Environmental Technology and Integrative Building Systems Design II

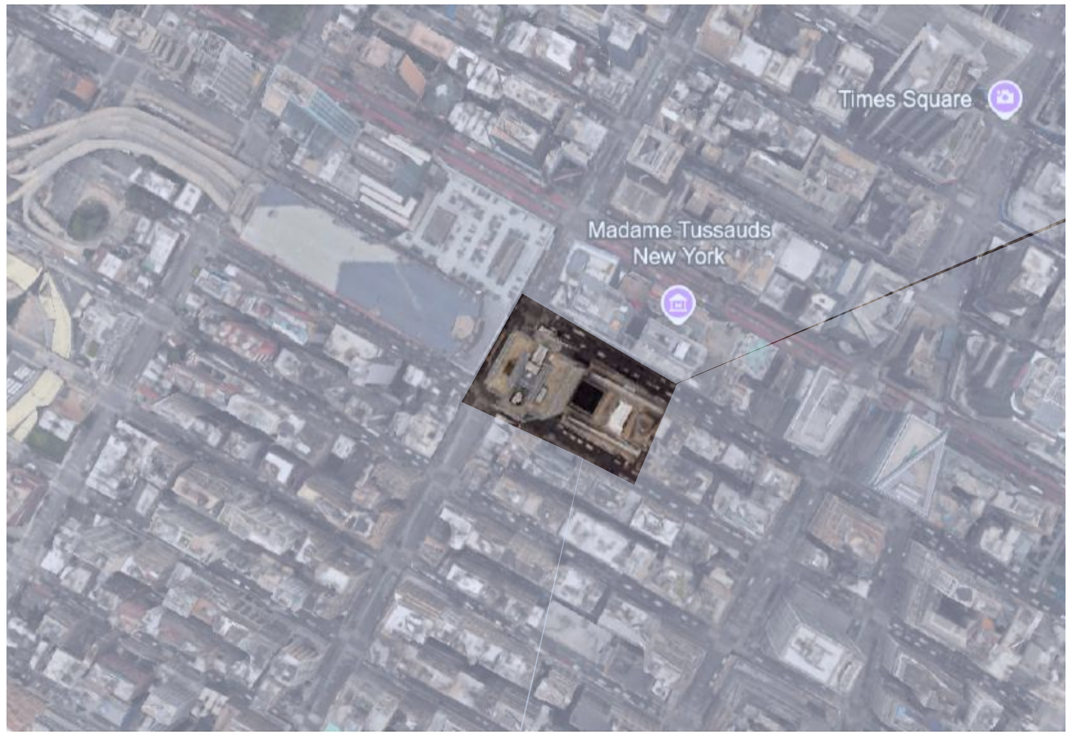
Case Study Report

The New York Times Building

Architect: Renzo Piano and Fox & Fowle
Themes: Transparency, sustainability, and openness,
Construction year: 2001 - 2007

Ajarn Vasuta Chan Group
6538066625 Punnanan Nuntapootidech (Poon)

Site Context



Buildidng floor area: 143,601.0 m2
Location: 620 Eighth AvenueNew York, NY 10018 U.S.
Topics: Office Buildings, Structural Steel, Concrete, Glass, Ceramic Rods, Curtain Wall, High-Rise,

Buildidng Location

The New York Times Building is located at 620 Eighth Avenue, between 40th and 41st Streets in Midtown Manhattan, near the iconic Times Square. The building responds thoughtfully to New York City's temperate climate, which experiences cold winters and hot, humid summers. Its glass curtain wall features double-glazed low-emissivity panels that regulate interior temperatures, reducing energy consumption by minimizing heat loss in winter and solar heat gain in summer. Ceramic rods mounted on the façade provide additional solar shading, preventing excessive heat while allowing natural light to illuminate the interiors. This design not only enhances energy efficiency but also improves occupant comfort throughout the year.

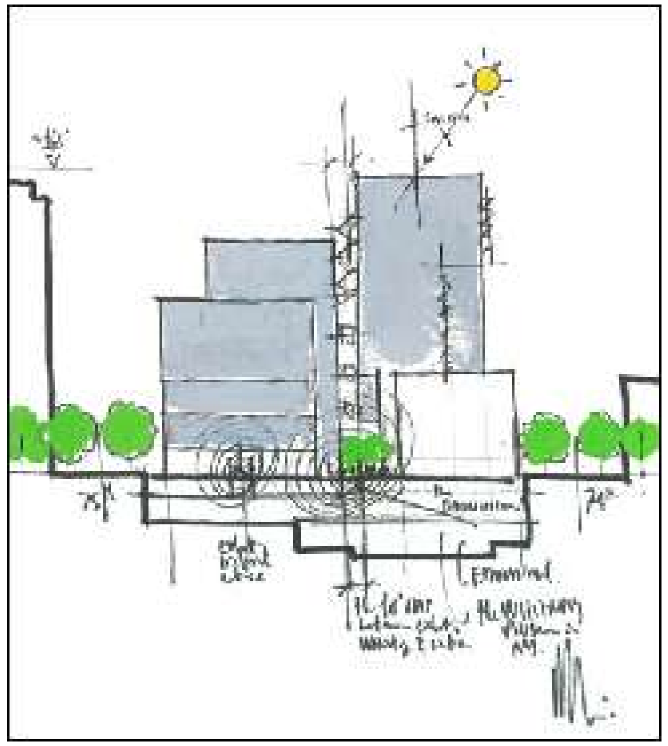
The building serves as the headquarters for The New York Times Company, featuring open-plan offices and a podium housing both traditional newsroom staff and web-based teams. Ground-level glass storefronts create a transparent connection to the bustling city, blending functionality with climate-conscious design in one of the world’s most dynamic urban environments.

Architect

Renzo Piano's vision for the New York Times Building was to create an architectural expression of transparency, openness, and functionality aligned with the values of journalism. His design strategies focused on integrating the building seamlessly into its urban context, prioritizing transparency and sustainability while responding to the specific needs of the New York Times.
The building's simple and primary shape aligns with Manhattan's street grid. It occupies nearly half a block between 40th and 41st Streets.

Combining glass curtain walls and ceramic rods design elements embodies environmental sustainability. It aligns with the Times' mission of openness and accessibility, creating a workspace that is both functional and symbolic of its purpose.

Height: 318.8 meters



Renzo Piabo Building Workshop

The New York Times Building

Building Design

Interior

The interior design emphasizes openness and collaboration. The open-plan layout promotes communication, which is essential for a fast-paced newsroom. Materials like concrete, polished steel, and wood panels create a modern, durable space, while warm finishes soften the industrial feel.
Neutral colors, such as whites and grays, promote focus, with pops of color like red banisters adding visual interest. Glass partitions provide privacy without compromising openness, ensuring the space is adaptable for evolving needs.

open plan layout

Glass partition

Vibrant color

Exterior

The exterior features a sleek glass curtain wall and slender cruciform tower, emphasizing transparency and openness. Double-glazed low-emissivity panels and ceramic rods regulate temperature and reduce glare, enhancing energy efficiency.
At ground level, glass storefronts connect the building to the surrounding urban space, reinforcing its role as a civic landmark. The design integrates seamlessly with Manhattan's grid.

Glass storefronts

Double-glazed
low-emissivity panels

Glass curtain wall

The New York Times Building

Whole Building Section

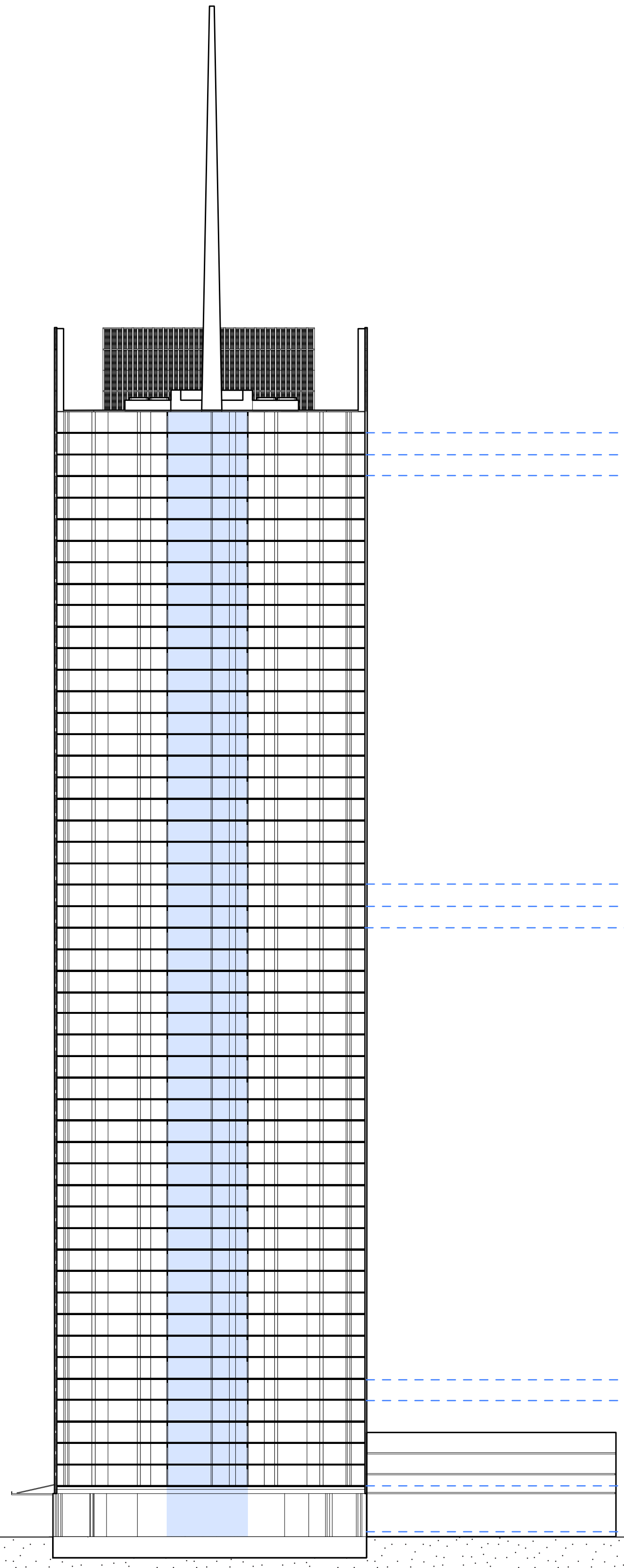
Vertical Circulation

The vertical circulation is designed for efficiency and ease of access. Elevators are centrally located, providing quick and direct access to the building's floors, while staircases with red banisters connect the newsroom's multiple levels, offering both functional and visual appeal.

14th floor cafeteria

Open plan office

Lobby



8TH Avenue Road

W 40th Street

Building Floor and Program

- **52nd Floor:** Houses additional mechanical equipment support for the building's mast.
- **51st Floor:** Mechanical floor containing elevator rooms, air-conditioning, lighting, and telecommunications equipment.
- **29th to 50th Floors:** Leased to various tenants, primarily law firms and other businesses.
- **28th Floor:** Serves as a mechanical floor, housing essential building systems.
- **2nd to 4th Floors:** Web-based staff of The New York Times office, designed with open-plan layouts.
- **Ground Floor:** Features a transparent lobby, retail spaces, a conference center, and restaurants.

Scale 1:1500

The New York Times Building

Office Floor Plan

Horizontal Circulation

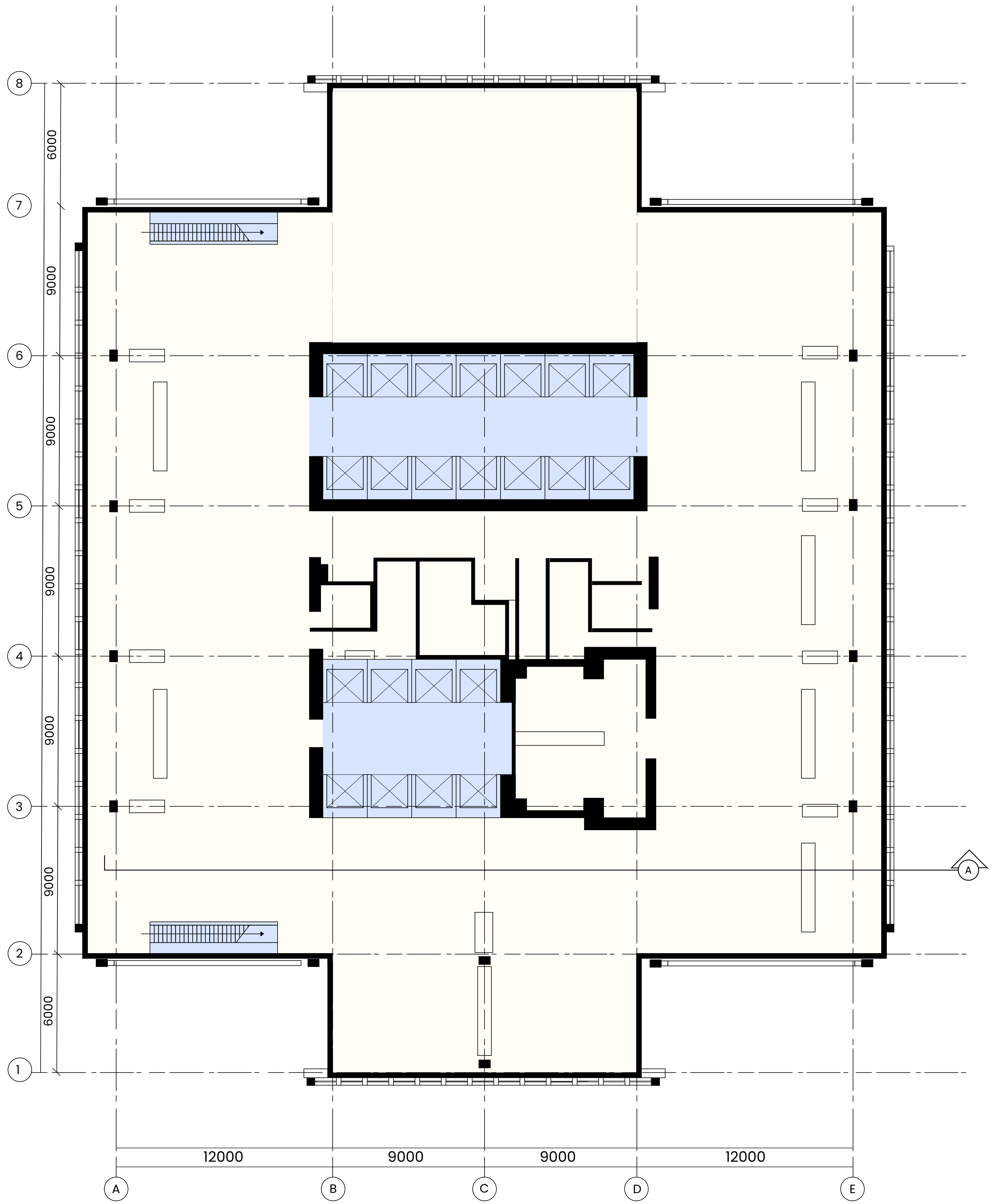
The horizontal circulation features flexible open-plan floor plates, allowing easy movement and collaboration. Hallways are minimal, and glass partitions connect departments while maintaining privacy. The ground-floor lobby serves as a public pathway, linking 40th and 41st Streets. Stairs and elevators are strategically placed for efficient movement between floors.

Room types

Newsroom
Private Offices
Meeting Rooms
Break Areas
Shared Facilities

Details

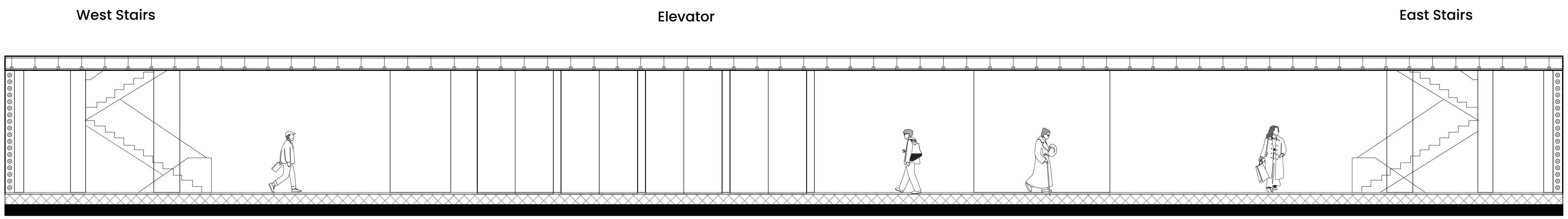
The New York Times Building embraces an open-plan layout, fostering collaboration and transparency within its workspaces. Distinctive red-banistered stairs link the newsroom levels, promoting interaction among teams. A skylight further enhances the workspace by flooding it with natural light, contributing to a bright, inviting atmosphere that encourages productivity and creativity.



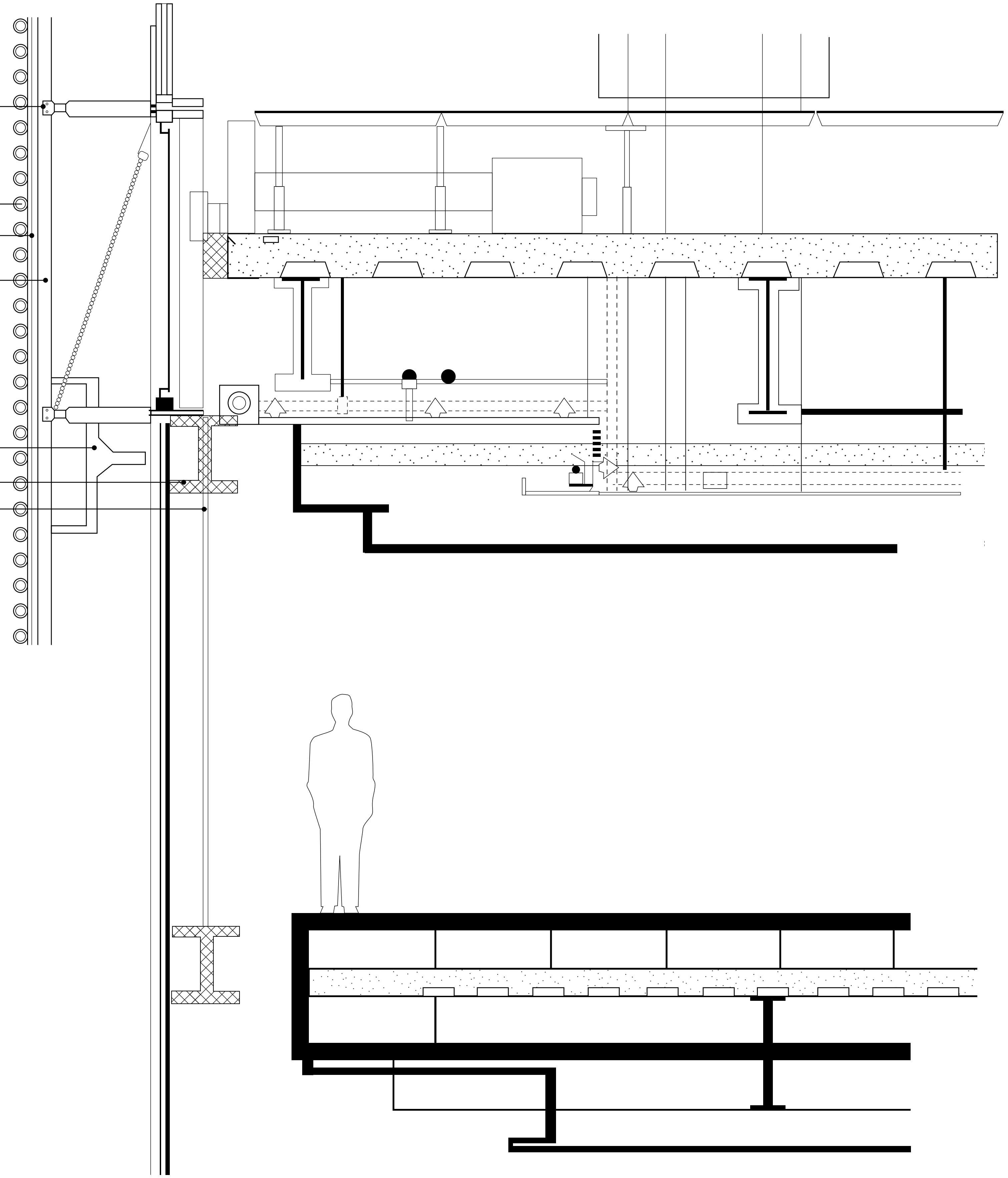
Scale 1:300

The New York Times Building

Floor Section (A)



Section Detail



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Material

The New York Times Building's façade features aluminum silicate ceramic rods in front of the curtain wall on aluminum. These rods enhance the building's sustainability by deflecting heat and reducing glare, even with untinted glass, improving energy efficiency.

1. Ceramic Rods

The ceramic rods absorb sunlight's heat while allowing natural light to illuminate the building.

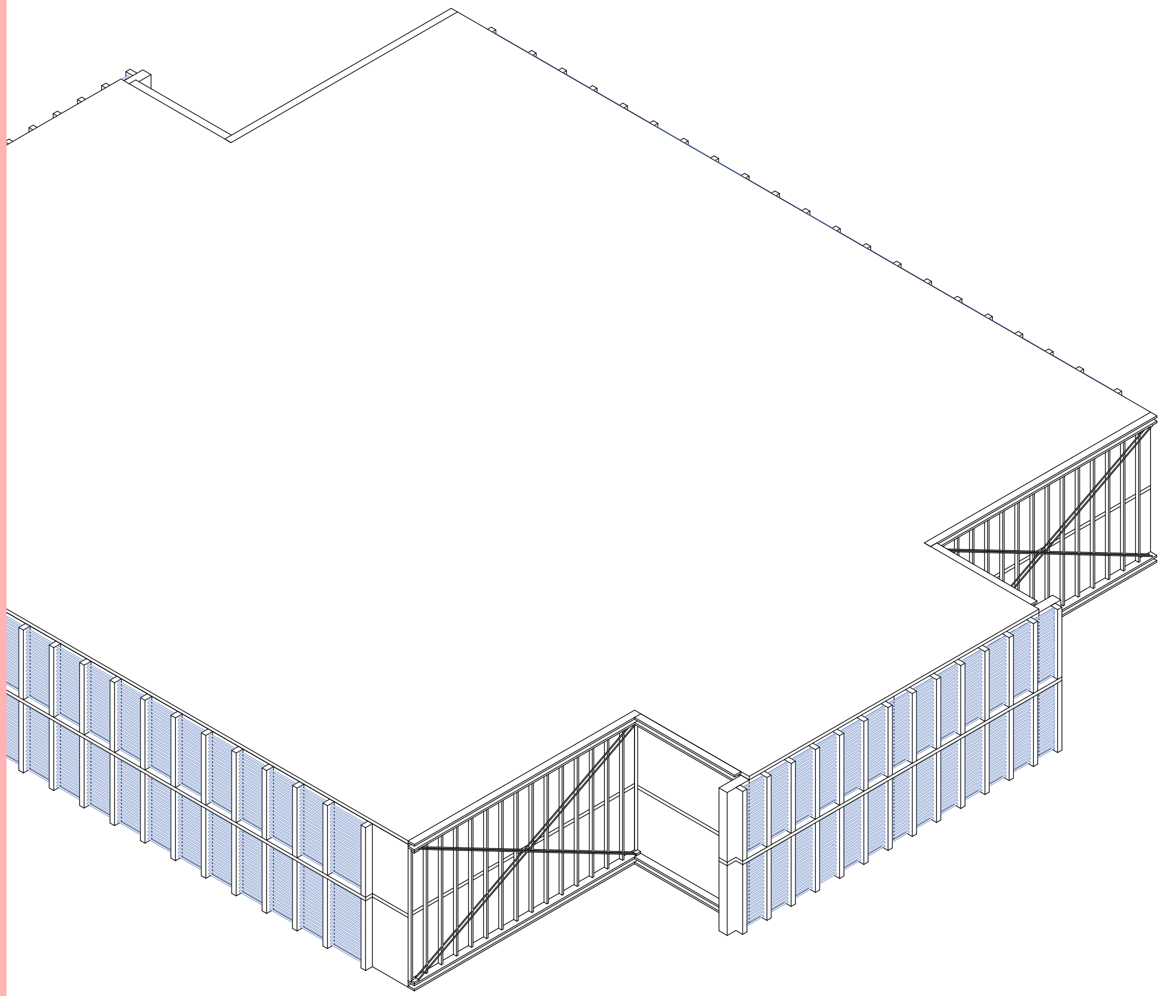
The rods are strategically positioned to ensure unobstructed views of the outside, whether seated or standing.

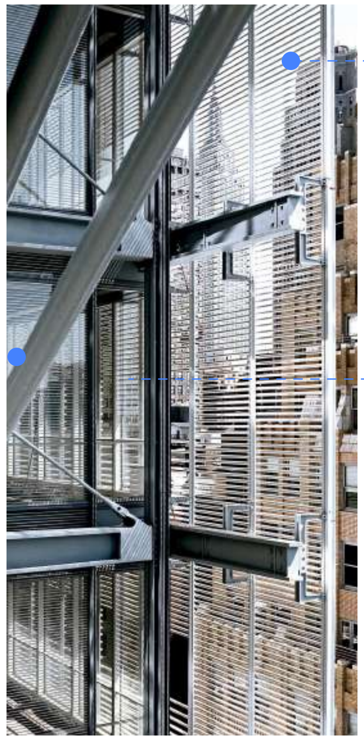
2. Glass Curtain Wall

A glass curtain wall of double-glazed low-emissivity panels extends floor-to-ceiling on each story. This design symbolizes media transparency while maximizing natural light and visual openness.

The New York Times Building

Existing Facade Analysis





Façade Composition

The building use the double curtain wall system which include 3 main layers

- Outer Sun Shade System Extruded Ceramic Rods

  1.Extruded Ceramic Rods
  2.Aluminum Support System

- Glass Curtain Wall System material

  1.Low-Iron Glass (Ultra-Clear Glass)
  2.Double-Glazed Insulated Glass Units
  3.Aluminum Mullions and Frames

- Opaque and Structural Wall System material

  1.Reinforced Concrete Core Walls
  2.Metal Panels & Insulated Cladding

Façade and temperate climate

The façade system is strategically designed to respond to New York's climatic variations. The integration of ceramic rods plays a pivotal role in solar shading, effectively reducing glare and heat gain during the day while permitting adequate natural light penetration; this reduces dependence on artificial lighting, thereby enhancing the building's overall energy efficiency.

Additionally, double-glazed glass enhances thermal insulation, minimizing heat loss during winter and heat gain during summer, thus reducing the need for extensive heating and cooling

The façade design of the New York Times Building is not well-suited to Thailand's tropical climate because of significant differences in climatic conditions. Thailand's high solar heat gain, characterized by intense year-round solar radiation, contrasts with New York's seasonal variations, where solar heat is lower during the winter months. The current system, which relies on ceramic rod sunshades, is less effective in mitigating direct sunlight in a tropical environment, leading to increased heat gain.

Additionally, the double-glazed glass necessitates more energy-intensive cooling solutions to maintain thermal comfort. In tropical climates, buildings generally require enhanced cooling capabilities due to the constant heat.

6538066625 Punnanan Nuntapootidech (Poon)

OTTV Calculation

Calculate heat gain of the North façade

1) Opaque envelope conduction				
1.1) Opaque wall area (m2)	866			
1.2) U-value (W/m.K)	73.392			
Material	Thickness	Thermal conductivity	R- value	
Normal Aluminum Alloy	0.01	0.807	0.012	
Ceramic Sleeve with Aluminum Reinforcement	0.019	25	0.001	
16 kg/cubic meter density Polystyrene Foam Insulation	0.1	211	0.000	
1.3) Equivalent temperature difference (Tdeq)	4.8			
Building type	Office building			
Tilted angle of the wall (roof = 0, wall = 90)	90			
Orientation of the wall	North			
DSH	96.17712			
Material	Density (p)	Specific heat (c)	Thickness	DSH of the material
Normal Aluminum Alloy	2672	0.896	0.01	23.94112
Ceramic Sleeve with Aluminum Reinforcement	3700	1	0.019	70.3
16 kg/cubic meter density Polystyrene Foam Insulation	16	1.21	0.1	1.936
Solar Absorptance	0.9			
Opaque envelope conduction (W)	**305074.9**			
2) Transparent envelope conduction				
2.1) Transparent wall area (m2)	888			
2.2) U-value (W/m.K)	16			
2.3) Temperature difference (ΔT)	5			
Transparent envelope conduction (W)	**71040**			
3) Transparent envelope radiation				
3.1) Transparent wall area (m2)	888			
3.2) Solar heat gain coefficient (SHGC)	0.28			
3.3) Shading coefficient (SC)	1			
3.4) Effective solar radiation (ESR)	185.06			
Building type	Office Building			
Tilted angle of the wall (roof = 0, wall = 90)	90			
Orientation of the wall	North			
ESR	185.06			
Transparent envelope radiation (W)	**46013.3184**			

Calculate heat gain of the South façade

1) Opaque envelope conduction				
1.1) Opaque wall area (m2)	866			
1.2) U-value (W/m.K)	0.329			
Material	Thickness	Thermal conductivity	R- value	
Plastered brick	0.1	0.807	0.124	
Plywood	0.01	0.047	0.213	
16 kg/cubic meter density Polystyrene Foam Insulation	0.1	0.037	2.703	
1.3) Equivalent temperature difference (Tdeq)	5.9			
Building type	Office Building			
Tilted angle of the wall (roof = 0, wall = 90)	90			
Orientation of the wall	South			
DSH	160.176			
Material	Density	Specific heat	Thickness	DSH of the material
Plastered brick	1760	0.84	0.1	147.84
Plywood	800	1.3	0.01	10.4
16 kg/cubic meter density Polystyrene Foam Insulation	16	1.21	0.1	1.936
Solar Absorptance	0.9			
Opaque envelope conduction (W)	**1681.1**			
2) Transparent envelope conduction				
2.1) Transparent wall area (m2)	888			
2.2) U-value (W/m.K)	16			
2.3) Temperature difference (ΔT)	5			
Transparent envelope conduction (W)	**71040**			
3) Transparent envelope radiation				
3.1) Transparent wall area (m2)	888			
3.2) Solar heat gain coefficient (SHGC)	0.28			
3.3) Shading coefficient (SC)	1			
3.4) Effective solar radiation (ESR)	267.41			
Building type	Office Building			
Tilted angle of the wall (roof = 0, wall = 90)	90			
Orientation of the wall	South			
ESR	267.41			
Transparent envelope radiation (W)	**66488.8224**			

The New York Times Building

OTTV Calculation

Calculate heat gain of the West façade

1) Opaque envelope conduction				
1.1) Opaque wall area (m2)	651			
1.2) U-value (W/m.K)	0.329			
Material	Thickness	Thermal conductivity	R- value	
Plastered brick	0.1	0.807	0.124	
Plywood	0.01	0.047	0.213	
16 kg/cubic meter density Polystyrene Foam Insulation	0.1	0.037	2.703	
1.3) Equivalent temperature difference (Tdeq)	6			
Building type	Office Building			
Tilted angle of the wall (roof = 0, wall = 90)	90			
Orientation of the wall	West			
DSH	160.176			
Material	Density	Specific heat	Thickness	DSH of the material
Plastered brick	1760	0.84	0.1	147.84
Plywood	800	1.3	0.01	10.4
16 kg/cubic meter density Polystyrene Foam Insulation	16	1.21	0.1	1.936
Solar Absorptance	0.9			
Opaque envelope conduction (W)	**1285.1**			
2) Transparent envelope conduction				
2.1) Transparent wall area (m2)	560			
2.2) U-value (W/m.K)	16			
2.3) Temperature difference (ΔT)	5			
Transparent envelope conduction (W)	**44800**			
3) Transparent envelope radiation				
3.1) Transparent wall area (m2)	560			
3.2) Solar heat gain coefficient (SHGC)	0.28			
3.3) Shading coefficient (SC)	1			
3.4) Effective solar radiation (ESR)	234.58			
Building type	Office Building			
Tilted angle of the wall (roof = 0, wall = 90)	90			
Orientation of the wall	West			
ESR	234.58			
Transparent envelope radiation (W)	**36782.144**			

Calculate heat gain of the East façade

1) Opaque envelope conduction				
1.1) Opaque wall area (m2)	651			
1.2) U-value (W/m.K)	2.252			
Material	Thickness	Thermal conductivity	R- value	
Plastered brick	0.1	0.807	0.124	
Plywood	0.01	0.047	0.213	
16 kg/cubic meter density Polystyrene Foam Insulation	0.1	0.931	0.107	
1.3) Equivalent temperature difference (Tdeq)	6.1			
Building type	Office Building			
Tilted angle of the wall (roof = 0, wall = 90)	90			
Orientation of the wall	East			
DSH	160.176			
Material	Density	Specific heat	Thickness	DSH of the material
Plastered brick	1760	0.84	0.1	147.84
Plywood	800	1.3	0.01	10.4
16 kg/cubic meter density Polystyrene Foam Insulation	16	1.21	0.1	1.936
Solar Absorptance	0.9			
Opaque envelope conduction (W)	**8942.0**			
2) Transparent envelope conduction				
2.1) Transparent wall area (m2)	560			
2.2) U-value (W/m.K)	16			
2.3) Temperature difference (ΔT)	5			
Transparent envelope conduction (W)	**44800**			
3) Transparent envelope radiation				
3.1) Transparent wall area (m2)	560			
3.2) Solar heat gain coefficient (SHGC)	0.28			
3.3) Shading coefficient (SC)	1			
3.4) Effective solar radiation (ESR)	244.53			
Building type	Office Building			
Tilted angle of the wall (roof = 0, wall = 90)	90			
Orientation of the wall	East			
ESR	244.53			
Transparent envelope radiation (W)	**38342.304**			

The New York Times Building

Exisiting Facade Design

Building Type: Office Building

Thermal property of opaque wall

Normal Aluminum Alloys (0.01 thickness)
Ceramic Sleeve with Aluminum Reinforcement (0.019 thickness)
16 kg/cubic meter density Polystyrene Foam Insulation (0.1 thickness)

Thermal property of opaque wall

Single later reflective glass
Shading

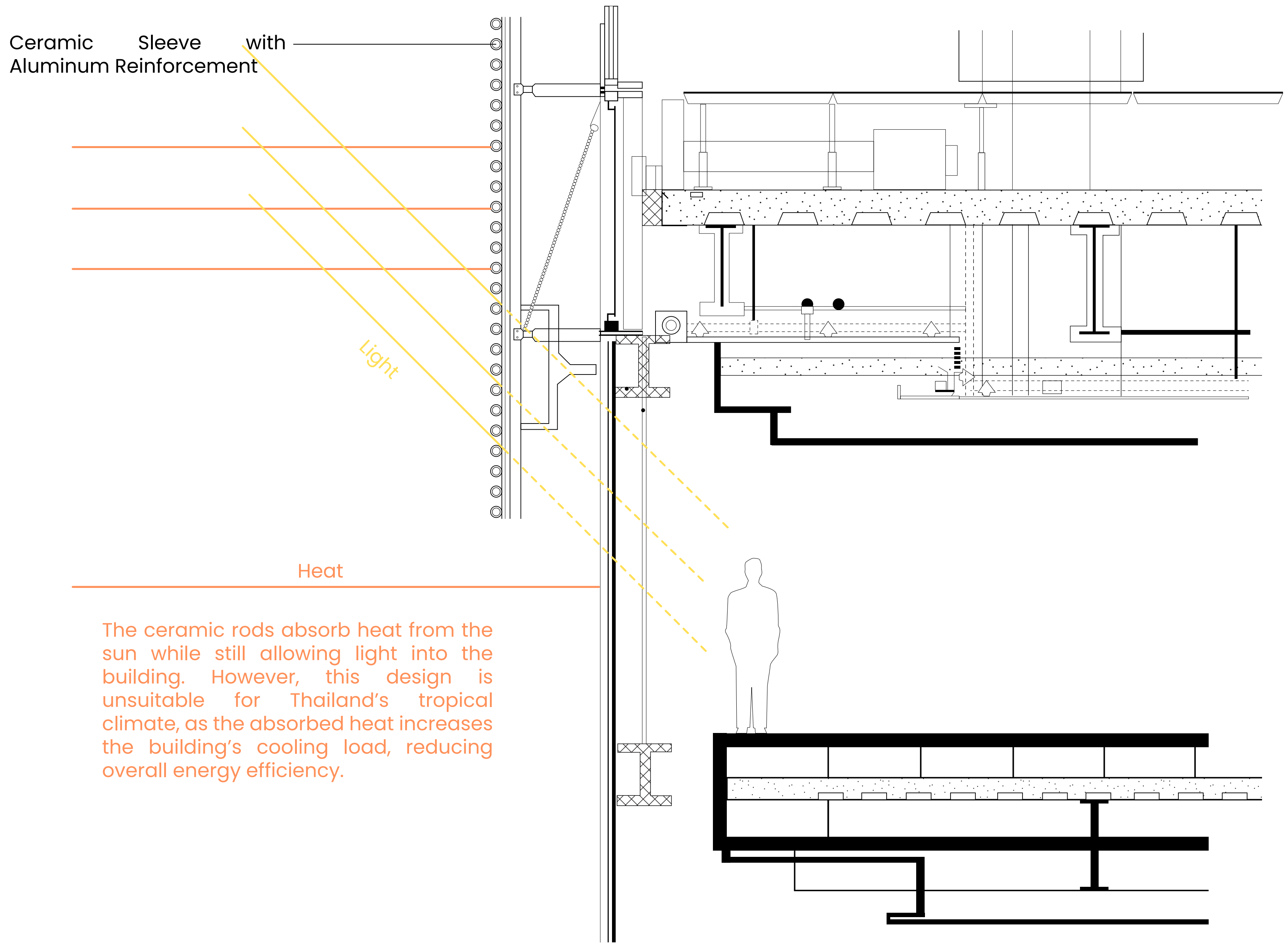
In tropical climate

The New York Times Building's facade lacks dedicated ventilation areas, limiting natural airflow and increasing reliance on air conditioning. Its sealed curtain wall design, effective in cooler climates, is unsuitable for tropical conditions, leading to higher cooling loads and reduced energy efficiency.

OTTV calculation				
Solar heat gain	Building façade orientation			
	North	South	East	West
Opaque Envelope Conduction	305074.9	1681.1	8942.0	1285.1
Transparent Envelope Conduction	71040.0	71040.0	44800.0	44800.0
Transparent Envelope Solar Radiation Transmission	46013.3	66488.8	38342.3	36782.1
Total heat gain	422128.2	139209.9	92084.3	82867.3
Total wall area	1754.0	1754.0	1211.0	1211.0
OTTV (W/m2)	124.16			
Comply with the Thai building code (< 50 W/m2)?	No			

The existing facade design is intended to optimize daylight and manage heat for energy efficiency, performing effectively in New York's climate. However, in Thailand's tropical environment, direct sunlight significantly impacts thermal comfort inside the building, causing the OTTV (Overall Thermal Transmittance Value) to exceed 50 W/m² and reach a value of 124. This is due to the choice of materials and the insufficient opaque wall area, which leads to a high amount of heat entering the building.

Furthermore, the current transparent wall area is composed of clear glass with a high heat transfer rate, exacerbating the thermal discomfort. With its current design, the facade system does not adequately suit the tropical climate, as the northern facade experiences the highest heat gain.



The ceramic rods absorb heat from the sun while still allowing light into the building. However, this design is unsuitable for Thailand's tropical climate, as the absorbed heat increases the building's cooling load, reducing overall energy efficiency.

New Facade design

Design strategies

1.Remove Ceramic Rods and Replace with Shading Devices

The ceramic rods on the New York Times building are designed primarily for aesthetic purposes and do not provide significant solar shading. In a tropical climate, these rods are ineffective at blocking intense sunlight, leading to excessive heat gain.

2.Incorporate a Double-Skin Facade System

Implement a double-skin facade system with an external glass layer that provides an air buffer zone to reduce heat transfer. The air gap between the two layers of the facade acts as insulation, helping to reduce the building's internal temperature while still allowing natural light to penetrate.

Replacing the New York Times Building's ceramic rods and single-layer glass facade with a double-skin facade (DSF) would make it more suitable for Thailand's tropical climate. A ventilated air gap between two glass layers would reduce heat gain, improve insulation, and allow natural cooling, lowering air-conditioning costs. Operable vents would enhance airflow, preventing heat buildup, while automated shading devices like adjustable louvers or perforated screens would provide dynamic sun control, unlike the fixed ceramic rods. Using Low-E glass and reflective coatings would minimize glare while maintaining daylight. Additionally, integrating solar panels on shading devices would improve energy efficiency. These upgrades would transform the building into a climate-responsive, energy-efficient high-rise, improving comfort and sustainability in Thailand.

OTTV calculation

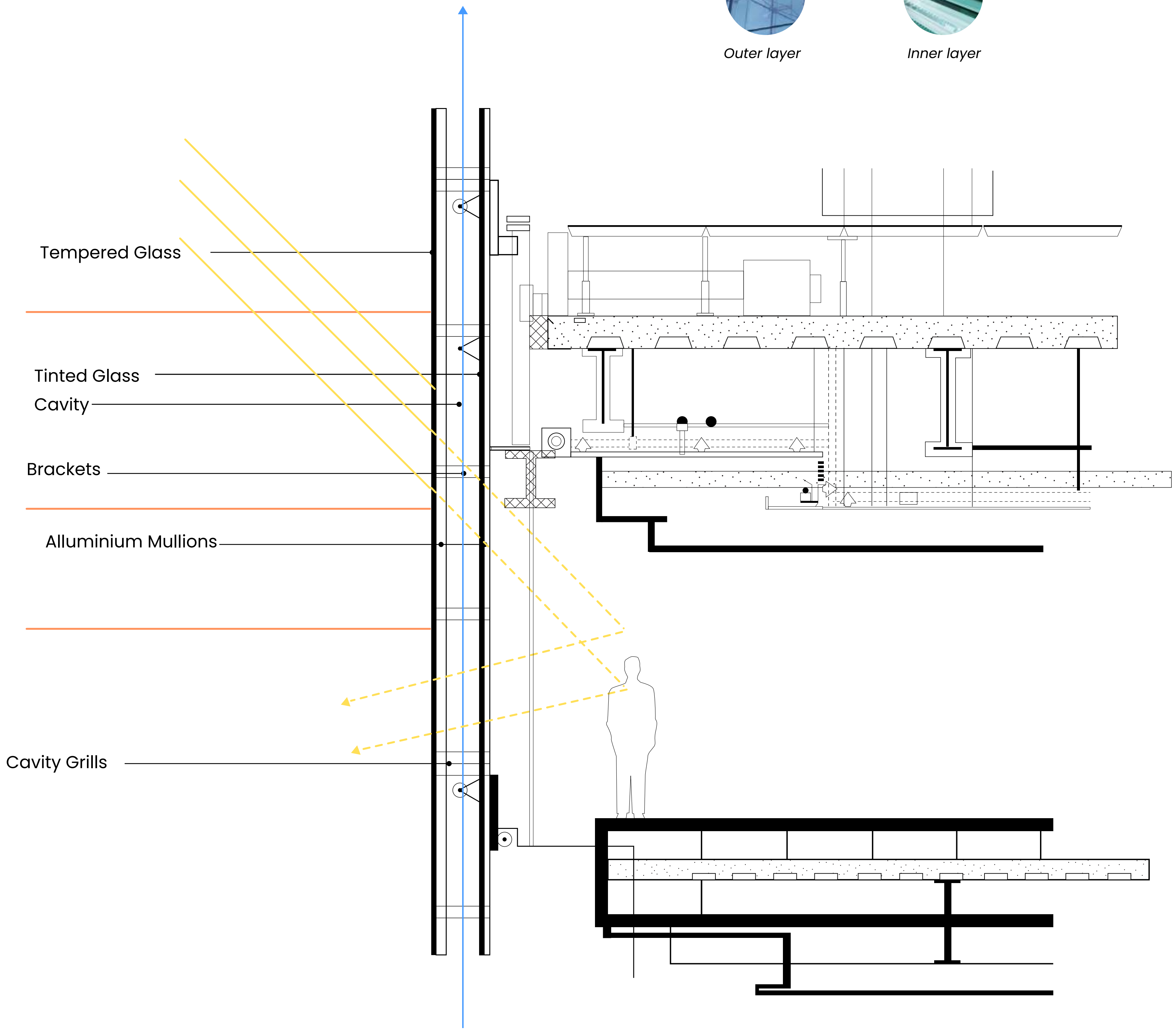
Solar heat gain	Building façade orientation			
	North	South	East	West
Opaque Envelope Conduction	1367.6	1681.1	1306.5	1285.1
Transparent Envelope Conduction	7548.0	7548.0	4760.0	4760.0
Transparent Envelope Solar Radiation Transmission	46013.3	65427.1	38342.3	36782.1
Total heat gain	54929.0	74656.2	44408.9	42827.3
Total wall area	1754.0	1754.0	1211.0	1211.0
OTTV (W/m2)	36.56			
Comply with the Thai building code (< 50 W/m2)?	Yes			

The new facade design incorporates a double-skin system to increase the opaque wall area, reducing the proportion of transparent surfaces while enhancing thermal performance. The design effectively mitigates heat accumulation by lowering the Solar Heat Gain Coefficient (SHGC) by 0.21 adding a 0.35m spandrel, and narrowing the building footprint to improve airflow. Additionally, the replacement of clear glass with tinted glass reduces the U-value, further enhancing insulation.

Material

Sun Protection & Ventilation — *Thermal Insulation & Comfort*

Outer layer — *Inner layer*



Create a gap between the two skins to allow for natural ventilation, expelling warm air and maintaining cooler indoor conditions.

Scale 1:150

The New York Times Building

OTTV Calculation

Calculate heat gain of the North façade

1) Opaque envelope conduction				
1.1) Opaque wall area (m2)	866			
1.2) U-value (W/m.K)	0.329			
Material	Thickness	Thermal conductivity	R- value	
Plastered brick	0.1	0.807	0.124	
Plywood	0.01	0.047	0.213	
16 kg/cubic meter density Polystyrene Foam Insulation	0.1	0.037	2.703	
1.3) Equivalent temperature difference (Tdeq)	4.8			
Building type	Office building			
Tilted angle of the wall (roof = 0, wall = 90)	90			
Orientation of the wall	North			
DSH	160.176			
Material	Density (p)	Specific heat (c)	Thickness	DSH of the material
Plastered brick	1760	0.84	0.1	147.84
Plywood	800	1.3	0.01	10.4
16 kg/cubic meter density Polystyrene Foam Insulation	16	1.21	0.1	1.936
Solar Absorptance	0.9			
Opaque envelope conduction (W)	**1367.6**			
2) Transparent envelope conduction				
2.1) Transparent wall area (m2)	888			
2.2) U-value (W/m.K)	1.7			
2.3) Temperature difference (ΔT)	5			
Transparent envelope conduction (W)	**7548**			
3) Transparent envelope radiation				
3.1) Transparent wall area (m2)	888			
3.2) Solar heat gain coefficient (SHGC)	0.28			
3.3) Shading coefficient (SC)	1			
3.4) Effective solar radiation (ESR)	185.06			
Building type	office Building			
Tilted angle of the wall (roof = 0, wall = 90)	90			
Orientation of the wall	North			
ESR	185.06			
Transparent envelope radiation (W)	**46013.3184**			

Calculate heat gain of the South façade

1) Opaque envelope conduction				
1.1) Opaque wall area (m2)	866			
1.2) U-value (W/m.K)	0.329			
Material	Thickness	Thermal conductivity	R- value	
Plastered brick	0.1	0.807	0.124	
Plywood	0.01	0.047	0.213	
16 kg/cubic meter density Polystyrene Foam Insulation	0.1	0.037	2.703	
1.3) Equivalent temperature difference (Tdeq)	5.9			
Building type	Office Building			
Tilted angle of the wall (roof = 0, wall = 90)	90			
Orientation of the wall	South			
DSH	160.176			
Material	Density	Specific heat	Thickness	DSH of the material
Plastered brick	1760	0.84	0.1	147.84
9kg/m3 polysterene foam	800	1.3	0.01	10.4
Plywood	16	1.21	0.1	1.936
Solar Absorptance	0.3			
Opaque envelope conduction (W)	**1681.1**			
2) Transparent envelope conduction				
2.1) Transparent wall area (m2)	888			
2.2) U-value (W/m.K)	1.7			
2.3) Temperature difference (ΔT)	5			
Transparent envelope conduction (W)	**7548**			
3) Transparent envelope radiation				
3.1) Transparent wall area (m2)	888			
3.2) Solar heat gain coefficient (SHGC)	0.28			
3.3) Shading coefficient (SC)	1			
3.4) Effective solar radiation (ESR)	263.14			
Building type	Office Building			
Tilted angle of the wall (roof = 0, wall = 90)	90			
Orientation of the wall	South			
ESR	263.14			
Transparent envelope radiation (W)	**65427.1296**			

The New York Times Building

OTTV Calculation

Calculate heat gain of the East façade

1) Opaque envelope conduction				
1.1) Opaque wall area (m2)	651			
1.2) U-value (W/m.K)	0.329			
Material	Thickness	Thermal conductivity	R- value	
Plastered brick	0.1	0.807	0.124	
Plywood	0.01	0.047	0.213	
16 kg/cubic meter density Polystyrene Foam Insulation	0.1	0.037	2.703	
1.3) Equivalent temperature difference (Tdeq)	6.1			
Building type	Office Building			
Tilted angle of the wall (roof = 0, wall = 90)	90			
Orientation of the wall	East			
DSH	142.4832			
Material	Density	Specific heat	Thickness	DSH of the material
Plastered brick	1760	0.807	0.1	142.032
Plywood	800	0.047	0.01	0.376
16 kg/cubic meter density Polystyrene Foam Insulation	16	0.047	0.1	0.0752
Solar Absorptance	Table 1.4			
Opaque envelope conduction (W)	**1306.5**			
2) Transparent envelope conduction				
2.1) Transparent wall area (m2)	560			
2.2) U-value (W/m.K)	1.7			
2.3) Temperature difference (∆T)	5			
Transparent envelope conduction (W)	**4760**			
3) Transparent envelope radiation				
3.1) Transparent wall area (m2)	560			
3.2) Solar heat gain coefficient (SHGC)	0.28			
3.3) Shading coefficient (SC)	1			
3.4) Effective solar radiation (ESR)	244.53			
Building type	Office Building			
Tilted angle of the wall (roof = 0, wall = 90)	90			
Orientation of the wall	East			
ESR	244.53			
Transparent envelope radiation (W)	**38342.304**			

Calculate heat gain of the West façade

1) Opaque envelope conduction				
1.1) Opaque wall area (m2)	651			
1.2) U-value (W/m.K)	0.329			
Material	Thickness	Thermal conductivity	R- value	
Plastered brick	0.1	0.807	0.124	
Plywood	0.01	0.047	0.213	
16 kg/cubic meter density Polystyrene Foam Insulation	0.1	0.037	2.703	
1.3) Equivalent temperature difference (Tdeq)	6			
Building type	Office Building			
Tilted angle of the wall (roof = 0, wall = 90)	90			
Orientation of the wall	West			
DSH	#VALUE!			
Material	Density	Specific heat	Thickness	DSH of the material
Plastered brick	1760	0.84	0.1	147.84
Plywood	800	1,3	0.01	#VALUE!
16 kg/cubic meter density Polystyrene Foam Insulation	16	1,21	0.1	#VALUE!
Solar Absorptance	0.3			
Opaque envelope conduction (W)	**1285.1**			
2) Transparent envelope conduction				
2.1) Transparent wall area (m2)	560			
2.2) U-value (W/m.K)	1.7			
2.3) Temperature difference (∆T)	5			
Transparent envelope conduction (W)	**4760**			
3) Transparent envelope radiation				
3.1) Transparent wall area (m2)	560			
3.2) Solar heat gain coefficient (SHGC)	0.28			
3.3) Shading coefficient (SC)	1			
3.4) Effective solar radiation (ESR)	234.58			
Building type	Office Building			
Tilted angle of the wall (roof = 0, wall = 90)	90			
Orientation of the wall	West			
ESR	234.58			
Transparent envelope radiation (W)	**36782.144**			

The New York Times Building

Current Building System

Building Information

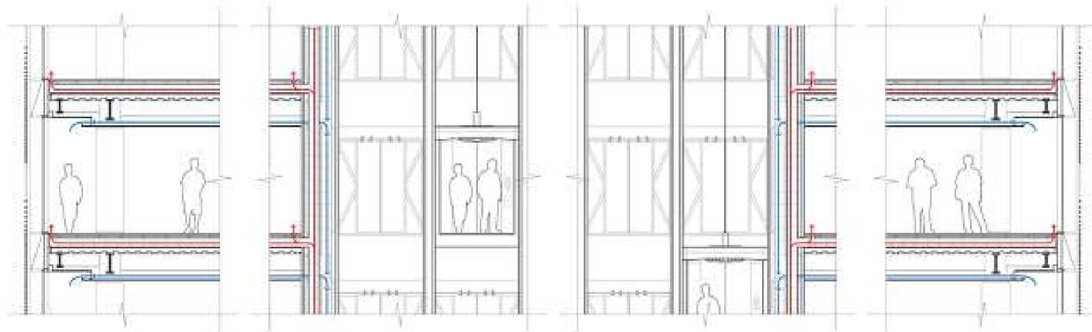
Building Floor: 52 Storey Building
Building Plan: Open plan office type
Location: New York, United State

Existing HVAC System : Chilled Beam System

The New York Times Building is recognized for its innovative and energy-efficient design, incorporating a chilled beam system for cooling. This system enhances energy efficiency while ensuring thermal comfort.

Installed in the ceiling, chilled beams absorb heat from the surrounding air, reducing reliance on forced-air cooling and lowering energy consumption. With sealed windows and the use of daylight heat, the system maintains a stable and comfortable indoor temperature without producing drafts. Unlike conventional air conditioning, it does not direct cold air onto occupants, creating a more natural cooling experience.

Existing HVAC System : Chilled Beam System diagram



Source: https://alexanderayres.com/New-York-Times-Building

Return
Supply

Pros and Cons of Chilled Beam System

Pros

This system is ideal for large buildings in dry climates with low humidity levels. Since it relies more on water than air for cooling, it enhances energy efficiency by reducing overall consumption.

Cons

Humidity must be more tightly controlled with the chilled beam system, as it lacks a dehumidification feature. Without proper control, it could result in water leakage, potentially damaging ceilings, floors, and furniture.

HVAC System and Bangkok Climate

Bangkok, located in tropical region experiences high humidity levels, particularly during the rainy season (May to October).

Humidity is typically 70-90% year-round, and in some periods, it can feel even higher. Which challenges for HVAC systems, which are essential for maintaining indoor comfort.

A chilled water system is suitable for Bangkok's hot and humid climate due to its efficiency in cooling large spaces and managing high temperatures. It offers energy savings by centralizing cooling at the chiller plant and distributing chilled water through the building. This system also controls both temperature and humidity, ensuring comfort in the city's tropical weather. Additionally, it's scalable for large buildings, reduces noise, and takes up less space.

System Consideration: Chilled Water System

The chilled water system is ideal for large office buildings with consistent and high cooling demands, particularly in open-plan office layouts. This system efficiently provides cooling across multiple floors, ensuring uniform temperature control.

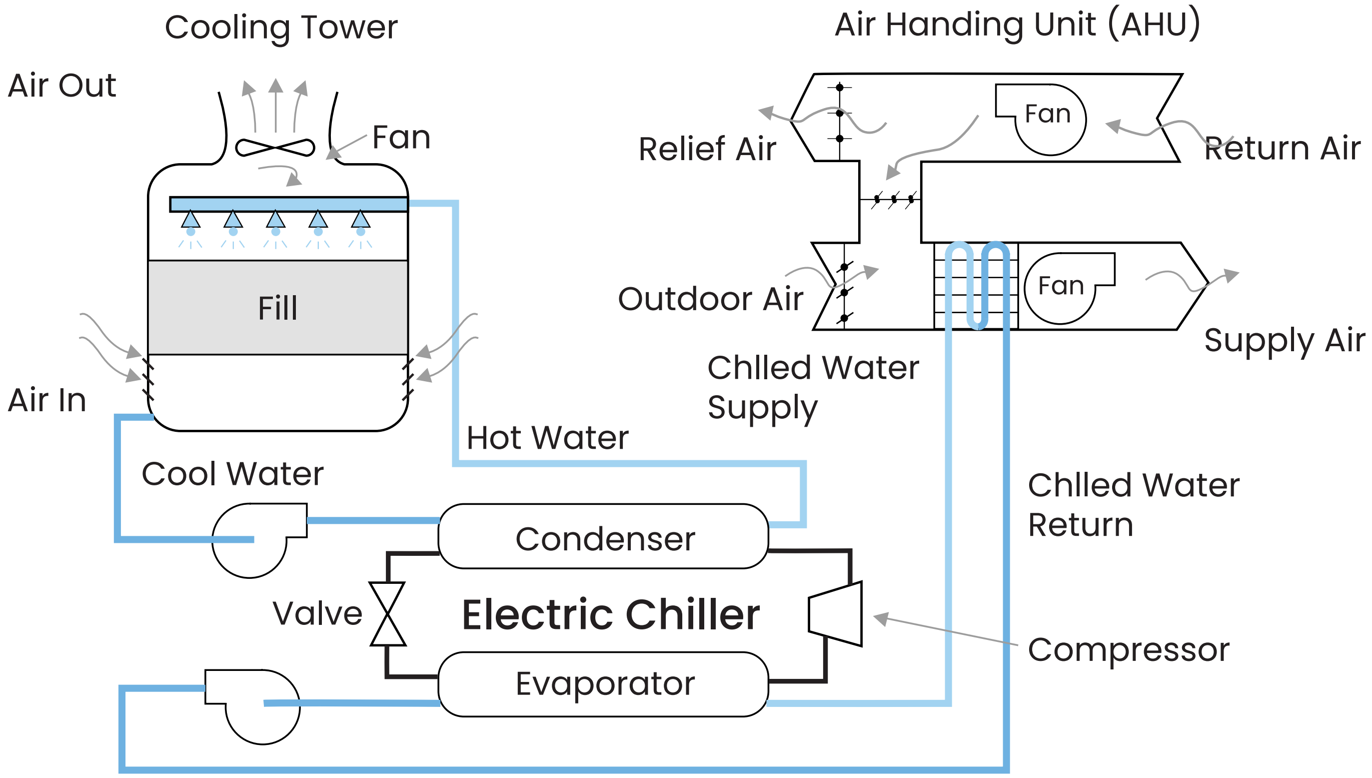
Aircondition centralized sysem

Cooling tower

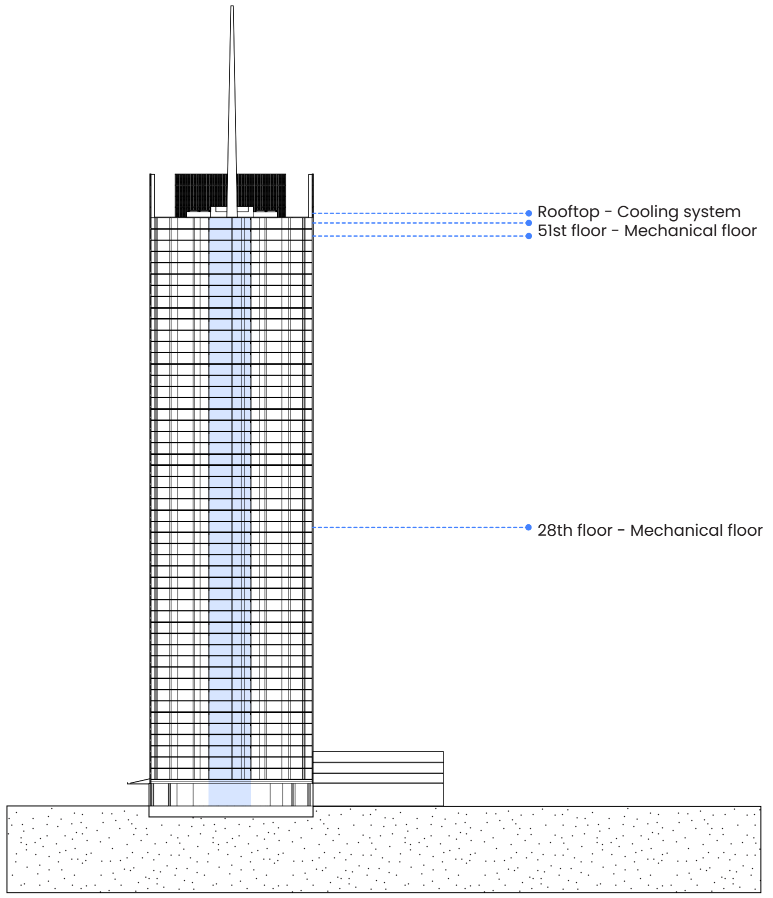
AHU room

HVAC SYSTEM: Chilled Water System

Component diagram



Component placement



Positioning the cooling tower on the rooftop enhances heat dissipation into the surrounding air while preventing hot air recirculation. Additionally, it maximizes the building's space, as the basement serves a primary function. The rooftop location also allows for more efficient drainage management through the building's system.

Chilled Water System

A chilled water system in an HVAC setup for a high-rise building is a centralized cooling system that uses chilled water to provide air conditioning throughout the structure.

Chilled Water System component

Component name	Function
Water-Cooled Chiller	Uses cooling towers to dissipate heat.
Cooling Tower	Removes heat from the condenser water before returning it to the chiller.
Water Condenser System	Circulate water between the chiller and cooling tower.
Chilled Water Pumps	Circulate chilled water from the chiller to the building's air handling units (AHUs)
Expansion Tank	Maintains system pressure by accommodating the expansion and contraction of water due to temperature changes.
Chilled Water Supply (CHWS)	The cold water flows from the chiller to the AHUs to cool the air.
Chilled Water Return (CHWR)	After absorbing heat from the air, the now warmer water returns to the chiller to be cooled again.
Fan Coil Units (FCUs)	Smaller units that directly use chilled water to cool specific rooms or areas.
Building Management System	Automated control system that monitors and manages a building's mechanical and electrical equipment to ensure efficient operation.

Chilled Water System pros and cons

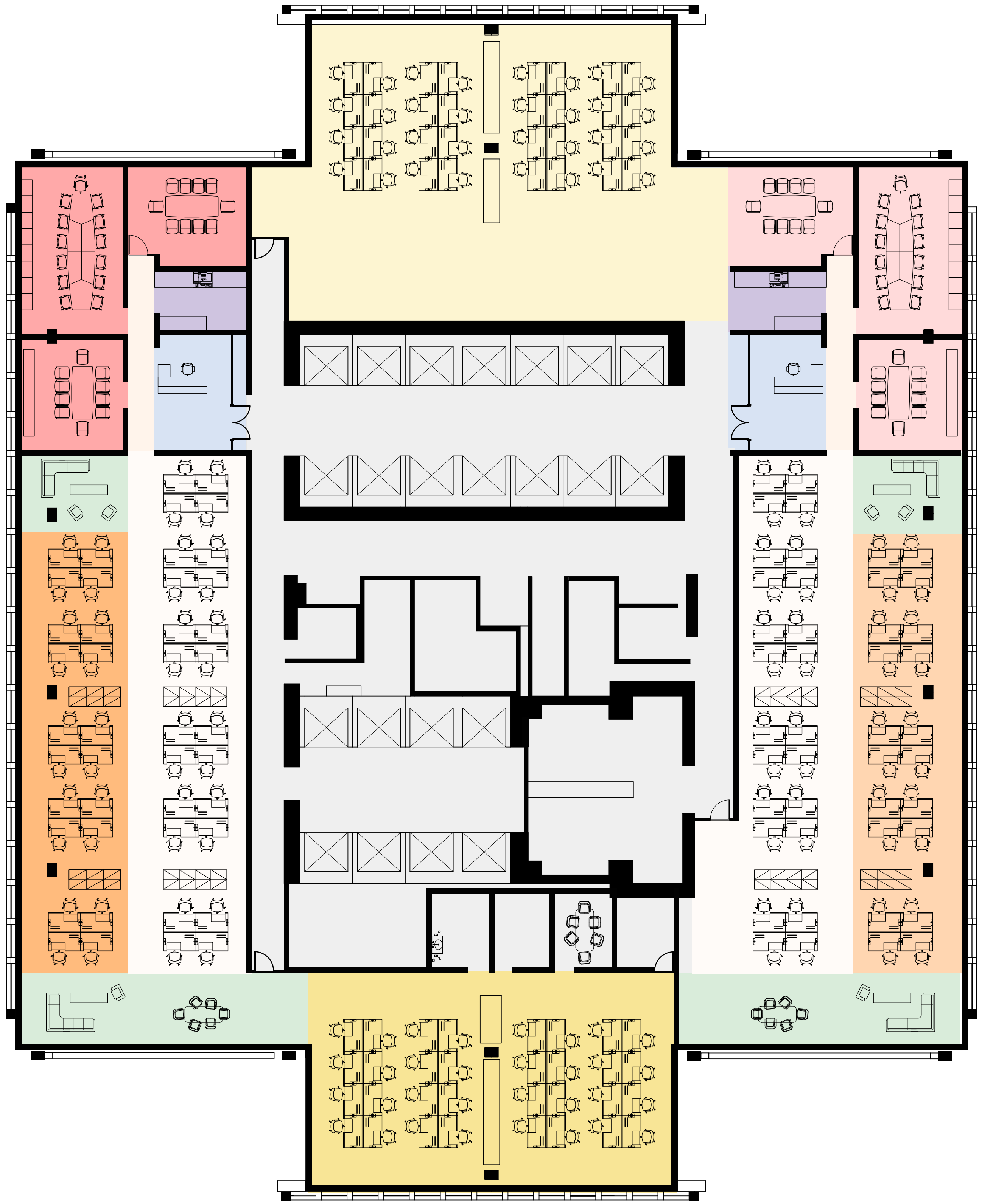
Pros	Cons
Provides effective dehumidification Suitable for large scale building Low energy consumption because using water as a cooling medium Reduces the risk of mold growth and improves indoor air quality	Requires upfront investment due to the requiremnt of chillers, pumps, pipes, cooling towers, and a centralized plant Requires regular maintenance of chillers, pumps, and cooling towers Chilled water systems take longer to cool a space

The New York Times Building

Thermal Zoning

Typical floor plan: office zone

North - receives the least direct sunlight



West - Receives the most intense and hottest sunlight in the afternoon

East - Receives direct sunlight in the morning

South - receives the most consistent sunlight

- Thermal zone 1 — Office area in North side
- Thermal zone 2 — Meeting room in West side
- Thermal zone 3 — Meeting room in East side
- Perimeter Zone
- Elevator lobby
- Thermal zone 4 — Office area in West side
- Thermal zone 5 — Office area in East side
- Thermal zone 6 — Office area in South side
- Relaxing zone in office area
- Reception

N

Scale 1:300

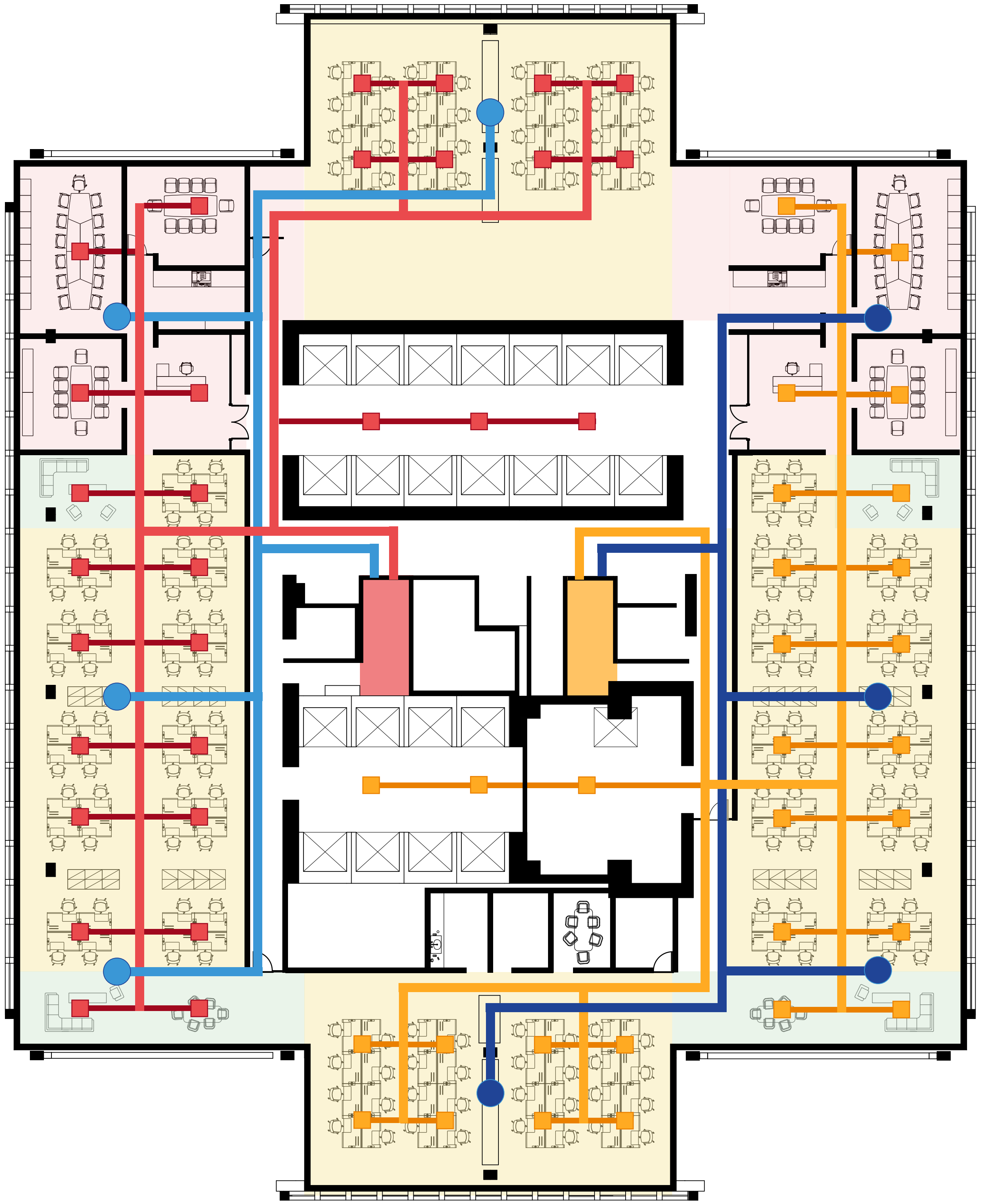
6538066625 Punnanan Nuntapootidech (Poon)

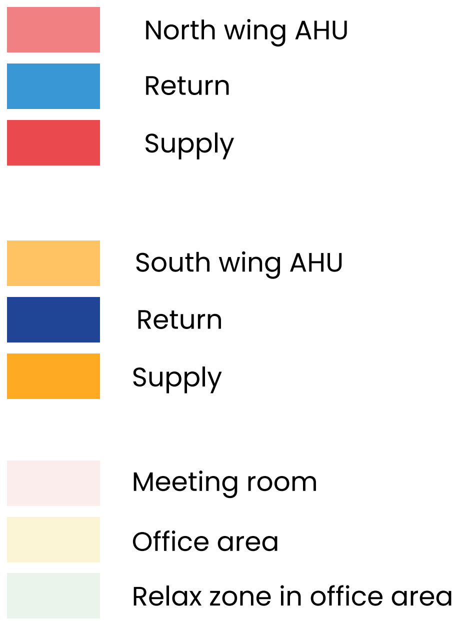
The New York Times Building

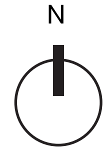
Floor Plan with HVAC System

Typical floor plan: office zone

In a chilled water system, the supply pipe carries cooled water from the chiller plant to cooling units throughout the building, where it absorbs heat and cools the space. The return pipe then carries the warmed water back to the chiller plant to be re-cooled. The system relies on proper balancing and control mechanisms, such as flow control valves and pressure sensors, to ensure efficiency. Maintaining a consistent flow and temperature between the supply and return lines helps optimize energy use and ensure effective cooling.





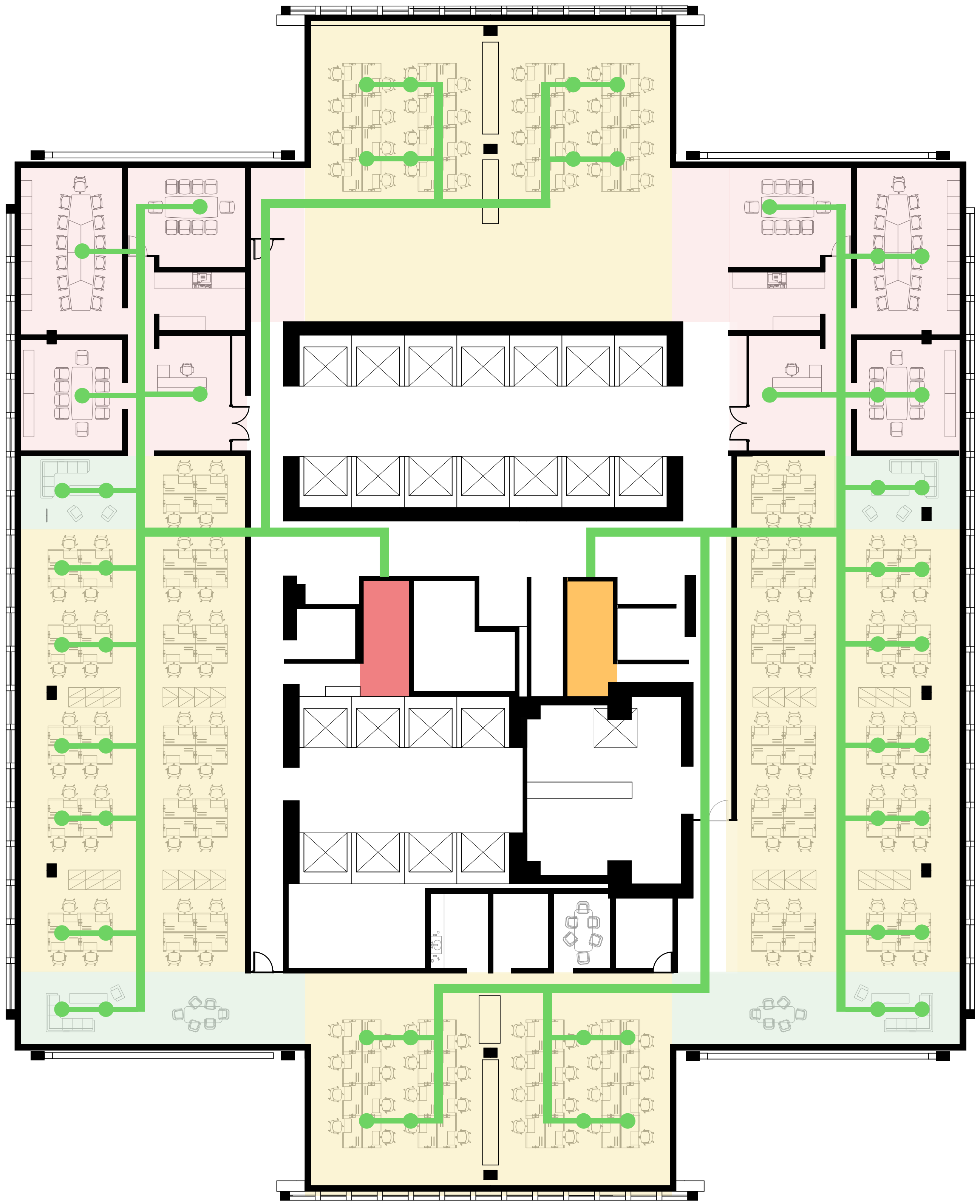


Scale 1:300

The New York Times Building

Floor Plan with Fresh Air Duct System

In a chilled water system, the supply pipe carries cooled water from the chiller plant to cooling units throughout the building, where it absorbs heat and cools the space. The return pipe then carries the warmed water back to the chiller plant to be re-cooled. The system relies on proper balancing and control mechanisms, such as flow control valves and pressure sensors, to ensure efficiency. Maintaining a consistent flow and temperature between the supply and return lines helps optimize energy use and ensure effective cooling.



Fresh air duct system

Meeting room

Office area

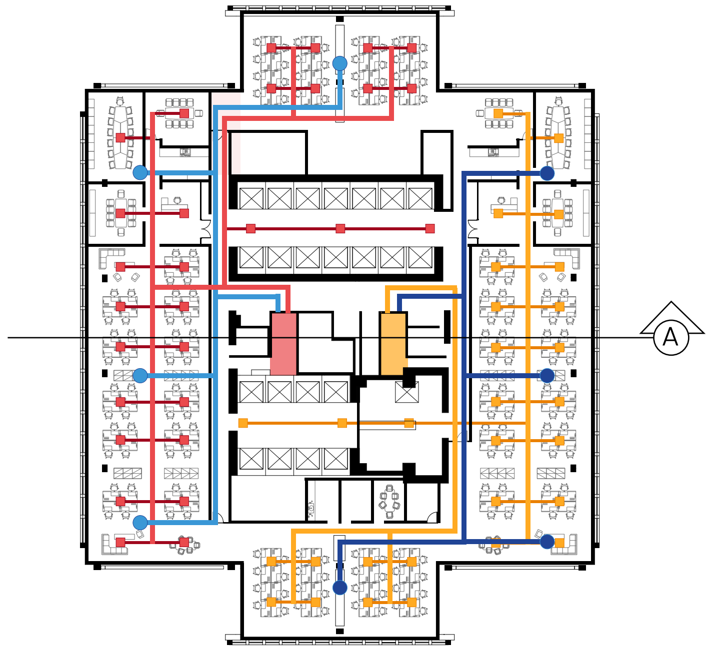
Relax zone in office area

N

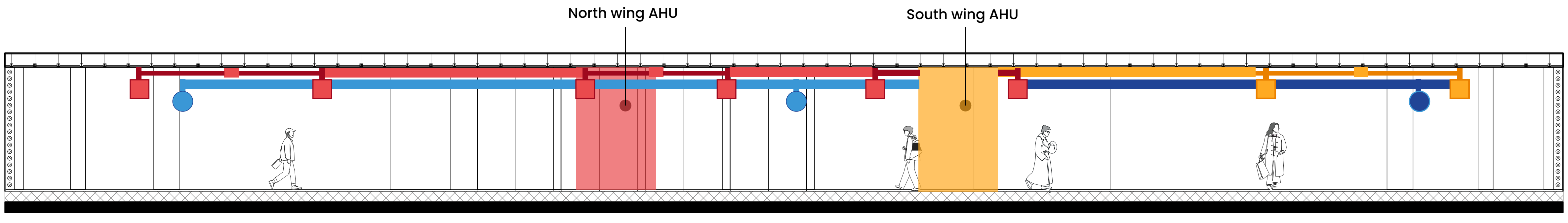
Scale 1:300

The New York Times Building

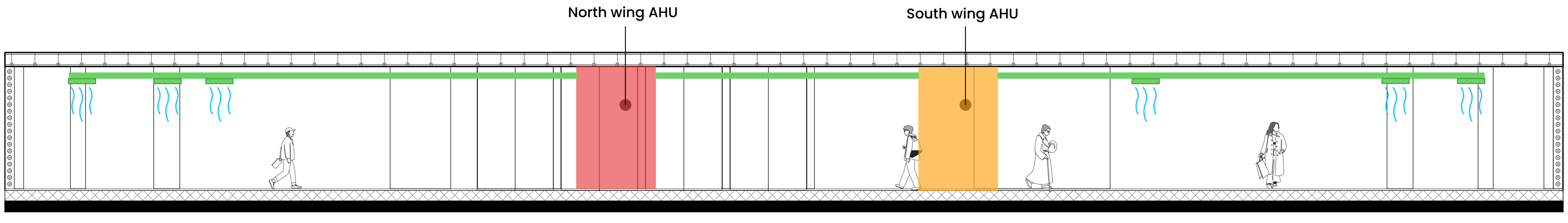
Floor Section with HVAC system



HVAC SYSTEM with Supply and Return Diagram

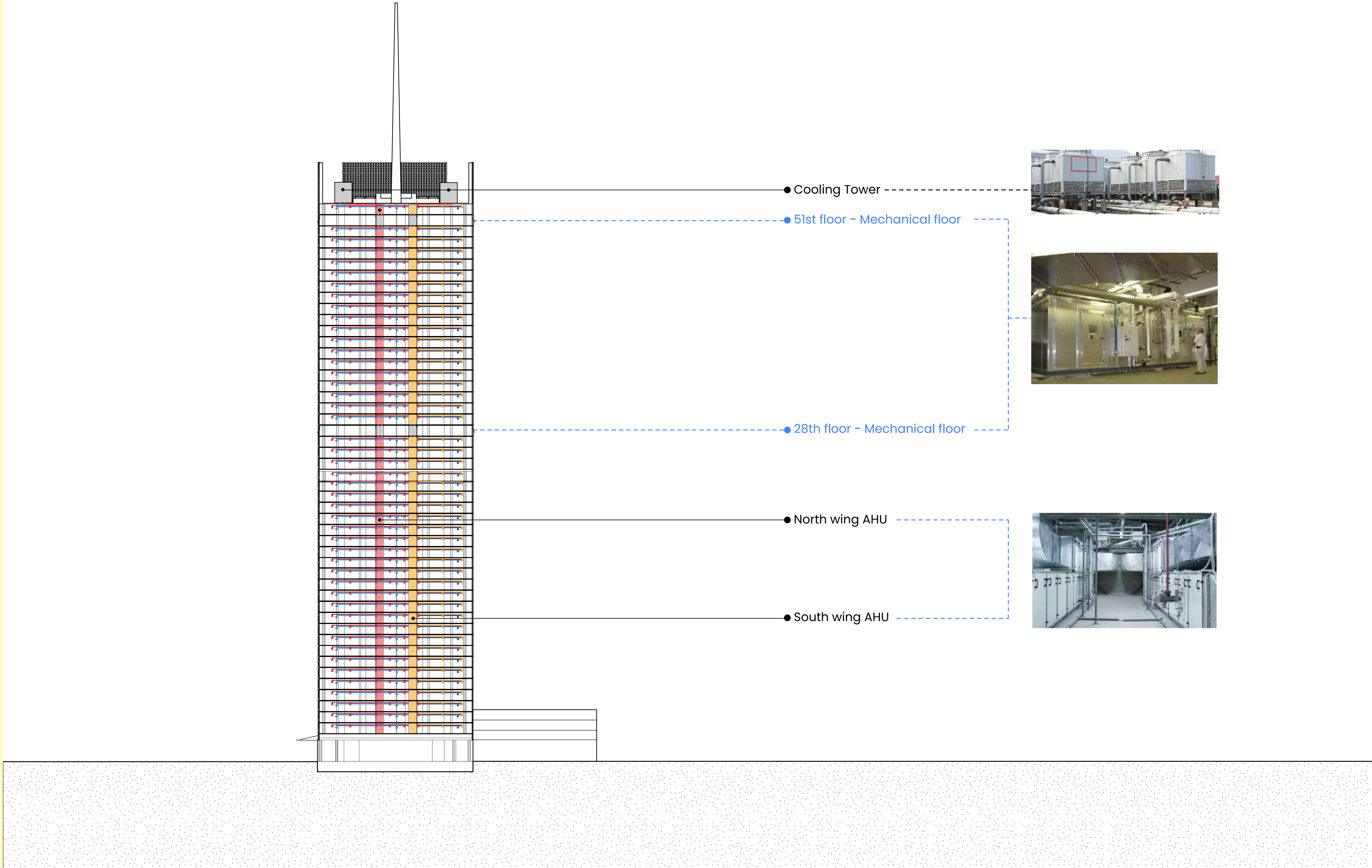


Fresh air duct system Diagram



The New York Times Building

Building Section with HVAC system



The New York Times Building

Daylight simulation study zone

Typical floor plan: office zone

The simulation tests evaluate daylight performance on the east and south orientations on March 21st, focusing on two specific times: 9 AM and 3 PM.

East daylight characteristic

The east side experiences strong early morning sun between 6:00 to 10:00 AM. Initially, the sunlight is soft and warm, creating a pleasant atmosphere during the early hours of the day. However, by 9:00 to 10:00 AM, it becomes harsher and more direct, accompanied by higher heat levels. As a result, although the east side receives moderate heat gain—not as severe as west-facing walls—it is still significant due to the direct, low-angle sunlight.

South daylight characteristic

The south side receives consistent daylight throughout the day, especially between 10:00 AM to 3:00 PM. Initially, the sunlight enters at a higher angle, making it less harsh on vertical surfaces. However, as the sun moves closer to its peak around 12:00 to 2:00 PM, the intensity increases, particularly on horizontal surfaces like roofs or balconies.

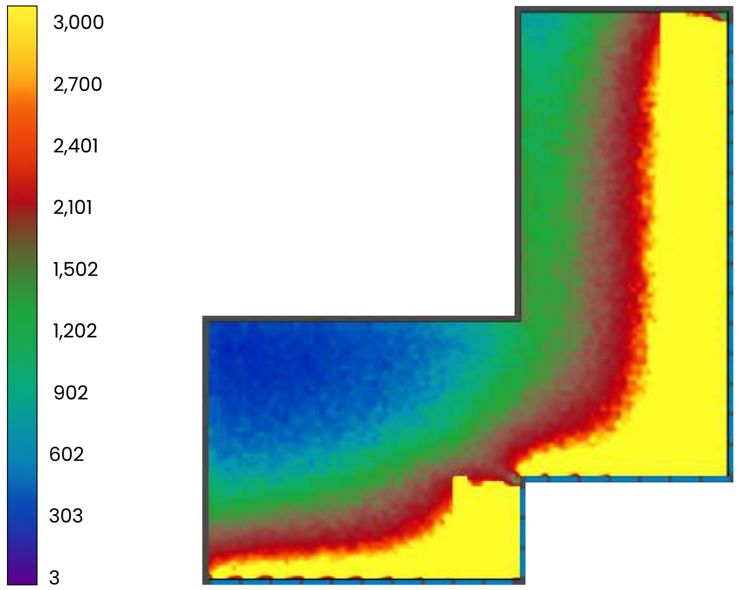
Daylight access goals

In the daylight simulation, the total area of the study zone is 590 square meters. To achieve the target of having an average of more than 50% of the area receiving adequate daylight, at least 295 square meters must reach an illuminance level above the defined threshold.

The New York Times Building

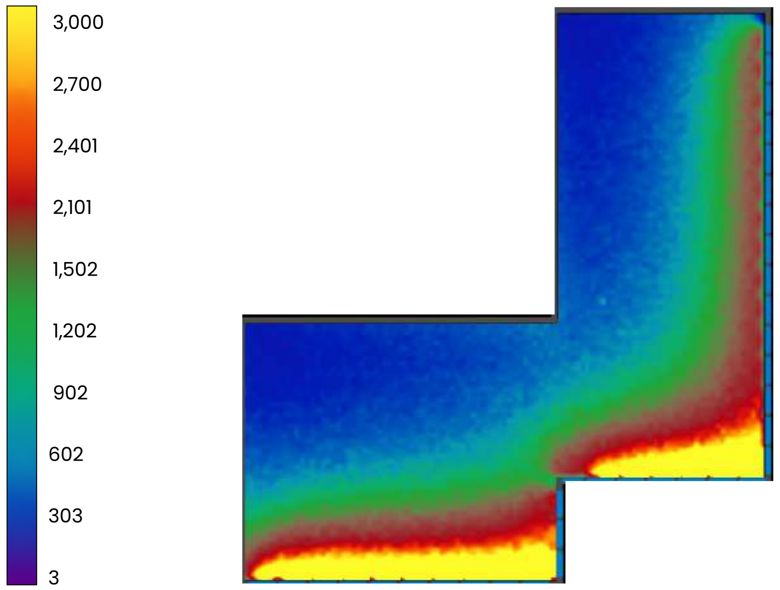
Daylight Simulation 1

Typical floor plan: office zone



March 21 9:00AM Simulation

Average percentage of the area with illuminance = 390sqm / 66%

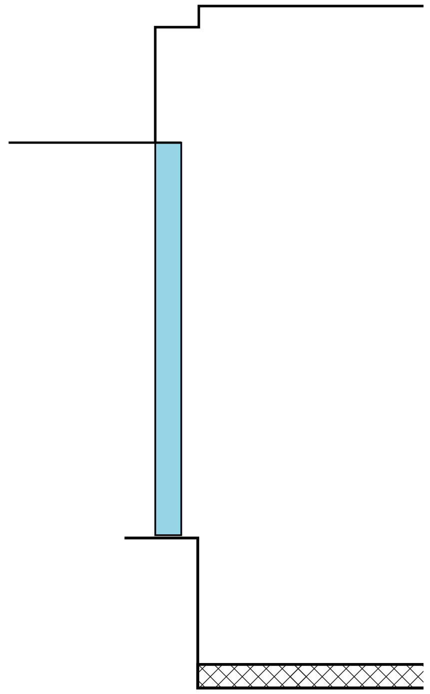


March 21 3:00PM Simulation

Average percentage of the area with illuminance = 532 sqm / 90%

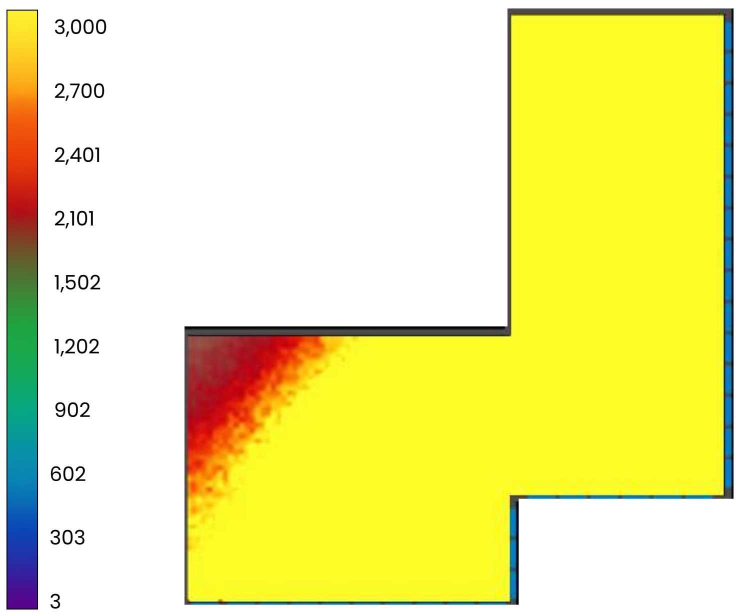
Overhang height
3.8 meter above ground
Overhang width
1 meter
Window dimension
Width 1.5 meter Lenght 3 meter

Section

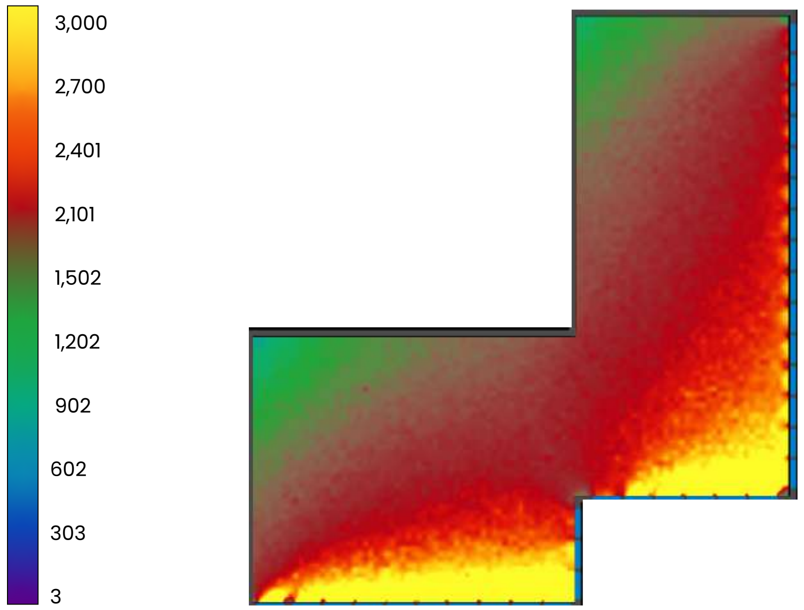


Daylight Simulation 2

Typical floor plan: office zone



March 21 9:00AM Simulation



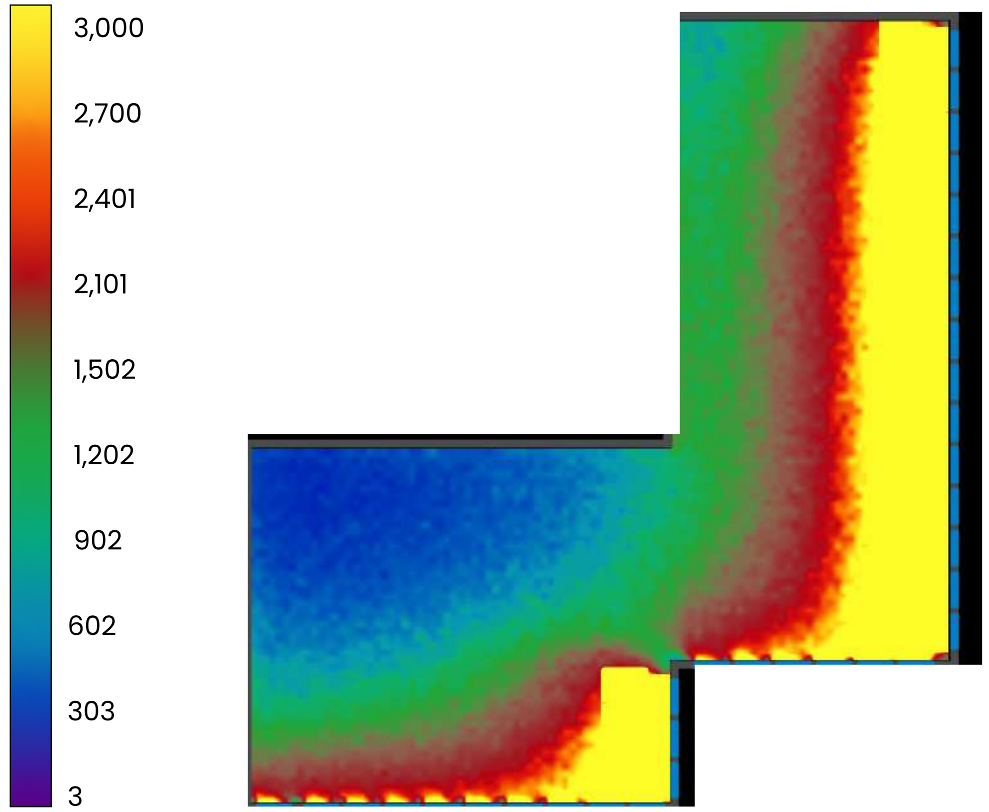
March 21 3:00PM Simulation

Material	Impact on simulation
Floor: carpet	The dimensions of the window and overhang significantly influence the daylight performance on the south façade, resulting in a reduction of natural light penetration into the interior spaces. The overhang also contributes to mitigating low-angle morning sunlight from the east. However, the selected material exhibits low reflectivity, limiting its ability to redirect daylight onto interior surfaces. In contrast, highly reflective materials tend to increase both daylight levels and associated heat gain, particularly around 9 AM.
Ceiling: Plastic 80% reflectance	
Wall: plastic 80% reflectancce	
Roof: plastic 90% reflectance	
Facade: 80% transmittance	

The New York Times Building

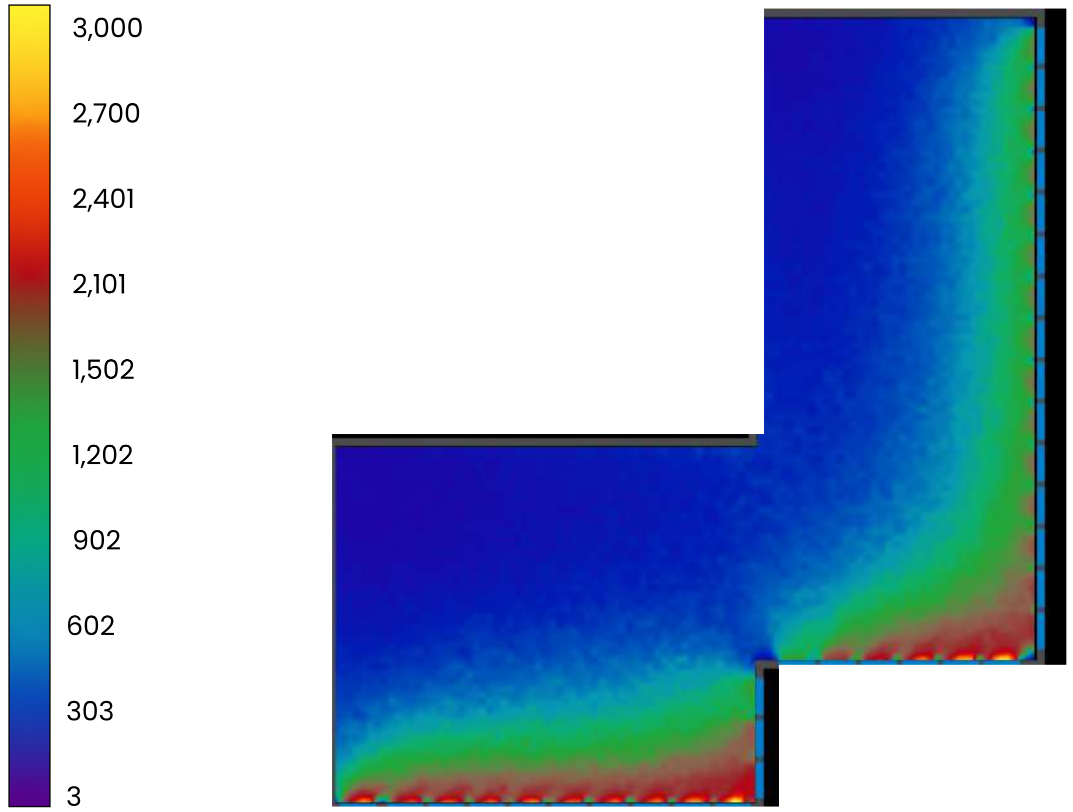
Daylight Simulation 3

Typical floor plan: office zone



March 21 9:00AM Simulation

Average percentage of the area with illuminance = 452sqm / 76%



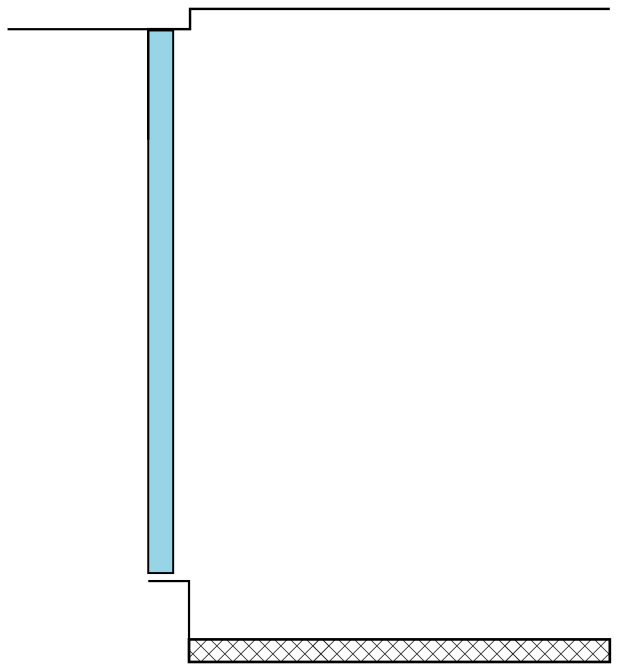
March 21 3:00PM Simulation

Average percentage of the area with illuminance = 575 sqm / 96%

Overhang height
4 meter above ground
Overhang width
1 meter
Window dimension
Width 1.5 meter Lenght 3.9 meter

Material	Impact on simulation
Floor: wood	Increasing the height of the overhang and extending the window length results in greater heat gain within the office space. However, modifying the floor and ceiling materials to have higher reflectance helps reduce daylight intensity on the east side around 9 AM. As a result, the afternoon period no longer shows any areas within the yellow daylight zone.
Ceiling: aluminium	
Wall: plastic 80% reflectancce	
Roof: plastic 90% reflectance	
Facade: 60% transmittance	

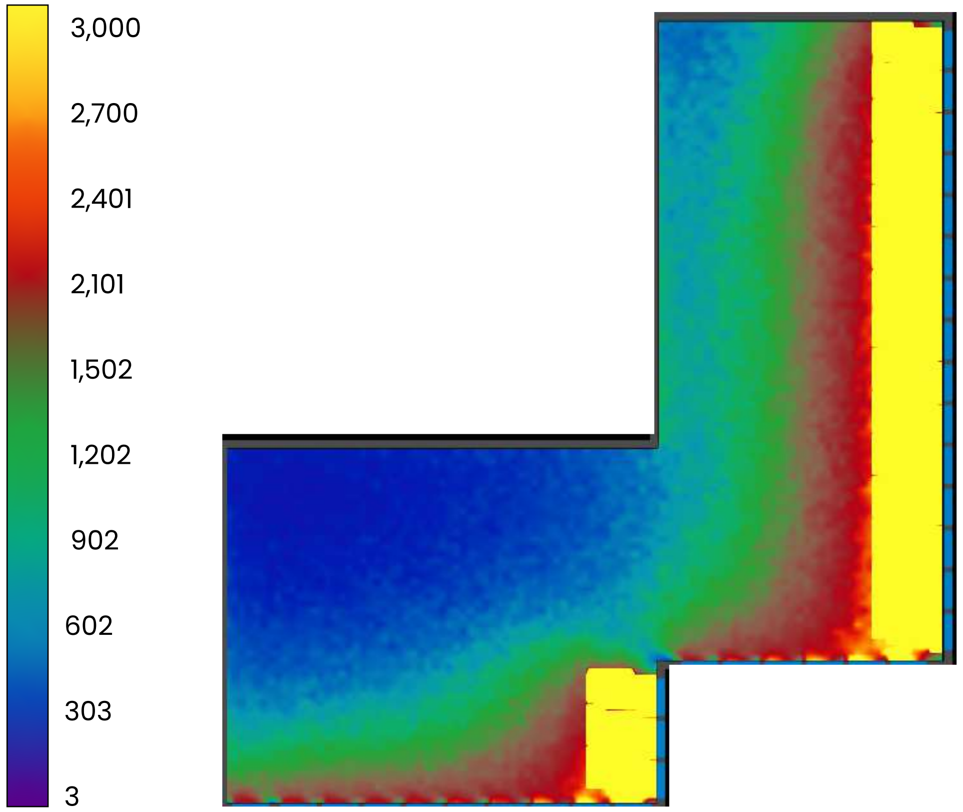
Section



The New York Times Building

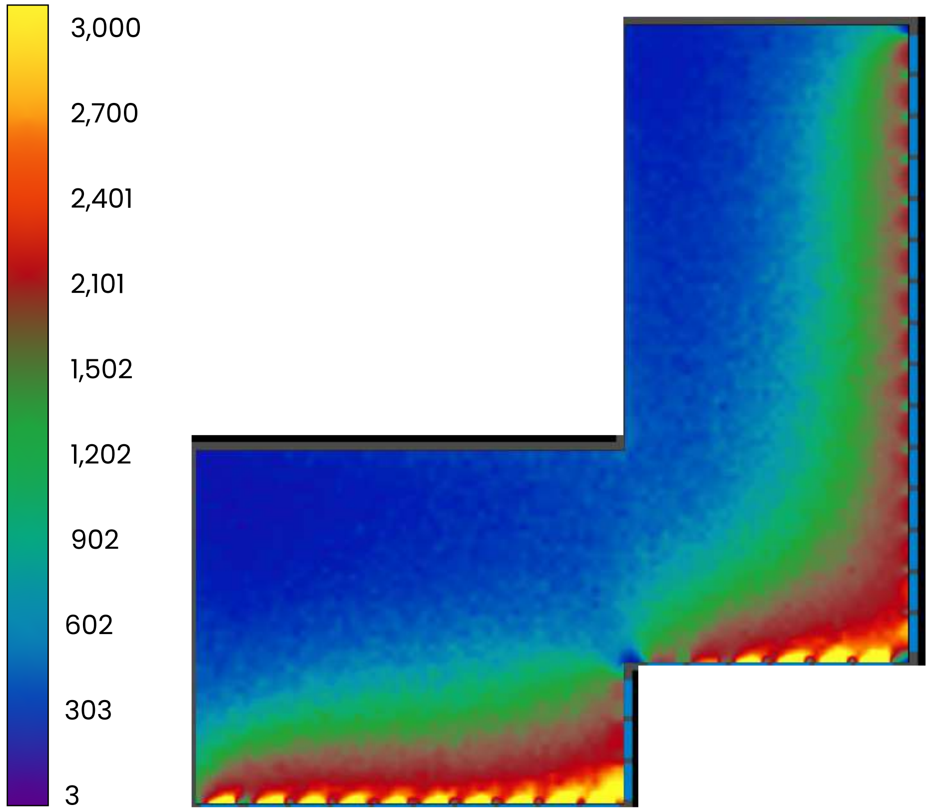
Final Daylight Simulation

Typical floor plan: office zone



March 21 9:00AM Simulation

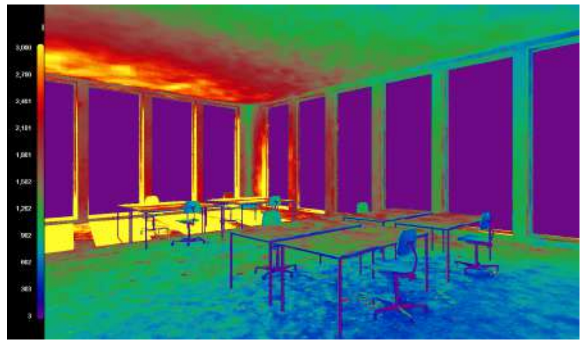
Average percentage of the area with illuminance = 491 sqm / 83%



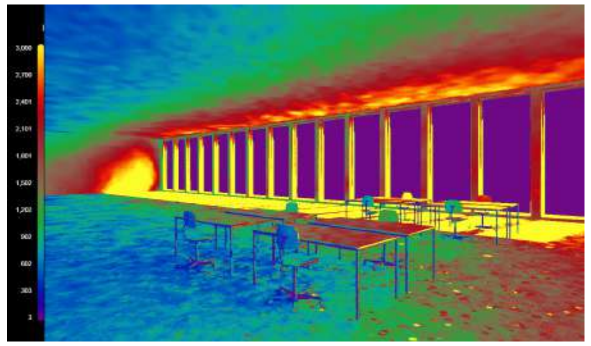
March 21 3:00PM Simulation

Average percentage of the area with illuminance = 585 sqm / 98%

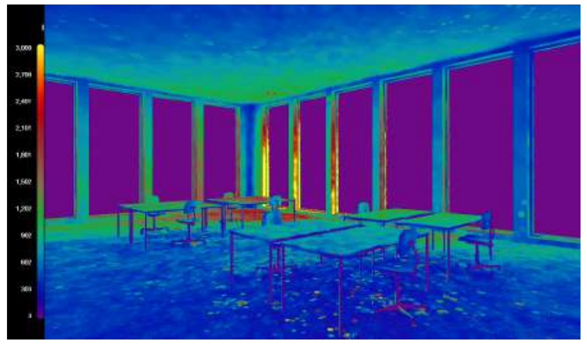
Perspective view



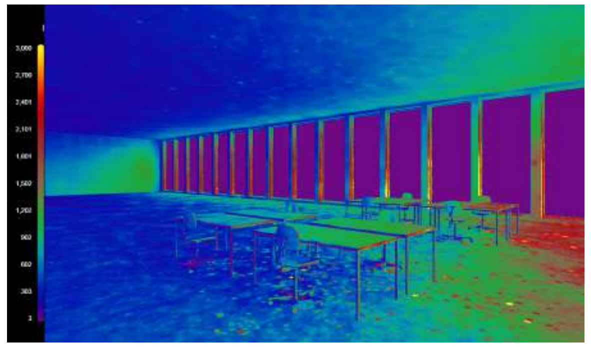
21 March 9AM



21 March 9AM



21 March 3PM

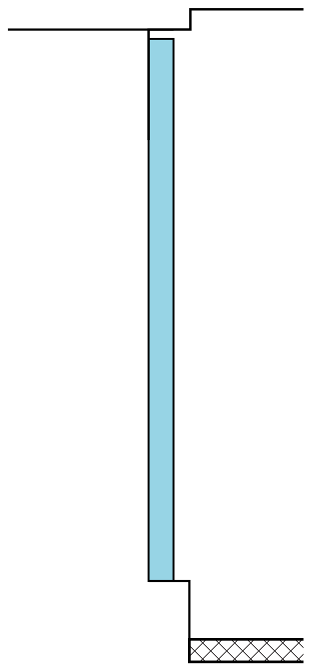


21 March 3PM

Overhang height
4 meter above ground
Overhang width
1 meter
Window dimension
Width 1.5 meter Lenght 3.9 meter

Material	Impact on simulation
Floor: wood	Even with the use of high-reflectance materials, the daylight levels at 9 AM remain high, contributing to increased heat gain in the space. To address this issue, the facade's transmittance level was adjusted from 60% to 80%, resulting in a significant improvement. This change led to an increase in the luminance heat ratio at 9 AM from 76% to 83%, creating a more balanced distribution of daylight and reducing excessive heat gain on the east side.
Ceiling: aluminium	
Wall: plastic 80% reflectance	
Roof: plastic 90% reflectance	
Facade: 60% transmittance	

Section



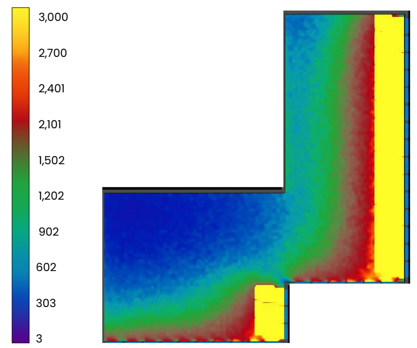
In conclusion, while increasing reflectance of interior materials can help manage daylight distribution, it may not sufficiently reduce heat gain during peak morning hours. Adjusting the facade transmittance from 60% to 80% proved to be a more effective strategy, significantly improving daylight balance and reducing excessive heat accumulation on the east side at 9 AM.

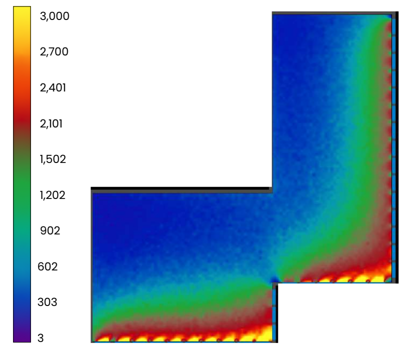
This highlights the importance of integrating both material selection and facade performance in optimizing thermal and visual comfort in office spaces.

The New York Times Building

Electric Lighting study zone and Daylight Analysis

Typical floor plan: office zone



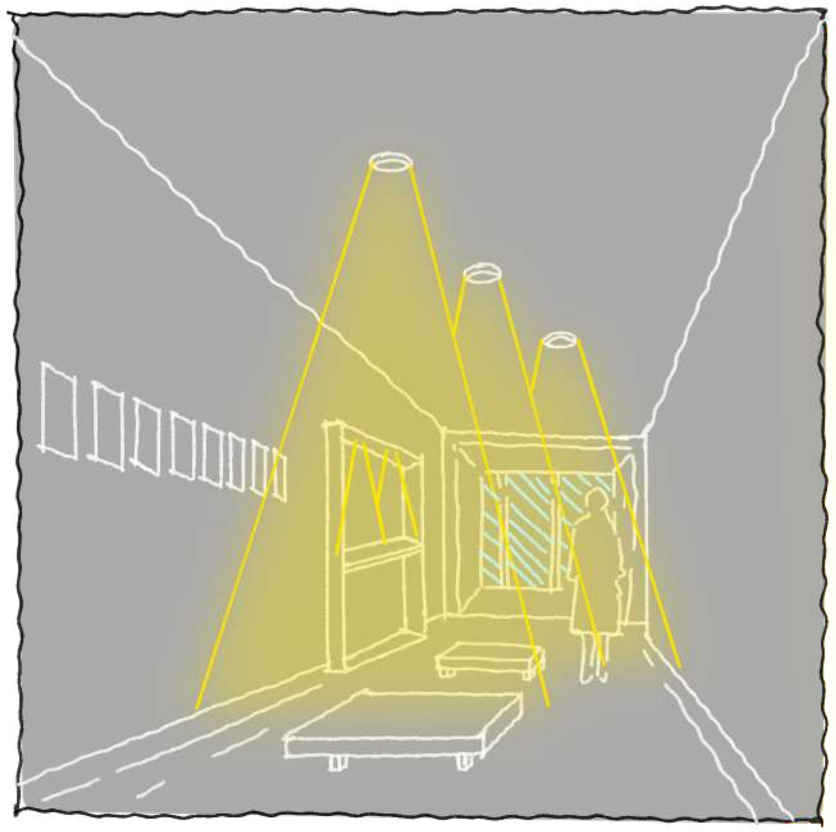


Zone division	9AM Daylight	3PM Daylight
1 Office desk - East side	Electric lighting is needed	Electric lighting is needed
2 Corridor - East side	Sufficient daylight with minimal electric lighting required	Sufficient daylight with minimal electric lighting required
3 Office zone - East side	Sufficient daylight	Electric lighting is needed
4 Relaxing zone - South side	Sufficient daylight	Sufficient daylight with minimal electric lighting required
5 Shelf zone - East side	Sufficient daylight	Sufficient daylight
6 Corridor - South side	Sufficient daylight with minimal electric lighting required	Sufficient daylight with minimal electric lighting required
7 Office desk - South side	Electric lighting is needed	Electric lighting is needed
8 Corridor - South side	Sufficient daylight with minimal electric lighting required	Sufficient daylight with minimal electric lighting required

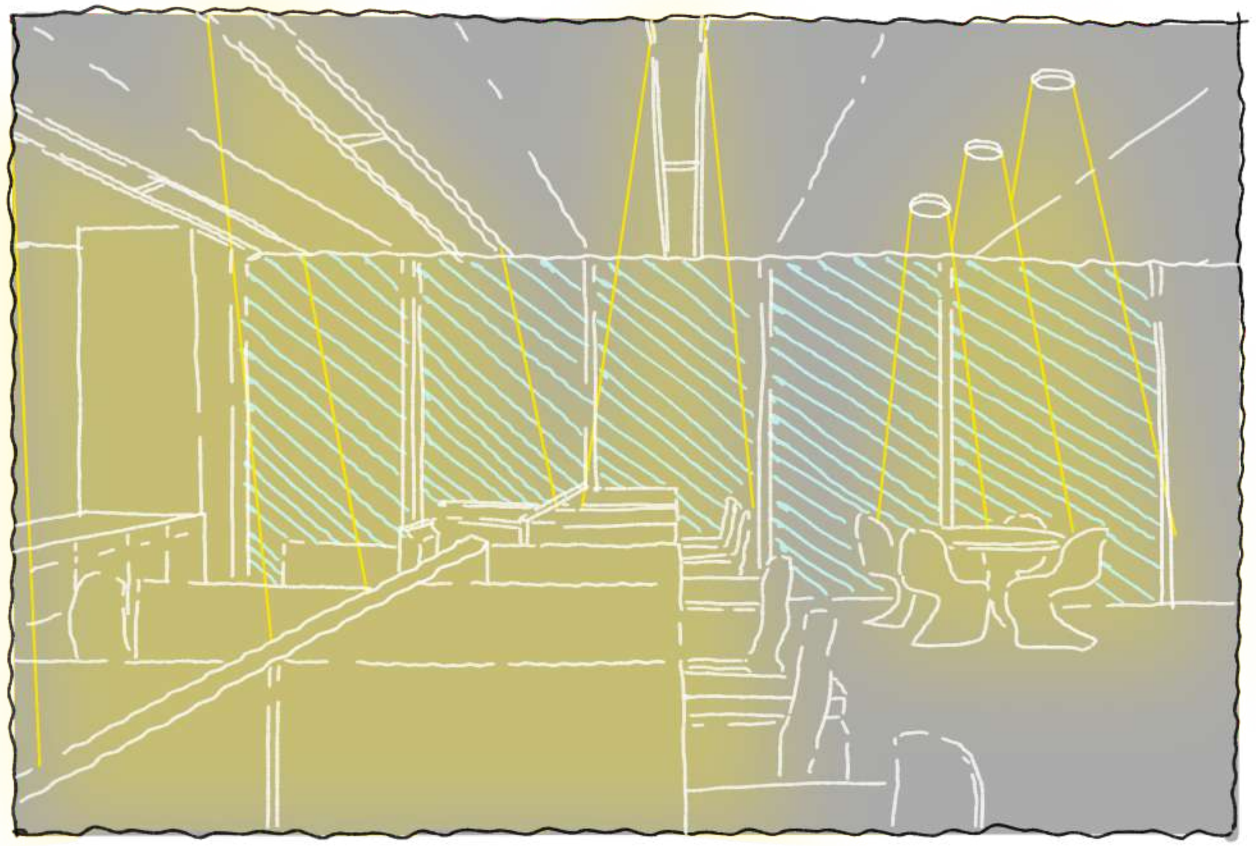
Electric Lighting Design Concept

Typical floor plan: office zone

2 6 8



1 3 7 4



Corridor

Corridors are typically used for short periods as people simply pass through them. Therefore, they require less lighting intensity, even in enclosed areas. A series of small downlights along the corridor is sufficient to provide adequate illumination for this space.

Office and Relaxing zone

In the office area, adequate lighting is essential to support work activities, especially during the morning and evening on the east side of the building. LED lights are used to ensure consistent and high-quality illumination throughout the day.

Meanwhile, the relaxing table area, which is not primarily used for work, utilizes downlights to minimize energy consumption. This space is also located near a glazed area, where natural light is sufficient for the intended activities.

The New York Times Building

Electric Lighting study zone

Typical floor plan: office zone

Switch Units in study zone

Switch #1	Office Desk – Near Perimeter Zone
Switch #2	Walk way – East side
Switch #3	Office Desk – Near Window Zone
Switch #4	Relaxing zone
Switch #5	Office Desk – Near Perimeter Zone
Switch #6	Display shelf
Switch #7	Relaxing zone
Switch #8	Walk way – South side
Switch #9	Office Desk –South side
Switch #10	Walk way – South side
Switch #11	Office Desk –South side

Legend

LED Light

Down Light

Light Directional Accent

Switch

Office zone light cables

Walk way zone light cables

Relaxing zone light cables

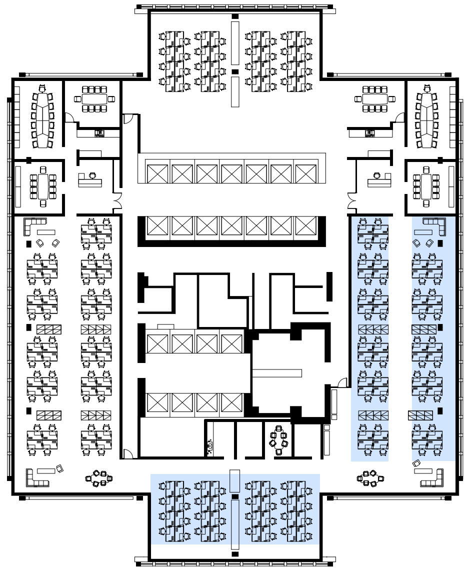
Scale 1:300

6538066625 Punnanan Nuntapootiedech (Poon)

The New York Times Building

Electric Lighting simulation

Typical floor plan: Office zone



LED Light

Down Light

Light Directional Accent

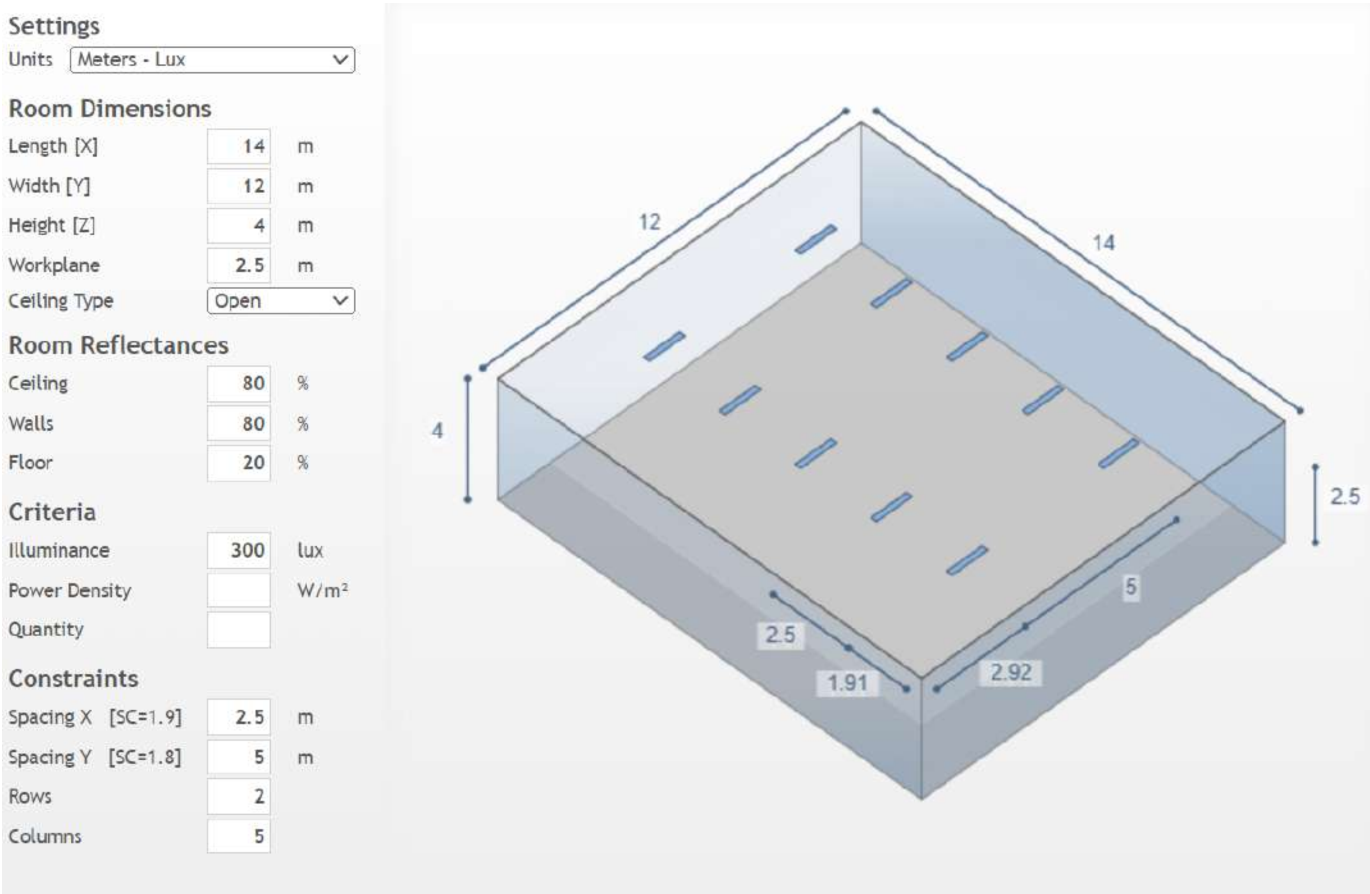
Simulation

Required Lux amout

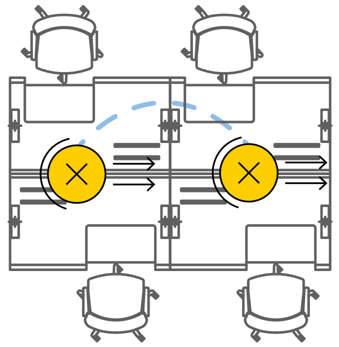
300 Lux

Calculation Result

Illuminance	379 Lux
Power Density	3.24 W/m^2
Quantity	10

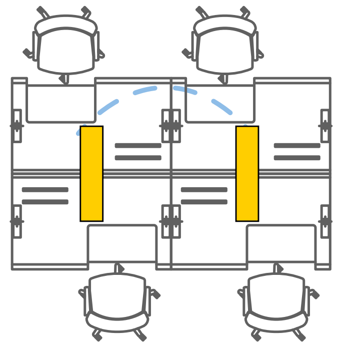


Light and Function



Down Light

The office desk located in the perimeter zone requires less natural light during the daytime due to sufficient daylight access. As a result, minimal artificial lighting is needed. Downlights with low wattage are sufficient for task illumination, eliminating the need for strong or high-intensity electric lighting.



LED Light

Office desks located further south require more electric lighting during the evening, making it important to install higher-intensity LED lighting in these areas to ensure adequate illumination for work tasks.

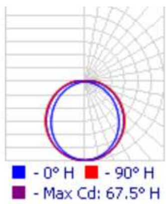
Light Fixture types

VPF8 4FT 50W 40K OP

Luminaire LED

[A] - VPF8 4FT 50W 40K OP

Light Loss Factor	1	Symbol Shape	Rectangular	Lamp Quantity	1
Suspension Length	0	Symbol Length	.18	Lumens Per Lamp	5614
Orientation	0	Symbol Width	1.17	Wattage	54.5

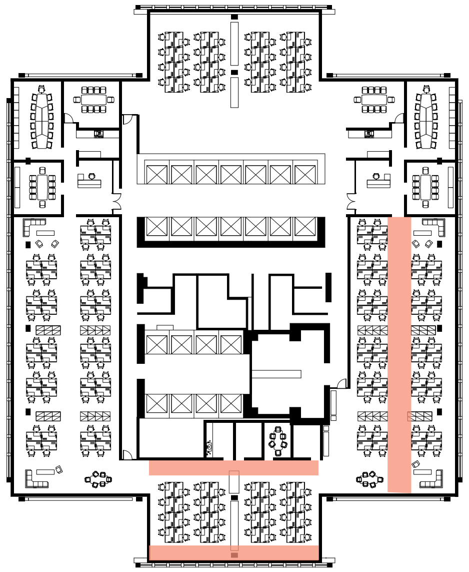


Concept reference

The New York Times Building

Electric Lighting simulation

Typical floor plan: Walk way zone



LED Light

Down Light

Light Directional Accent

Simulation

Required Lux amout	Calculation Result	
100 Lux	Illuminance	104 Lux
	Power Density	1.61 W/m ^{2}
	Quantity	5

Settings

Units: Meters - Lux

Room Dimensions

Length [X]	14	m
Width [Y]	3.5	m
Height [Z]	4	m
Workplane	2.5	m
Ceiling Type	Open	

Room Reflectances

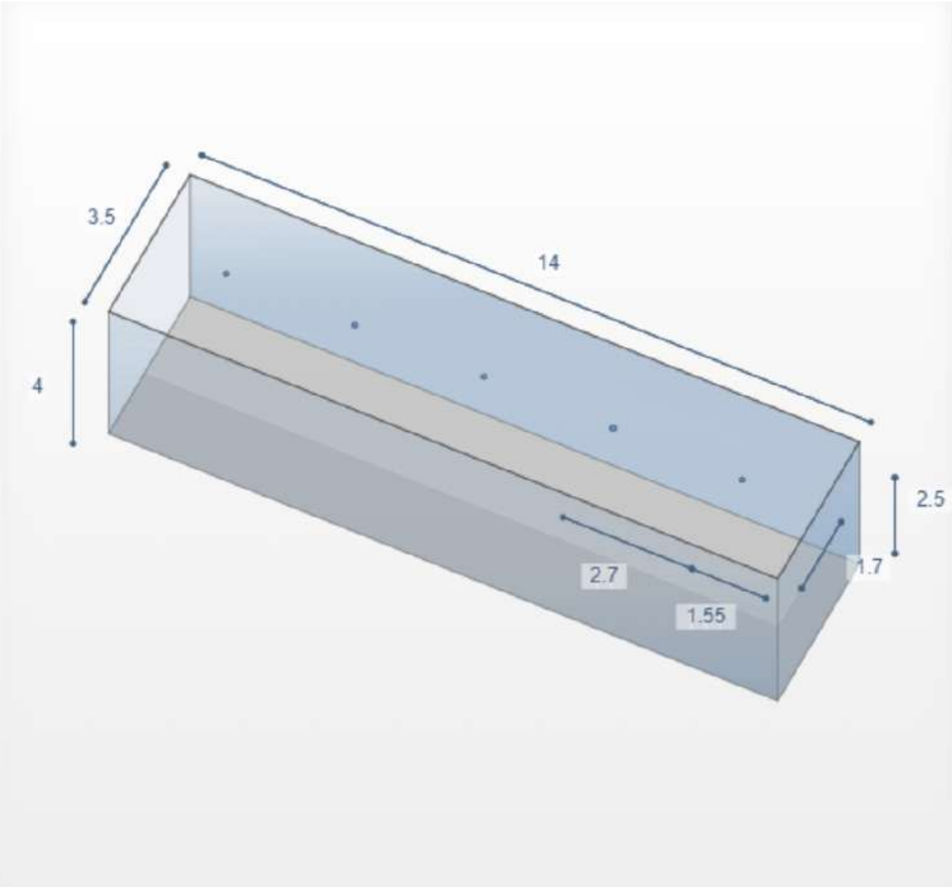
Ceiling	80	%
Walls	80	%
Floor	20	%

Criteria

Illuminance	100	lux
Power Density		W/m²
Quantity		

Constraints

Spacing X [SC=1.6]		m
Spacing Y [SC=1.6]		m
Rows	1	
Columns	5	



Light and Function

Down Light

The walkway area, which functions primarily as a circulation zone, does not demand high levels of electric lighting. To maintain both visual comfort and energy efficiency, low-intensity downlights are recommended. These fixtures provide adequate ambient illumination for safe passage without contributing to unnecessary energy consumption. The lighting design in this area should respond to the functional requirements of the space, emphasizing uniformity and subtle guidance rather than task-focused brightness.

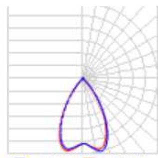
Light Fixture types

VRDL4 1000LM TUWH RHYR MD 90CRI CAL @46K

Luminaire LED

[A] - VRDL4 1000LM TUWH RHYR MD 90CRI CAL @46K

Light Loss Factor	1	Symbol Shape	Circular	Lamp Quantity	5
Suspension Length	0	Symbol Length	.1	Lumens Per Lamp	178
Orientation	0	Symbol Width		Wattage	15.8



Concept reference

The New York Times Building

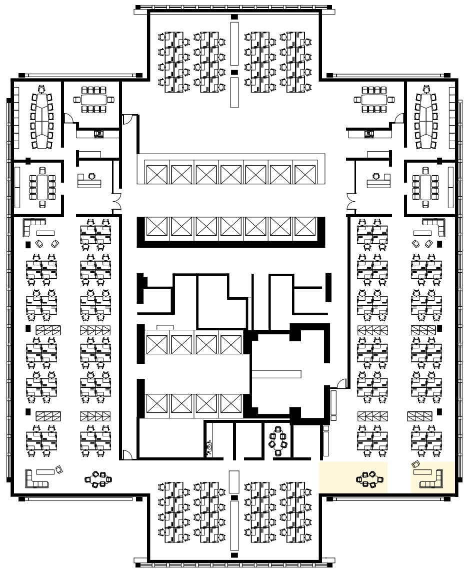
Electric Lighting simulation

Typical floor plan: Relaxing zone

LED Light

Down Light

Light Directional Accent



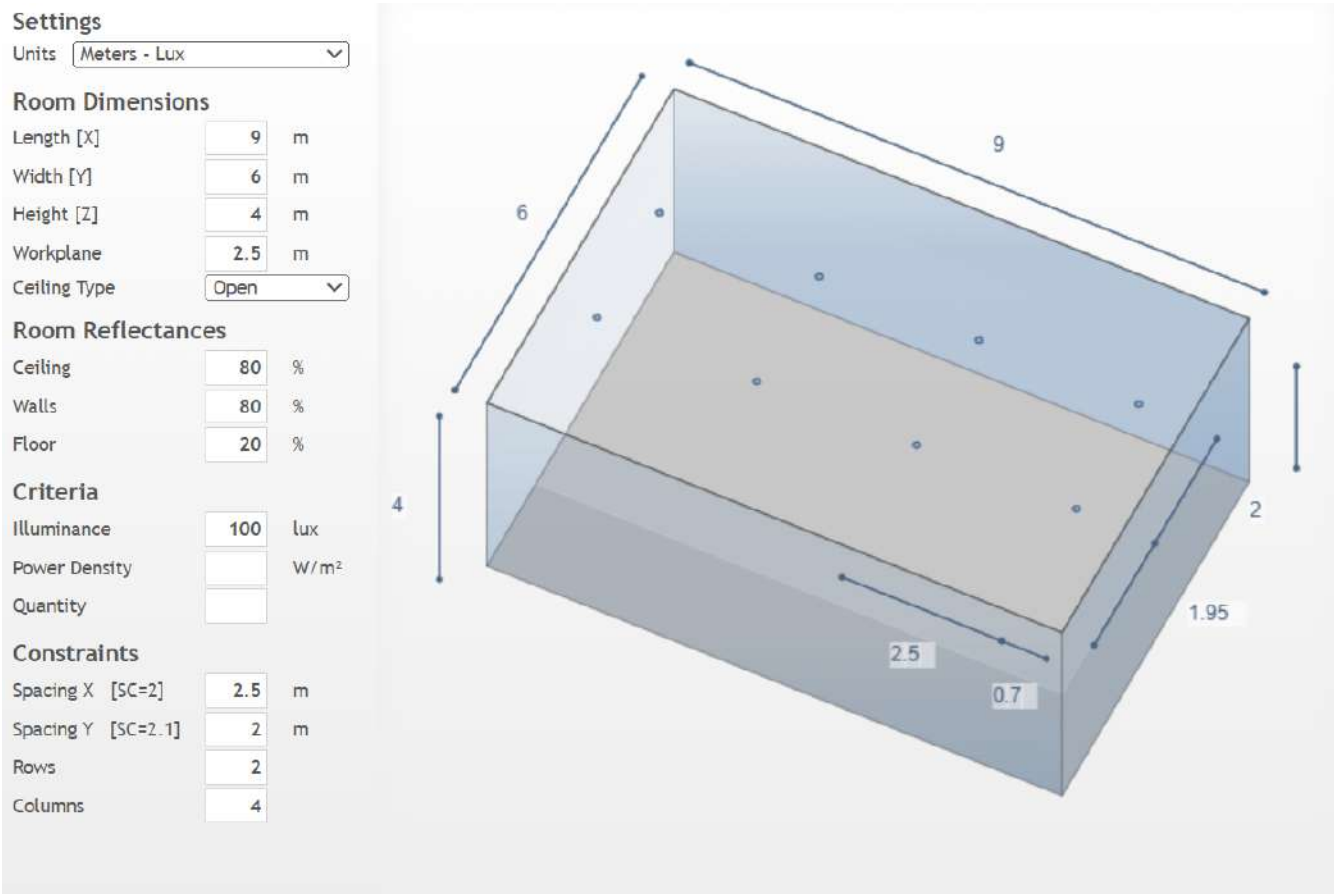
Simulation

Required Lux amout

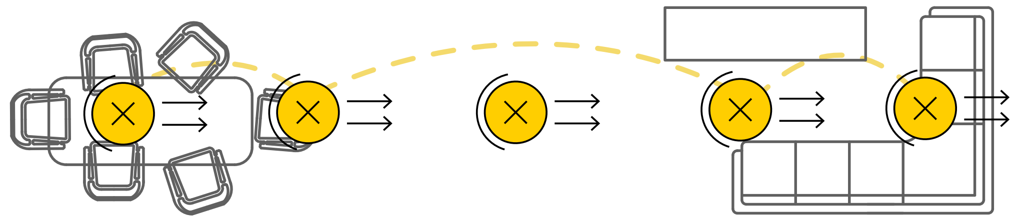
200 Lux

Calculation Result

Illuminance	228 Lux
Power Density	3.97 W/m^2
Quantity	8



Light and Function



The relaxing zone requires a carefully considered lighting strategy that prioritizes comfort and well-being over task performance. In this area, electric lighting should be deliberately low in intensity, utilizing warm color temperatures and diffuse distribution to foster a sense of calm and tranquility. Dimmable downlights or concealed indirect lighting are recommended to minimize glare and visual stress.

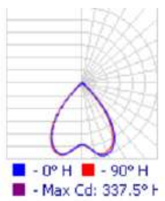
Light Fixture types

VRDL4 1500LM WDIM HALR WD 90CRI CPL @30K

Luminaire LED

[A] - VRDL4 1500LM WDIM HALR WD 90CRI CPL @30K

Light Loss Factor	1	Symbol Shape	Circular	Lamp Quantity	83
Suspension Length	0	Symbol Length	.1	Lumens Per Lamp	16
Orientation	0	Symbol Width		Wattage	26.8



Concept reference

Daylighting & Electric Lighting
Asiignment 5

Citation

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