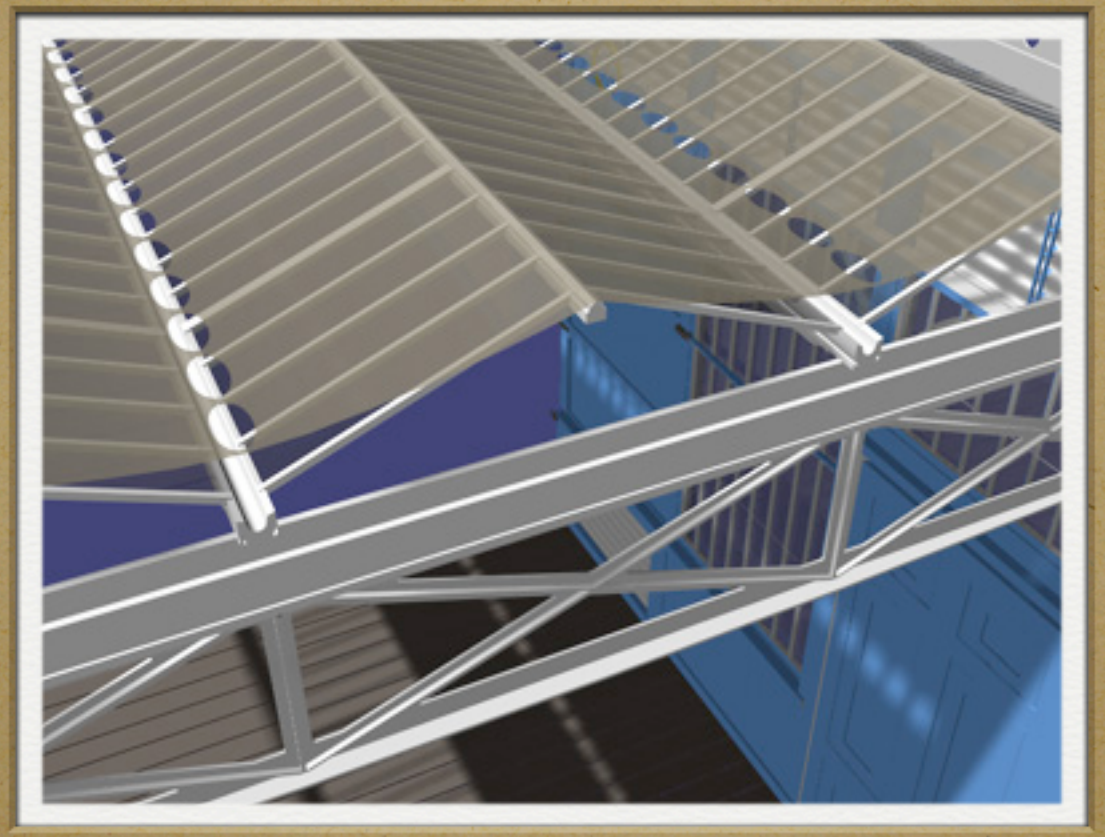
bay to whole



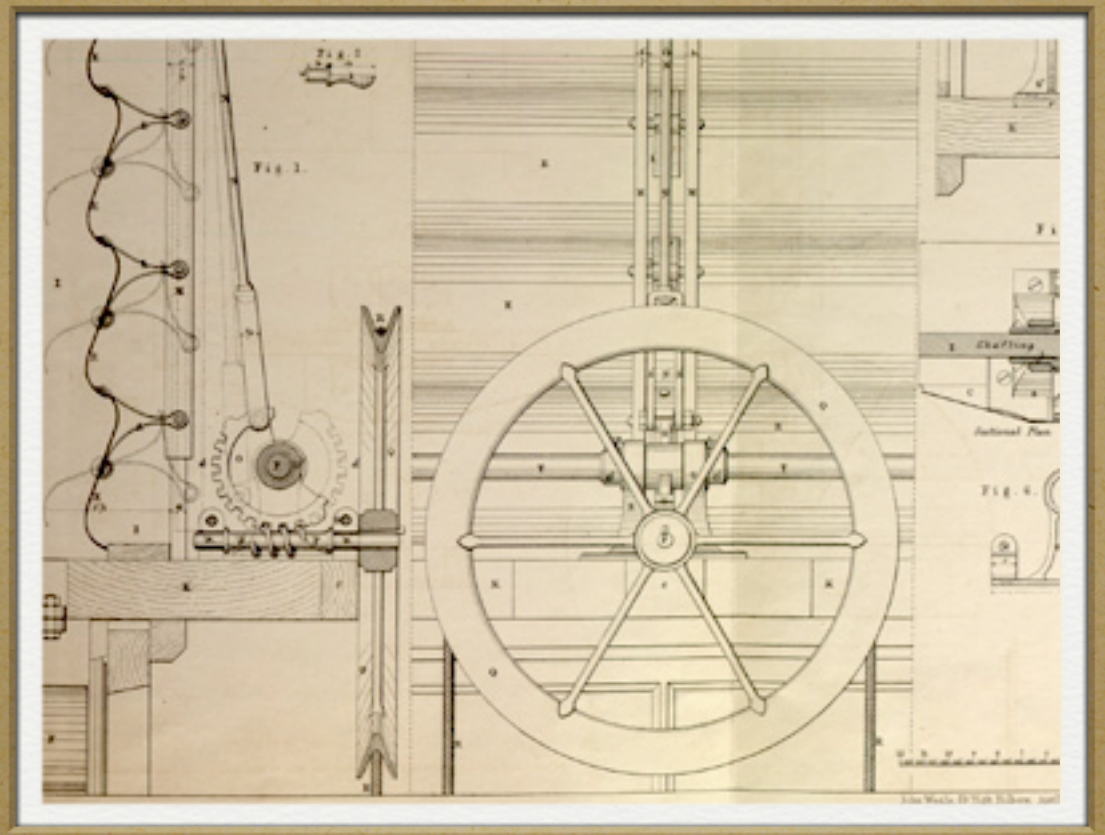
aerial view



roof structure

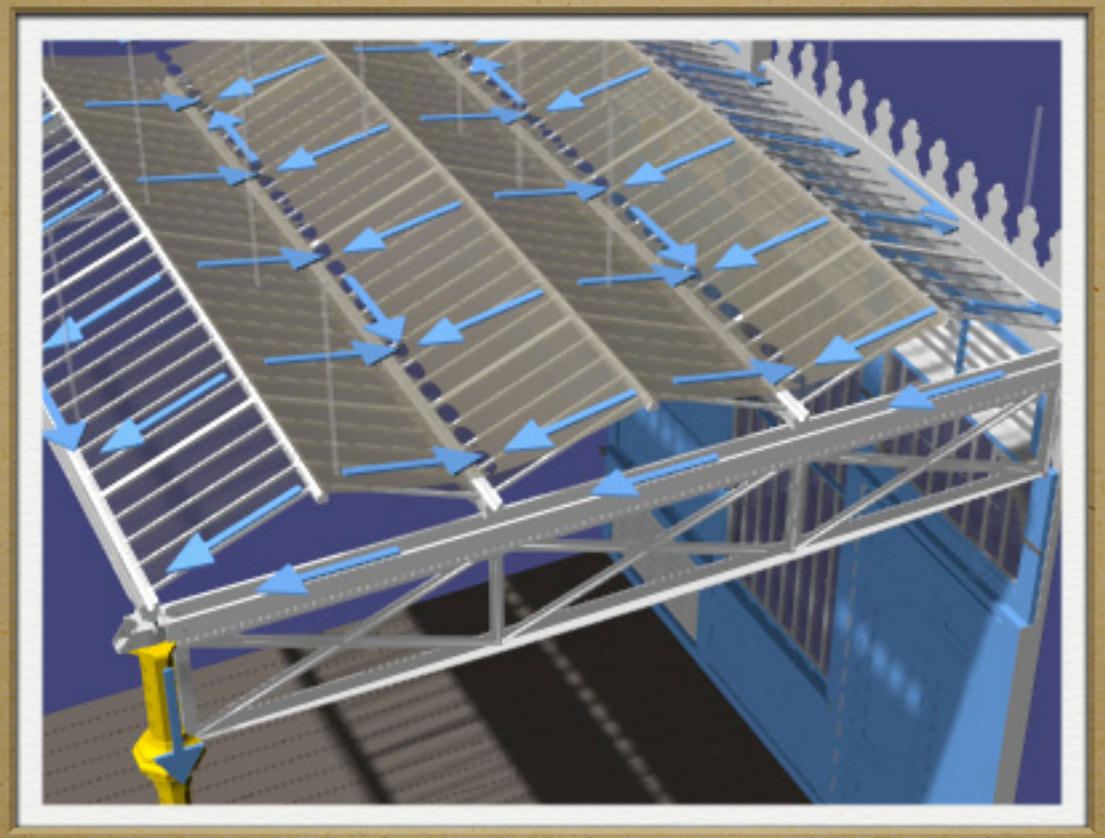


daylight control

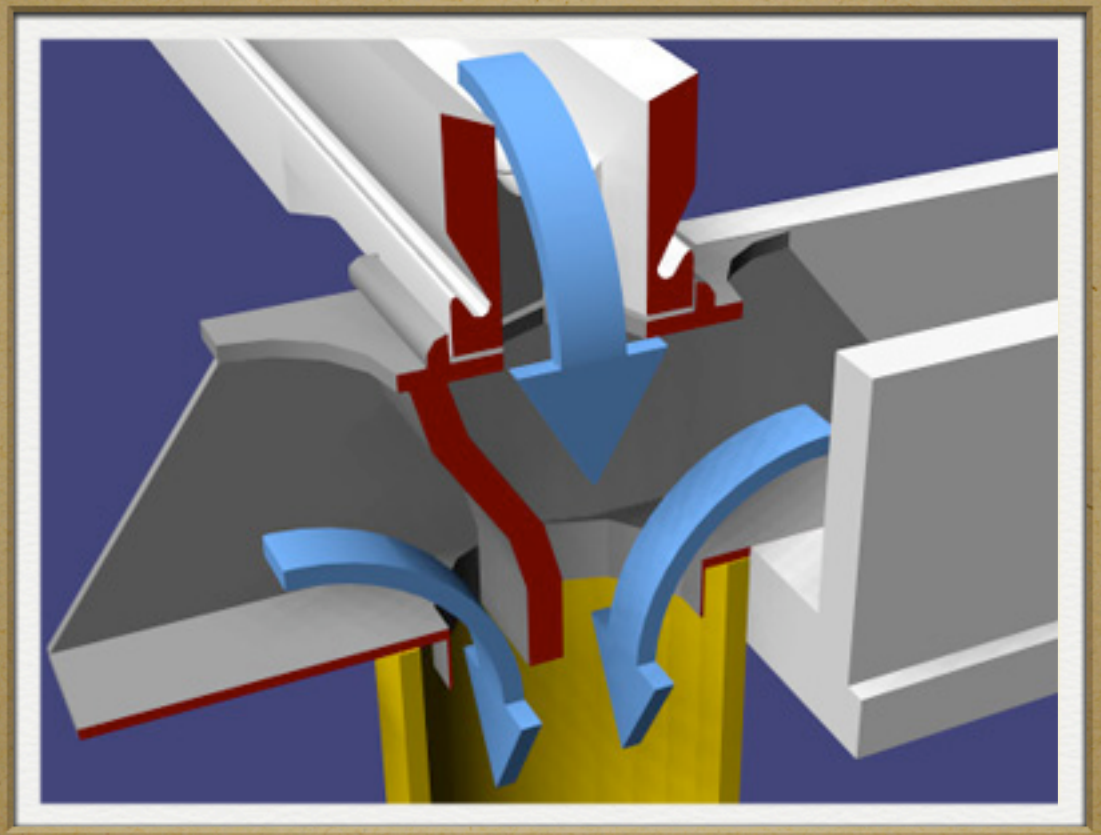


ventilation system

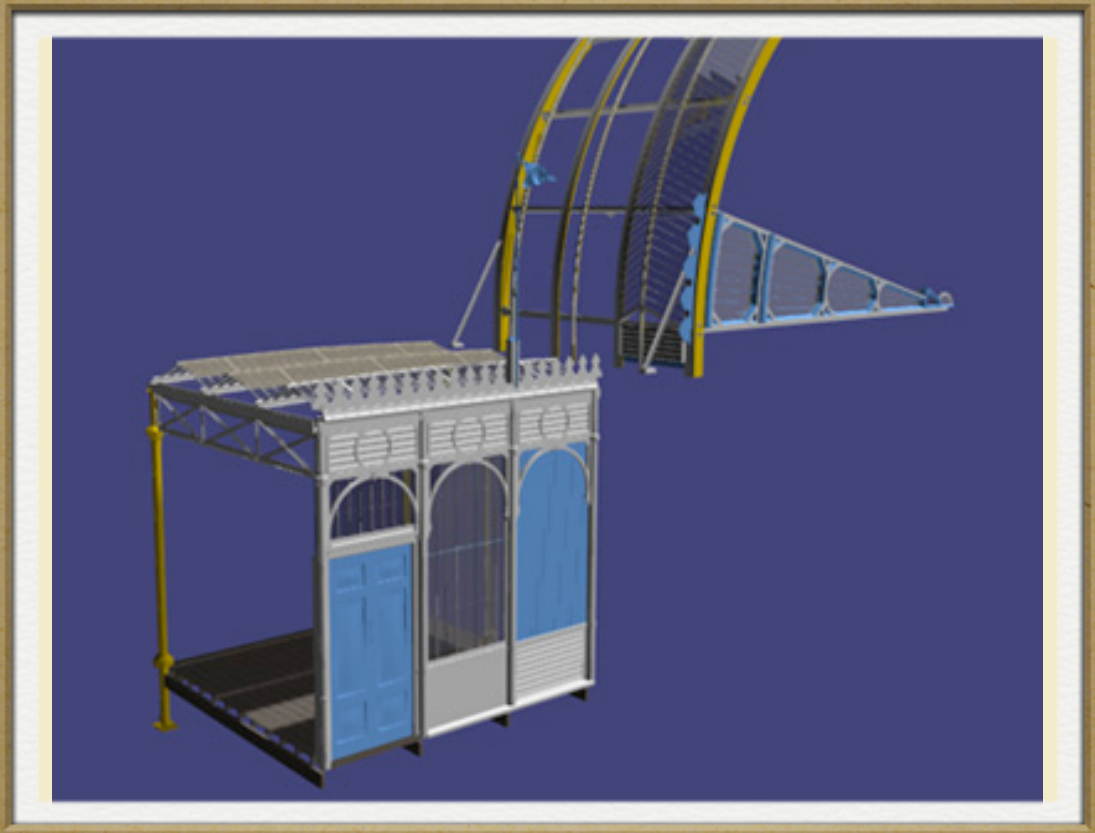
typical bay with vents



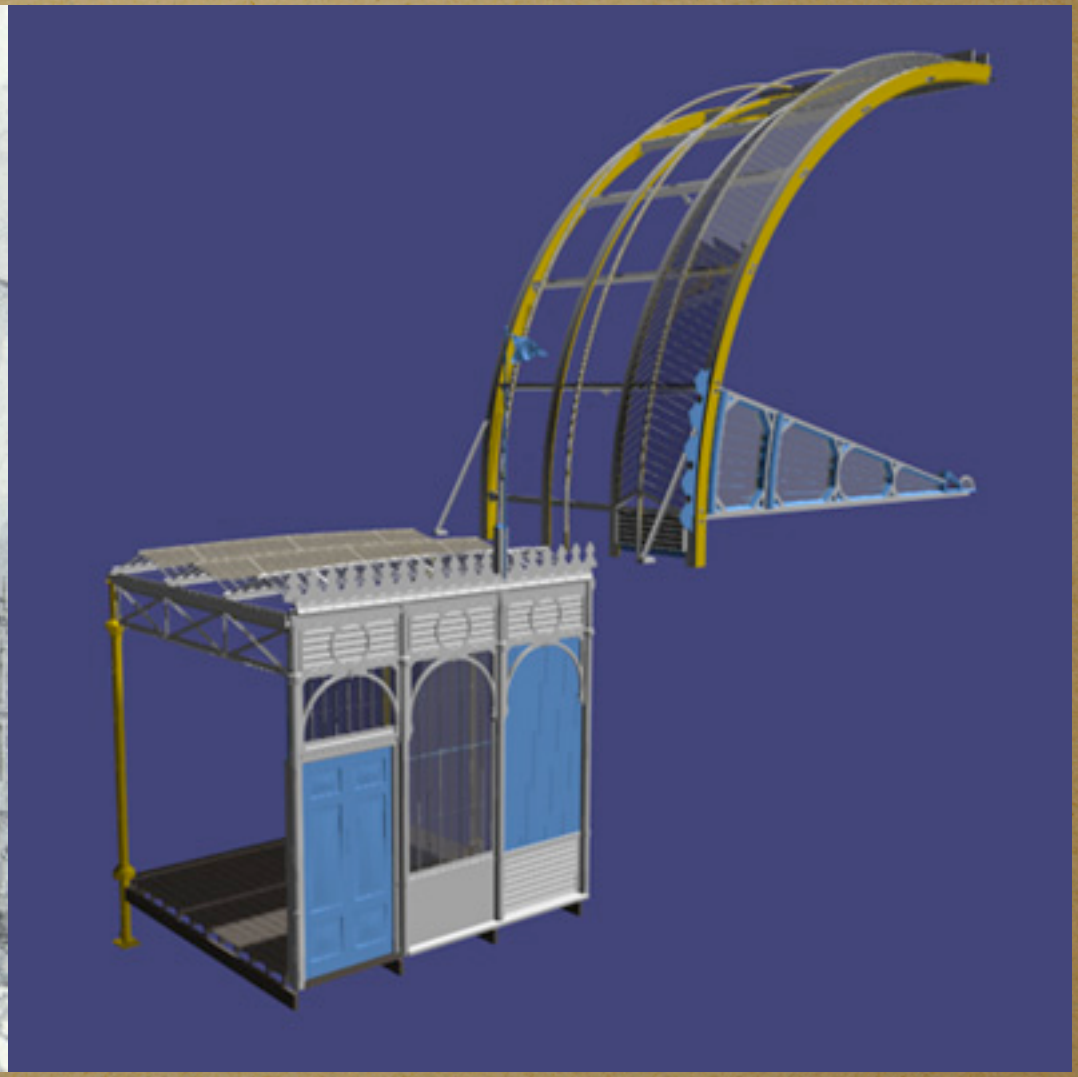
rainwater control



drain detail

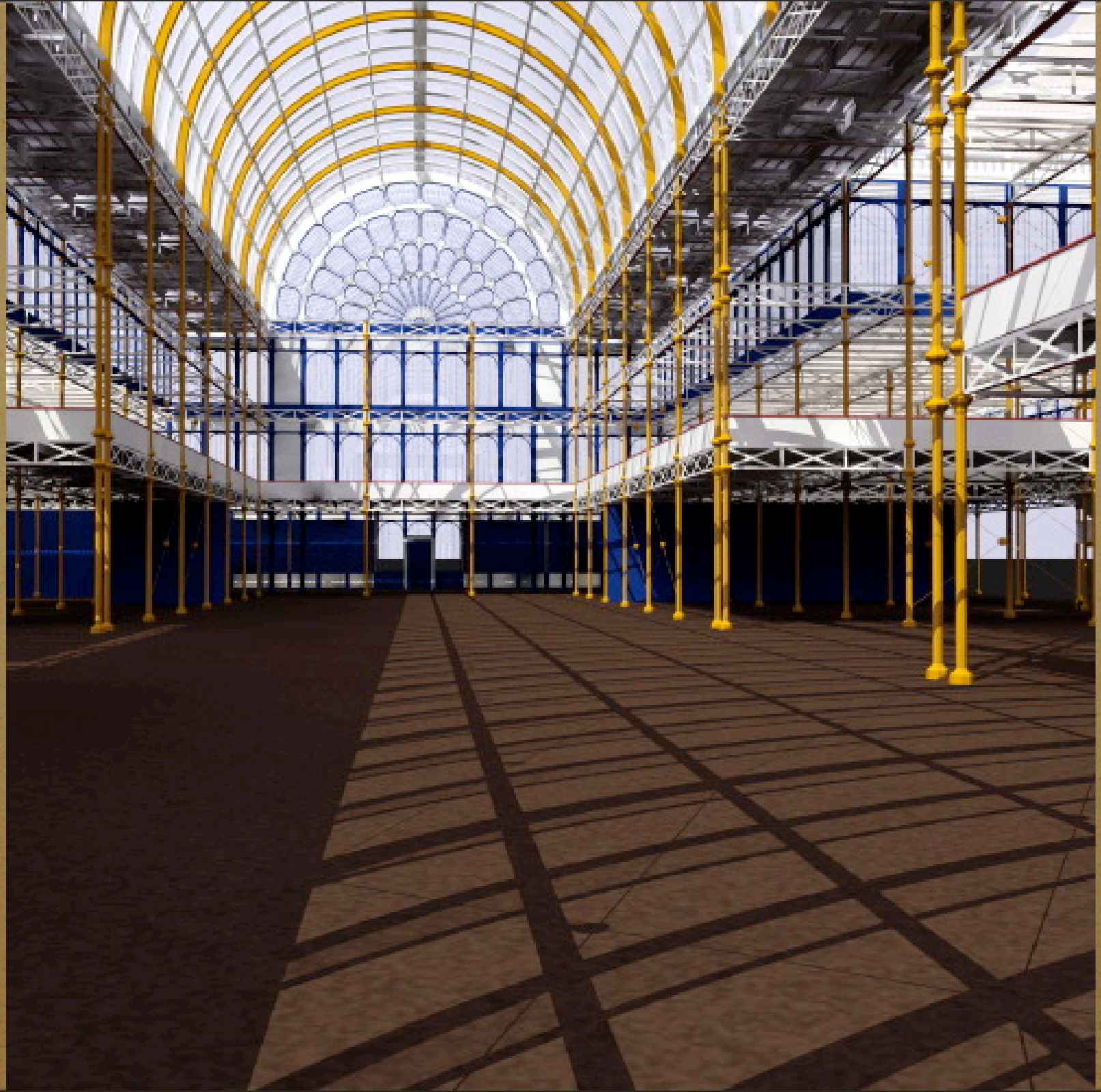


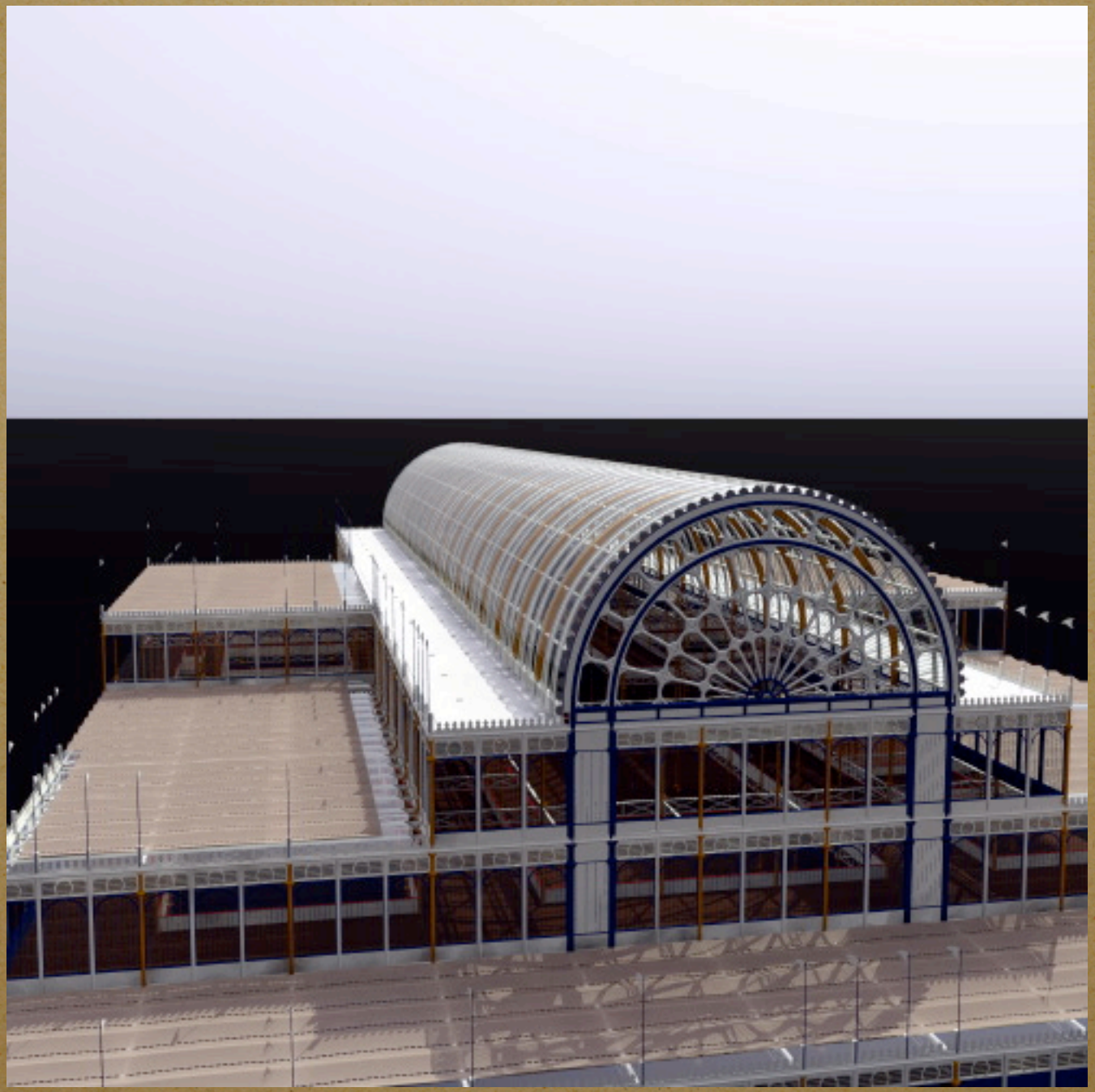
kit-of-parts

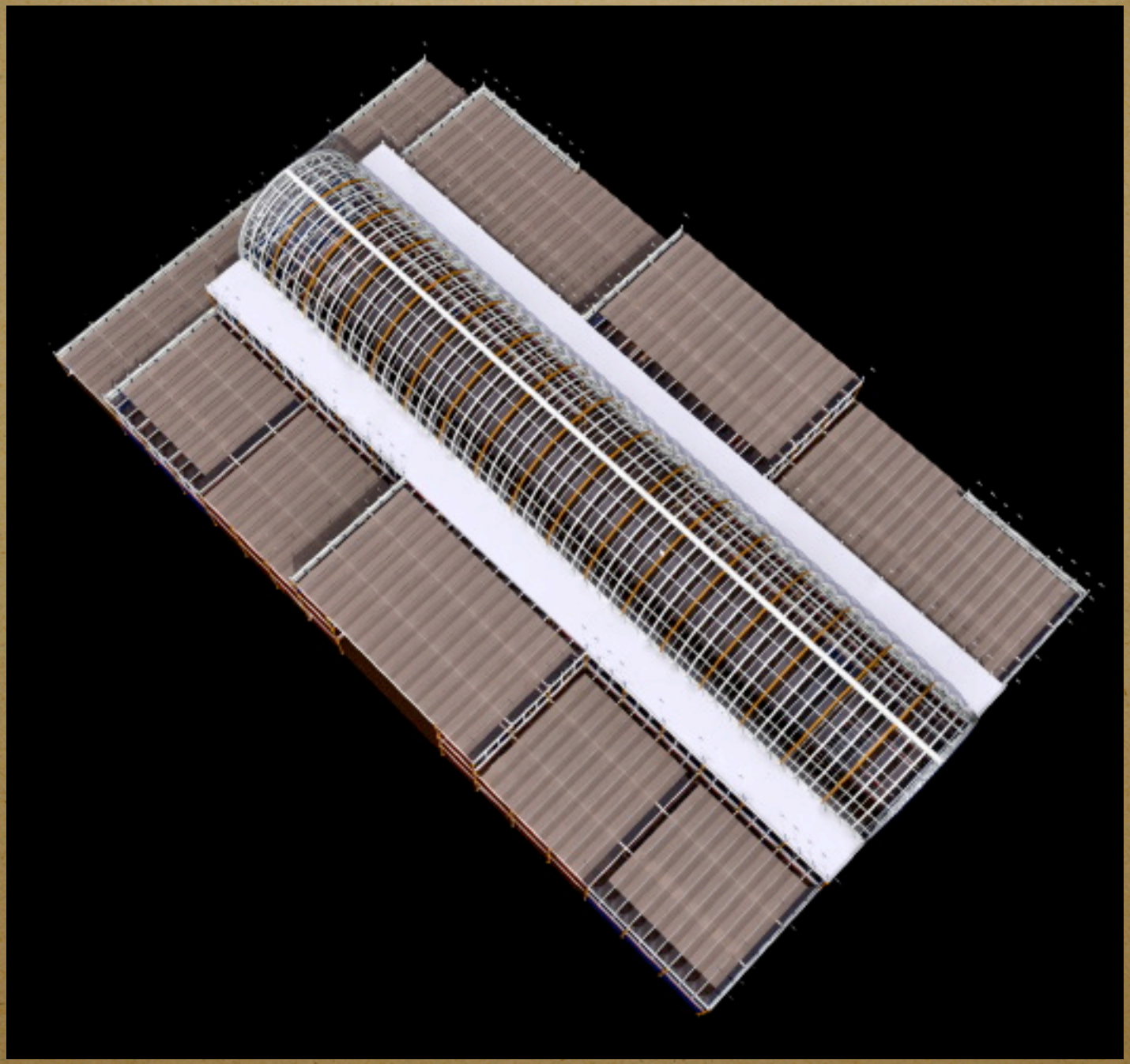


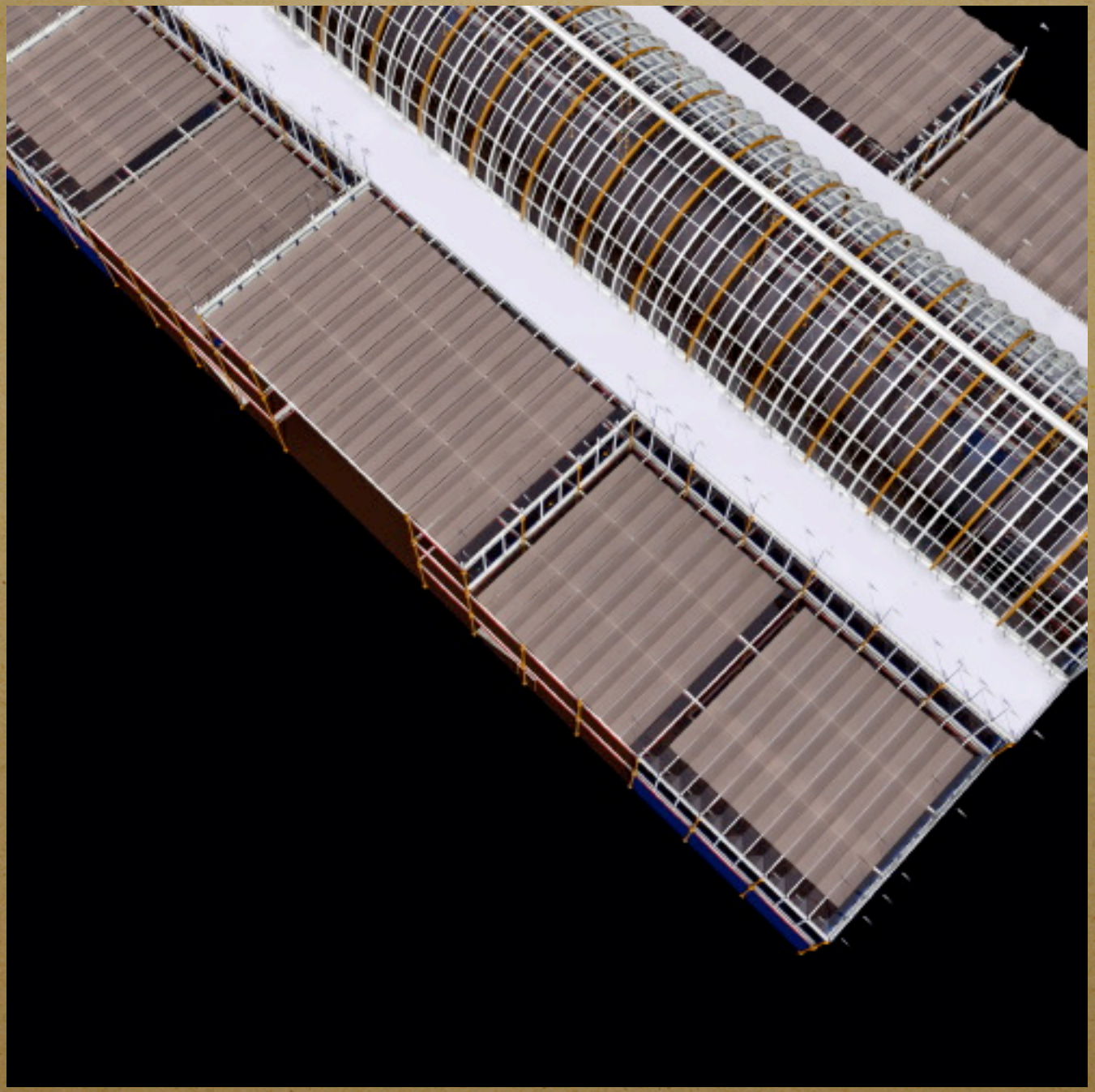
cultural shift

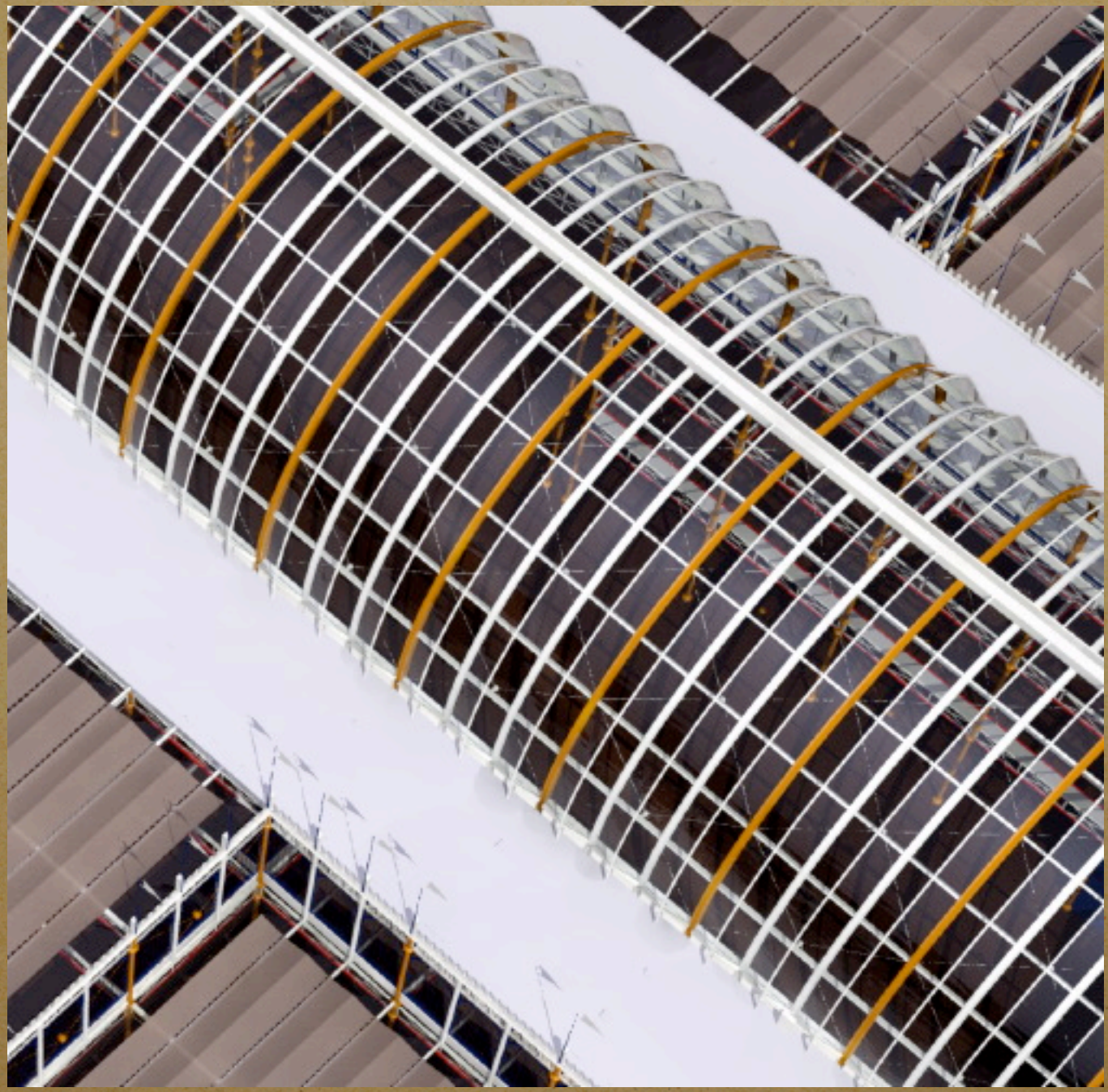
but what was it like?

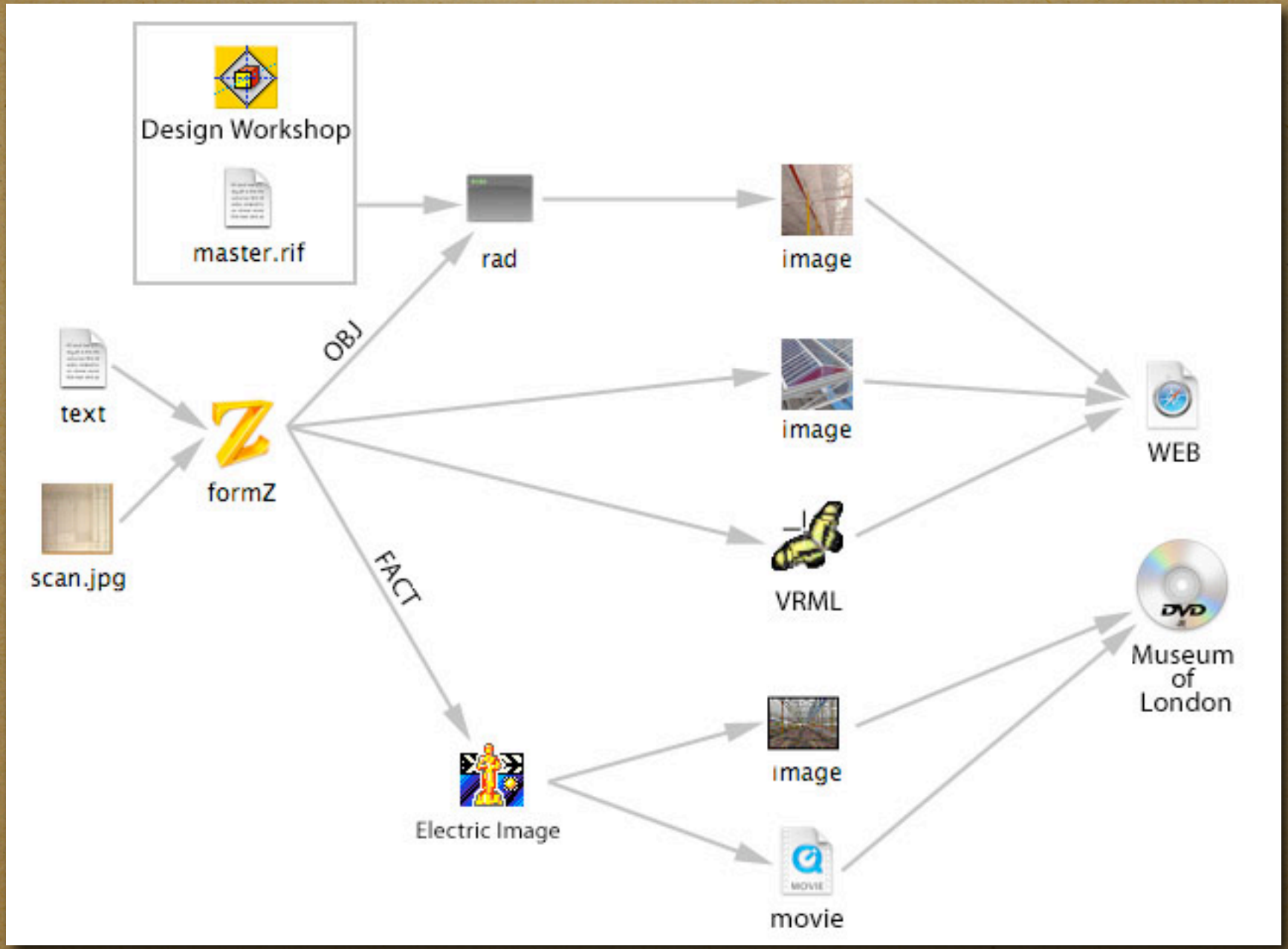












Process & Tools

```
scene= win1.rad
#
#          Uncomment and set base file name correctly for "materials" file,
#          if you are using one. By default, the name-based material definitions
#        in "dw.mat" or any second mat library will override the color-based
#        material definitions in your project.mat, because dw.mat comes later in the command line.
#
materials= master.mat
#
#          The octree is generated automatically.  The following line just defines
#          the name of the octree, so Radiance can keep track of it properly.
#
OCTREE= win1.oct
#
#          Uncomment and adjust "oconv" options _if_necessary_ in the following
#          line.  For instance, if Radiance gives an error "Set Overflow in oconv",
#          try repeatedly doubling the -r value below until either 1) your rendering
#          works, or 2) you get  a different error.
#
# oconv -r 1024
#
#          PICTURE defines the base filename for output images.
#
PICTURE= win1
#
#         For typical perspective views, the view parameters are extracted manually
#       from FZ. See the viewmaster.txt file for help.
#
# Example View Parameters: view=  -vtv -vp -169.308 -146.681 17.0199 -vd 109.551 96.3275 0.0801116
-vu 0 0 1 -vh 70 -vv 70 -vs 0 -vl 0
#
#view= XyZI
view=  -vtv -vo 367 -vp 159 -337 70 -vd 0 525 0 -vu 0 -0 1 -vh 50 -vv 50 -vs 0 -vl 0
#view= yl -vo 30
#          Read dimensions from the FZ model to set zone of interest, interior
#          or exterior.  The zone of interest defines the region of the model
#          for which lighting calculations will be optimized, and if the type is
```

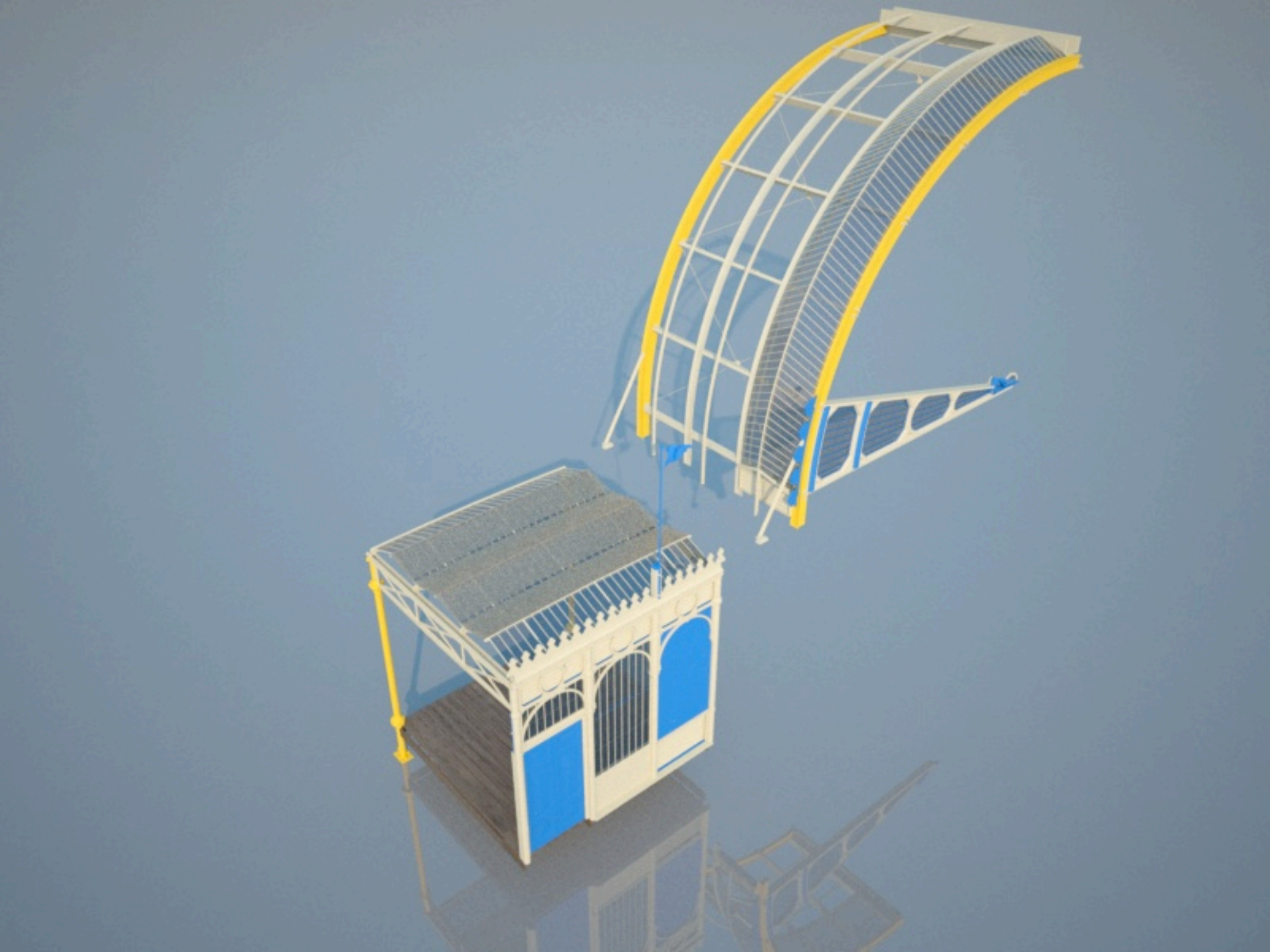
Radiance

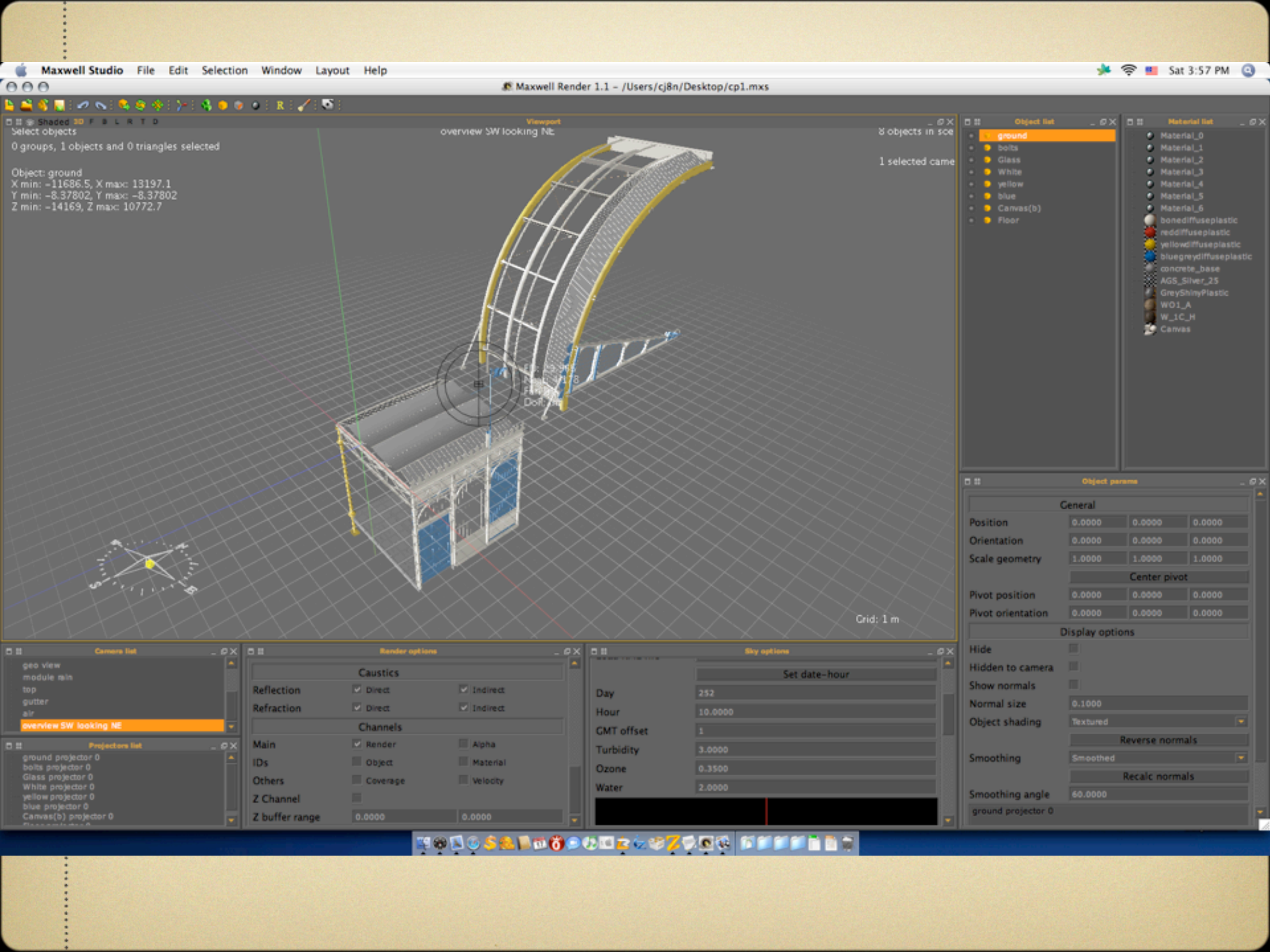
- Difficult to use
- Poor integration with standard modelers
- ✓ Free
- ✓ Photometrically accurate
- What else is available if you want visual accuracy but don't need the numerics?

Maxwell Render

http://www.maxwellrender.com

- ✓ New render engine based on physics of light
- ✓ Ease of use - graphic interface!
- ✓ Integrates with major 3D applications
  3dsMAX, Viz, Maya, Lightwave, Rhino, SolidWorks, ArchiCAD, Cinema 4D, formZ and SketchUp
- ✓ Windows, Mac and Linux
- ★ No lighting numerics, yet...




Maxwell Studio File Edit Selection Window Layout Help
Sat 3:57 PM
Maxwell Render 1.1 - /Users/cj8n/Desktop/cp1.mxs
Viewport
Select objects
0 groups, 1 objects and 0 triangles selected
Object: ground
X min: -11686.5, X max: 13197.1
Y min: -8.37802, Y max: -8.37802
Z min: -14169, Z max: 10772.7
overview SW looking NE
8 objects in sce
1 selected came
Grid: 1 m
Object list
ground
bolts
Glass
White
yellow
blue
Canvas(b)
Floor
Material list
Material_0
Material_1
Material_2
Material_3
Material_4
Material_5
Material_6
bonediffuseplastic
reddiffuseplastic
yellowdiffuseplastic
bluegreydiffuseplastic
concrete_base
AGS_Silver_25
GreyShinyPlastic
WO1_A
W_1C_H
Canvas
Object params
General
Position
Orientation
Scale geometry
Center pivot
Pivot position
Pivot orientation
Display options
Hide
Hidden to camera
Show normals
Normal size
Object shading
Textured
Reverse normals
Smoothing
Smoothed
Recalc normals
Smoothing angle
ground projector 0
Camera list
geo view
module min
top
gutter
air
overview SW looking NE
Projectors list
ground projector 0
bolts projector 0
Glass projector 0
White projector 0
yellow projector 0
blue projector 0
Canvas(b) projector 0
Render options
Caustics
Reflection
Refraction
Direct
Indirect
Channels
Main
Render
Alpha
IDs
Object
Material
Others
Coverage
Velocity
Z Channel
Z buffer range
Sky options
Set date-hour
Day
Hour
GMT offset
Turbidity
Ozone
Water

Links

- Main Site:
  http://www.iath.virginia.edu/london/model
- Lighting Simulation:
  http://www.iath.virginia.edu/london/model /cpls.html
- Documentation:
  http://www.iath.virginia.edu/~spw4s/CP/CrystalPalace2.html

Project Team

- Chris Jessee, Researcher - modeling and rendering
- Michael Levenson, Monuments Project Director
- Worthy Martin, Associate Director IATH
- Will Rourk, Researcher - modeling
- Sarah Wells Staff - documentation
- Ying Yao, Staff - rendering and documentation

Sponsored by
The Institute for Advanced Technology in the Humanities at the University of Virginia