

Skylight · Building Constructions | The New Library,
Magdalene College, Cambridge, United Kingdom

天窗 · 建築結構

英國劍橋大學莫德林學院新圖書館

尼爾·麥克勞克林建築師事務所 | Niall McLaughlin Architects

影像 · 尼克·凱恩

Photo · Nick Kane

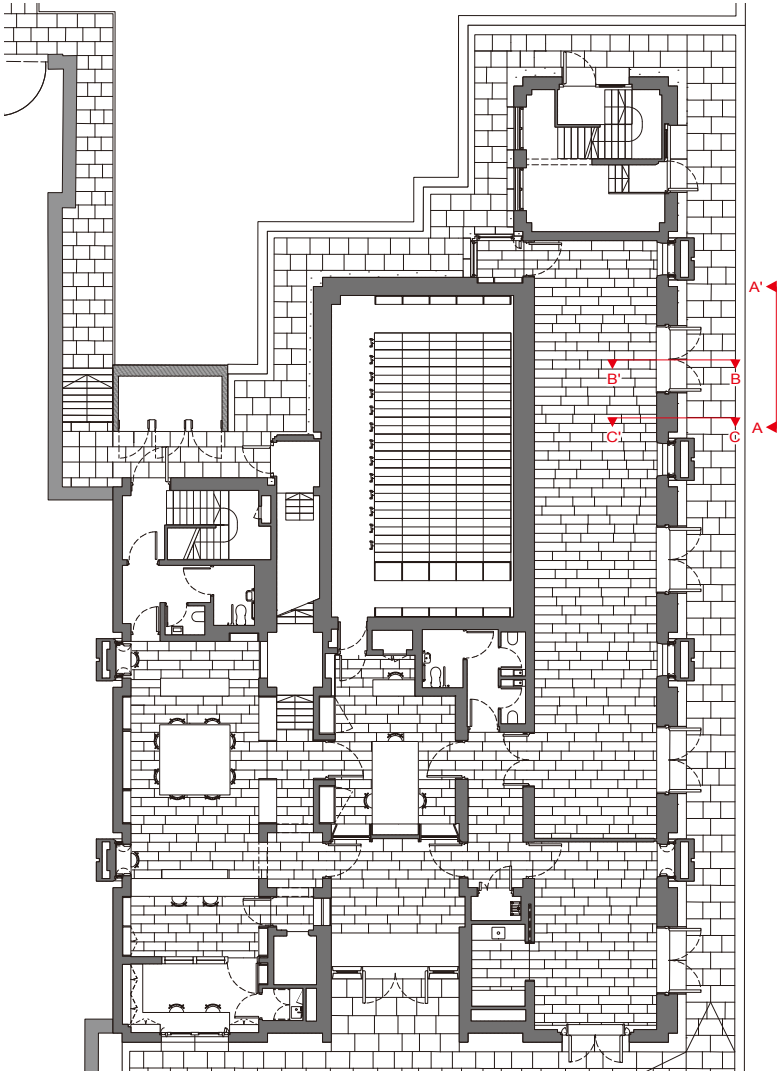
劍橋大學新圖書館位於一個高度敏感的歷史環境中，該項目沿著學區中兩座花園的邊界而造，其位置擴展了建築和庭院既有的排列，同時取代了相鄰的佩提斯大樓中狹窄且簡陋的設施，並整合既有檔案室和圖像室。設計團隊想讓建築成為一個逐漸上升的旅程，隱喻走向光明。在上升的過程中，會經過一些房間、長廊和藏書處，到達頂樓，則可看到草坪上的池塘。一個一個有規律的磚造煙囪支撐著地板和書架，並將暖空氣帶入建築內進行通風，在每組四個煙囪之間有一個天窗，將內部空氣引流上升，光線向下照耀，這種規律排列自然延伸出一種層次結構，狹窄區域用於流通，寬闊區用於閱讀。新圖書館的建材和形式靈感皆源自於周邊環境和學院規範，意即建造一個高度耐用的永續建築。承重磚、木地板和雙坡屋頂結構是既有建築元素，其中磚造煙囪使天際線看似更加生動，而石製窗花使門窗顯得格外亮眼。

The new building is sited in a highly sensitive historic setting, along the boundary wall between the enclosed space of the Master's Garden and the more open space of the Fellows' Garden. Its placement extends the quadrangular arrangement of buildings and courts that developed from the monastic origins of the college site. The new building replaces cramped and poorly equipped facilities in the adjacent Grade I Listed Pepys Building, with a larger library, incorporating an archive facility and a picture gallery. We wanted to make the building a journey that gradually rose up towards the light. On the way up there would be rooms, galleries and places to perch with a book. At the top, there would be views out over the lawn towards the water. A regular grid of brick chimneys supports the floors and book stacks and carries warm air up to ventilate the building. Between each set of four chimneys there is a roof lantern bringing light down into the spaces below: air rising and light falling. This regular array produces a natural hierarchy with narrow zones for circulation and wide zones for reading rooms. The materiality and form of the new library are derived both from its context and from the College's brief to make a highly durable and sustainable building. The older college buildings are of load bearing brick, with timber floors and gabled pitched roofs structures. Brick chimneys animate the skyline and stone tracery picks out the fenestration.

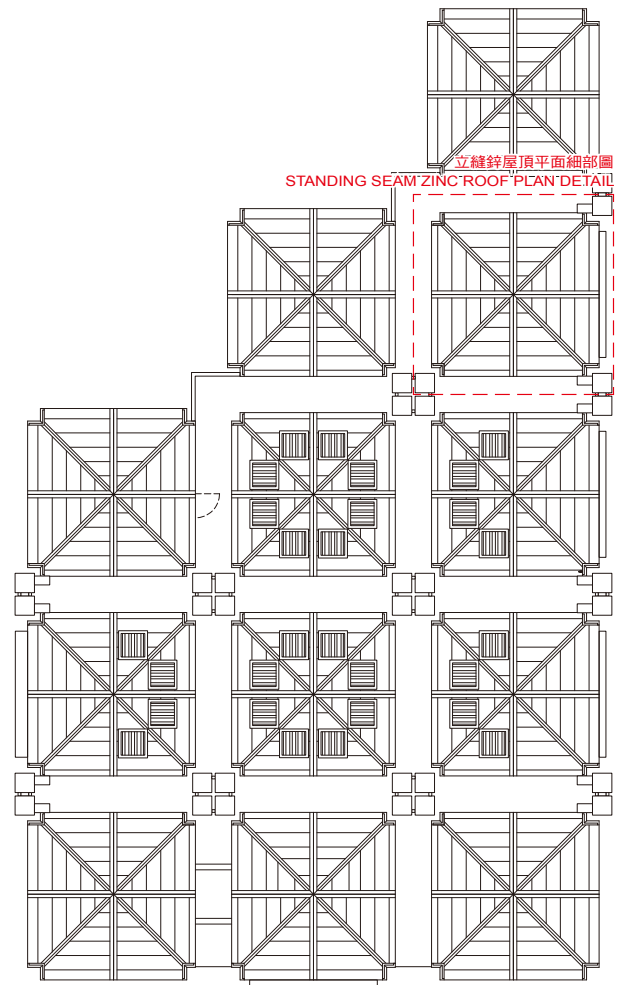




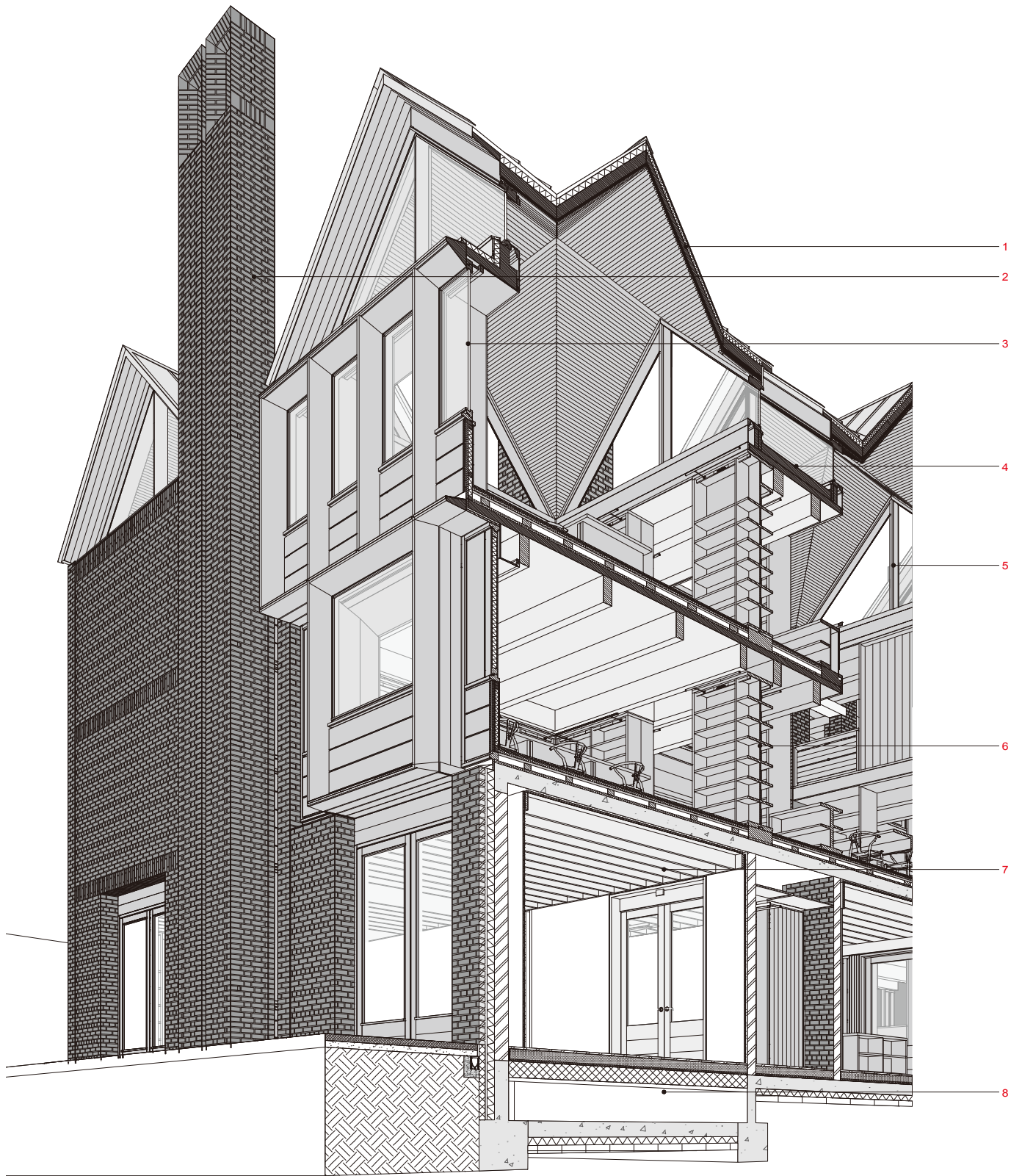
建築結構施作過程
THE PROCESS OF BUILDING CONSTRUCTION



地面層平面圖 GROUND FLOOR PLAN



屋頂平面圖 ROOF PLAN

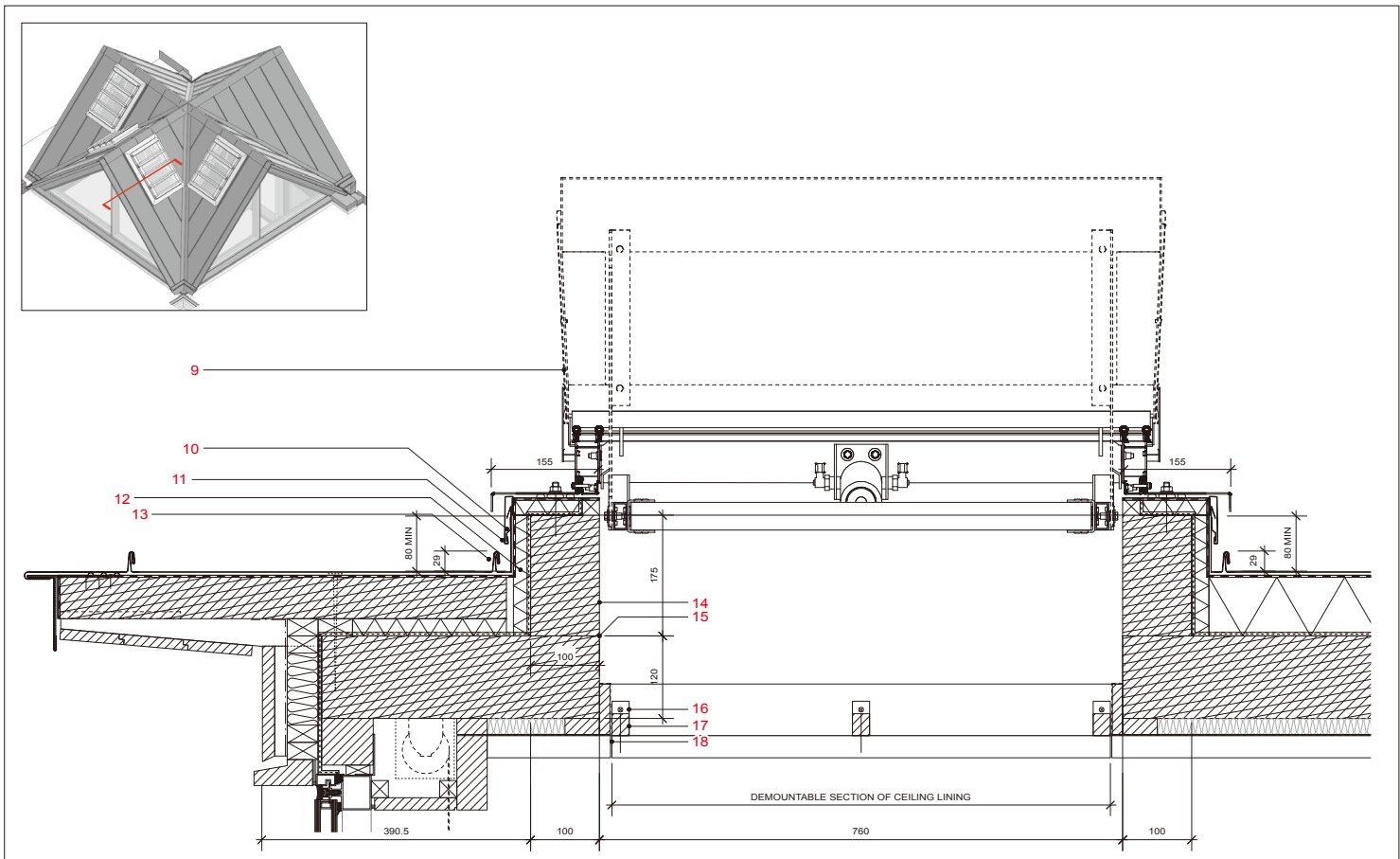


建築剖立面軸測圖 BUILDING SECTION AXONOMETRIC VIEW

1. 屋頂結構：立縫鋅覆層和底層；剛性絕緣體；高性能隔汽層；CLT結構板；織物飾面隔音；橡木板條
2. 煙囪：手工砌磚210毫米厚，15毫米草縫；煙囪末端由特殊形狀的磚製成，並配有與之相匹配的磚包層預製混凝土頂蓋
3. 窗台：外部實心膠合橡木圍邊；固定和可打開的雙層玻璃窗和特製實心橡木框架中的隔熱木百葉窗；跨越樓板之間的內部CLT結構；纖維板，以匹配室內木作
4. 平屋頂天窗：加強瀝青防水卷材；剛性絕緣；高性能蒸汽阻隔層；CLT結構板；膠合雲杉地板梁

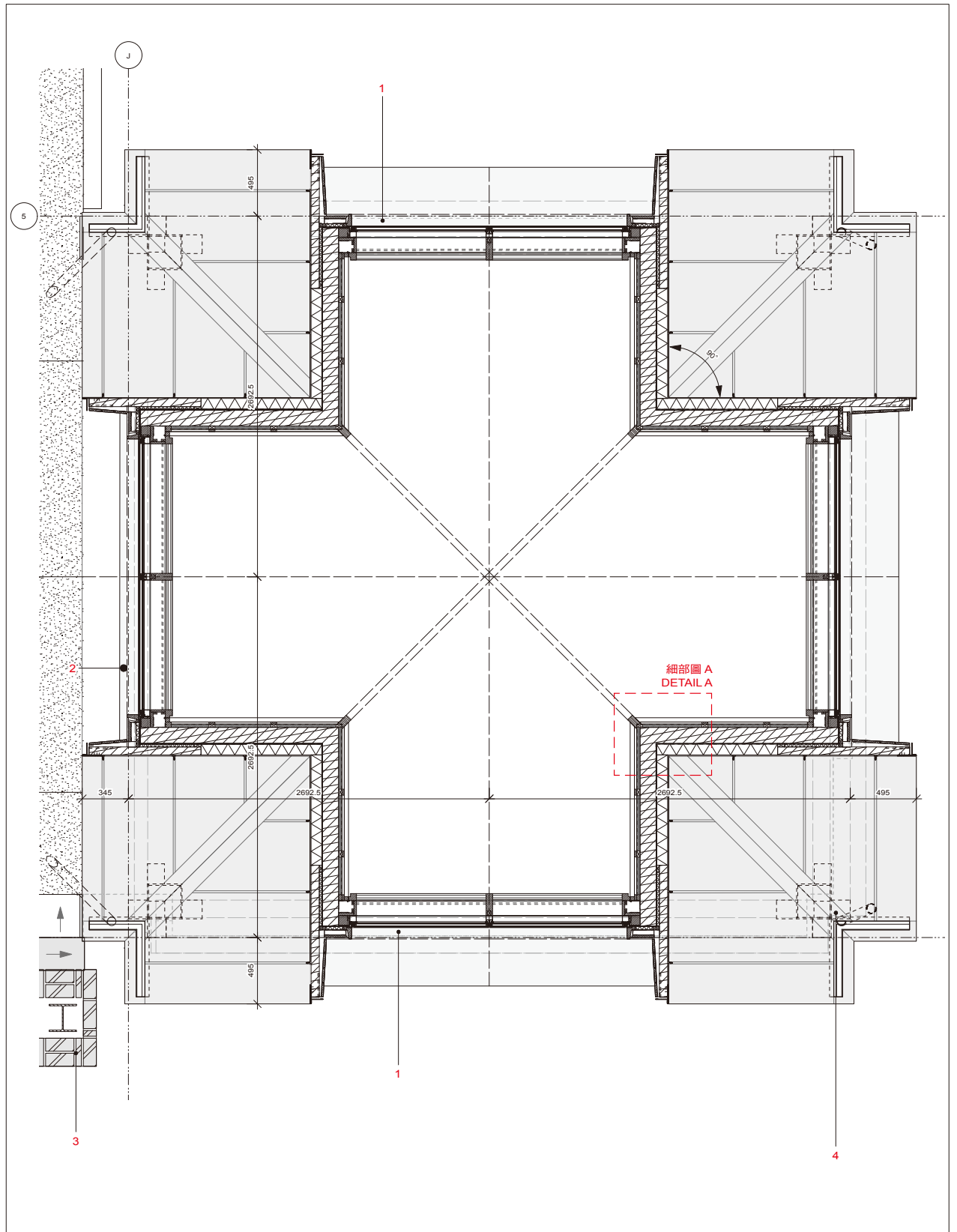
5. 玻璃山牆：鉛框幕牆系統中的雙層玻璃；橡木露出內部襯裡
6. 書架：特製實心橡木書櫃，具可調節書架和內置照明
7. 畫廊天花板：結構拱腹採用木材覆層，具有吸音效果；單點畫廊照明插座和周邊掛畫導軌和通風回風分配
8. 畫廊地板：波特蘭石板；剛性絕緣；在地板上形成氣流用於通風送風分配；樁基礎上的現澆混凝土樓板
9. 百葉窗通風口760×1200
10. 滴水板
11. 天窗防水板

12. 泡沫隔熱板25毫米
13. 立縫鋅屋頂
14. CLT表面塗漆以搭配襯物顏色
15. 接縫處需密封以確保氣密
16. 開口邊緣的支撐板條
17. 橡木支撐板條與拱腹襯裡相匹配
18. 2毫米接頭



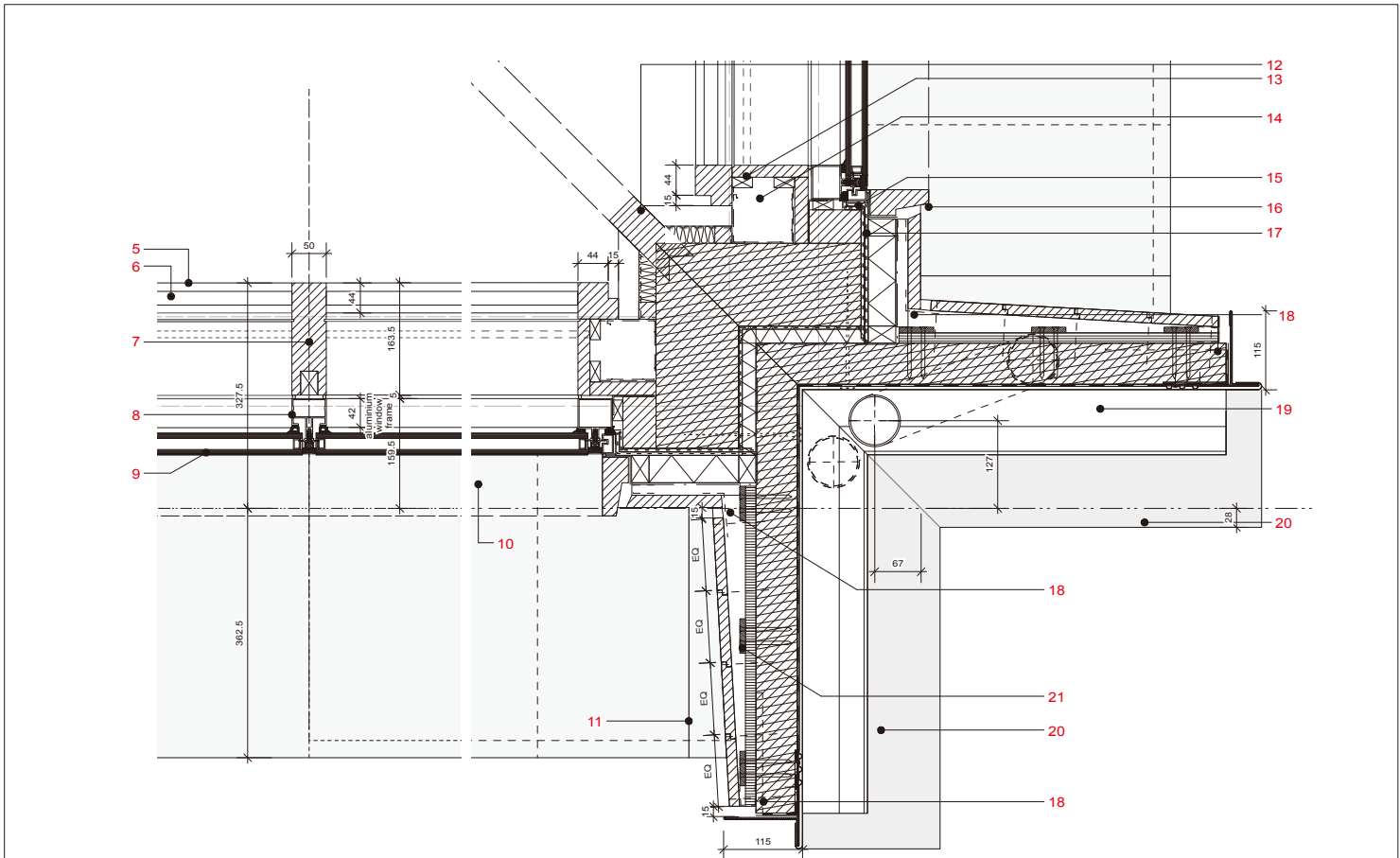
天窗結構剖面細部圖 SKYLIGHT CONSTRUCTION SECTION DETAIL

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|--|--|--|
| <p>1. roof build-up: standing seam zinc cladding and underlay; rigid insulation; high performance vapour barrier; CLT structural slab; acoustic insulation with fabric facing; oak slats</p> <p>2. chimney: hand-laid brickwork 210 mm thick with 15 mm coursing joints; chimney terminals formed in brick with special shapes and brick-clad precast concrete caps to match</p> <p>3. window bays: external solid glue-laminated oak surrounds; fixed and opening double glazing and insulated timber-clad shutters in purpose-made solid oak frames; internal CLT structure spanning between floor slabs; internal reveals lined with veneered MDF to match internal joinery</p> | <p>4. flat roofs between roof lanterns: reinforced bitumen membrane to falls; on rigid insulation; on high performance vapour barrier; on CLT structural deck; on glue-laminated spruce floor beams</p> <p>5. gable glazing: double glazing in aluminium framed curtain walling system; oak reveal linings internally</p> <p>6. book shelves: purpose-made solid oak bookcases with adjustable shelves and built-in lighting</p> <p>7. gallery ceiling: timber cladding to structural soffit, incorporating acoustic absorption; Monopoint gallery lighting sockets and perimeter picture hanging rail and ventilation return air distribution</p> <p>8. gallery floor build-up: portland stone slabs; on floating</p> | <p>scree; on rigid insulation; on beam and block suspended floor forming plenum for ventilation supply air distribution; in-situ concrete ground slab on piled foundation</p> <p>9. louvre vent 760 × 1200</p> <p>10. drip</p> <p>11. skylight flashing</p> <p>12. 25 mm rigid insulation</p> <p>13. standing seam</p> <p>14. CLT surface to be painted to match fabric lining colour</p> <p>15. slab joint to be sealed to ensure airtight</p> <p>16. bracket supporting batten at edge of opening</p> <p>17. oak support batten to match soffit lining</p> <p>18. 2 mm joint</p> |
|--|--|--|



立縫鋅屋頂平面細部圖 STANDING SEAM ZINC ROOF PLAN DETAIL

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|--------------------------|----------------------|--|
| 1. 窗戶製造商制的PPC鋁製防水板 | 9. 玻璃 | 18. 昆蟲網 |
| 2. 鋁門檻 | 10. 窗戶承包商提供的沖壓PPC鋁窗台 | 19. 隱藏式凹槽天溝 |
| 3. 煙囪 | 11. 沖壓PPC鋁門檻 | 20. 連續鍍鋅屋簷 |
| 4. 熔焊雨水管偏移到牆腔中 | 12. 實心橡木肋骨與天花板連接處 | 21. 鋼支架天溝；支架應塗漆或覆蓋合適薄膜，以防止橡木屋簷底板的單寧酸影響鋼材 |
| 5. 窗台邊緣採用實心橡木框架 | 13. 18毫米橡木襯至窗戶 | |
| 6. LED燈帶 | 14. 窗簾盒 | |
| 7. 實心橡木蓋板通過隱藏式固定裝置固定在窗框上 | 15. 窗戶承包商提供的防風雨底板封隔器 | |
| 8. 鋁幕牆系統 | 16. 窗戶用橡木框架 | |
| | 17. EPDM橡膠層 | |

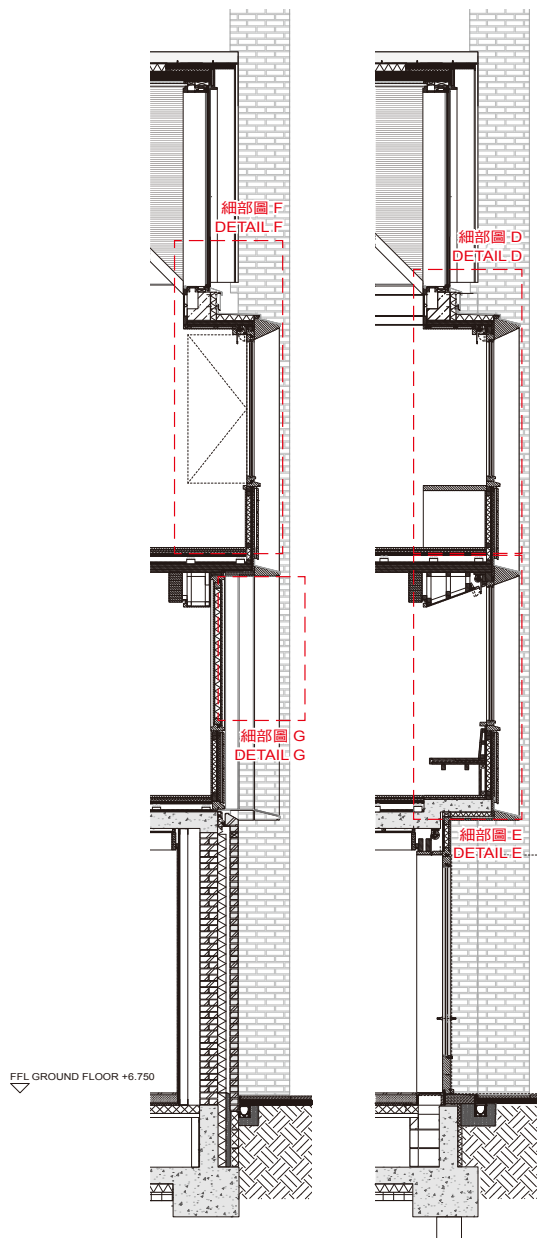


細部圖 A DETAIL A

1. pressed PPC aluminium flashing by window fabricator
2. aluminium sill
3. chimney
4. fusion welded rainwater pipe offsets into wall cavity
5. solid oak framing to edge of sill
6. LED strip light
7. solid oak coverpiece fixed to mullion with concealed fixings
8. Anodised aluminium mullion to curtain wall system
9. glazing

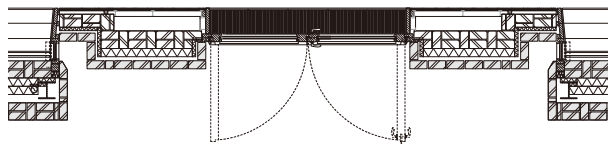
10. pressed PPC aluminium sill by window subcontractor
11. pressed PPC aluminium sill
12. solid oak rib to ceiling junction
13. 18 mm oak lining to window reveal
14. recess for blind guide dashed
15. weathertight insulated packer by window fabricator
16. profiled oak framing to window
17. EPDM
18. insect Mesh

19. concealed recess gutter
20. continuous zinc eaves strip
21. steel bracket gutter supports; steel brackets to be painted or covered in suitable membrane to prevent tannic acid from oak soffit lining affecting steels

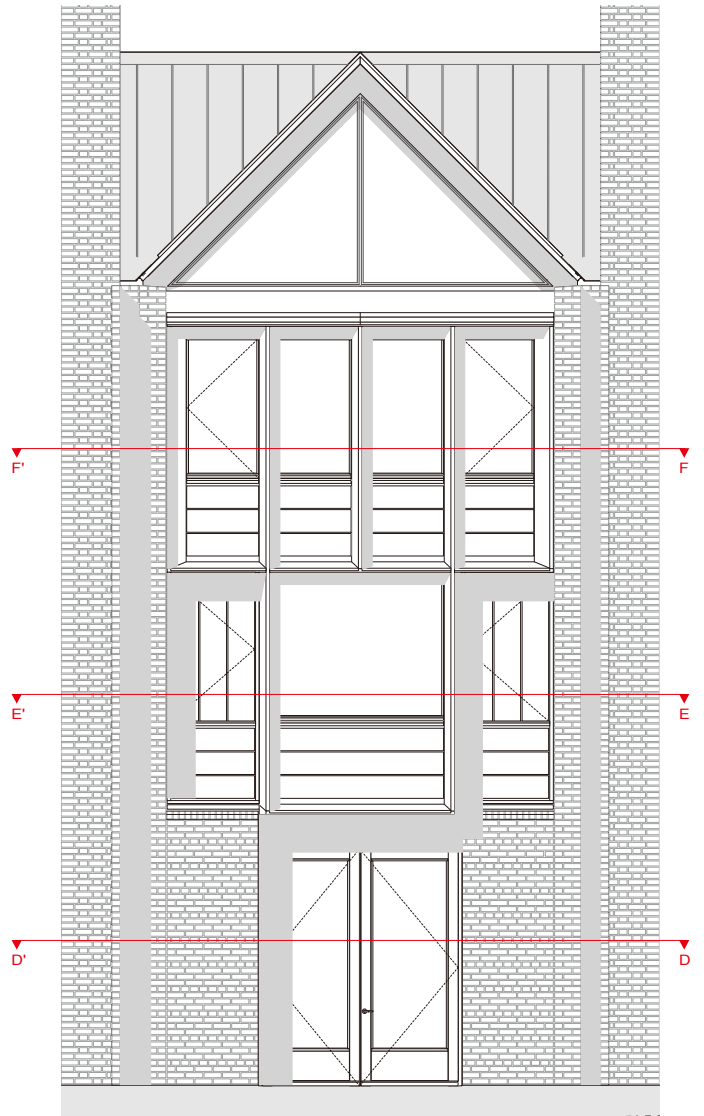


建築剖面圖 C-C'
BUILDING SECTION C-C'

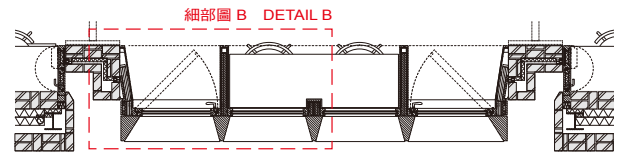
建築剖面圖 B-B'
BUILDING SECTION B-B'



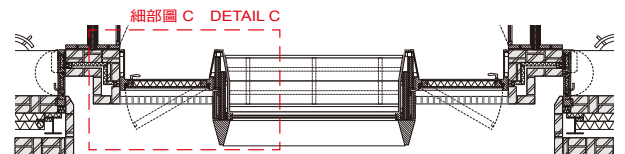
建築剖面圖 D-D'
BUILDING SECTION D-D'



建築正立面圖 A-A' BUILDING ELEVATION A-A'



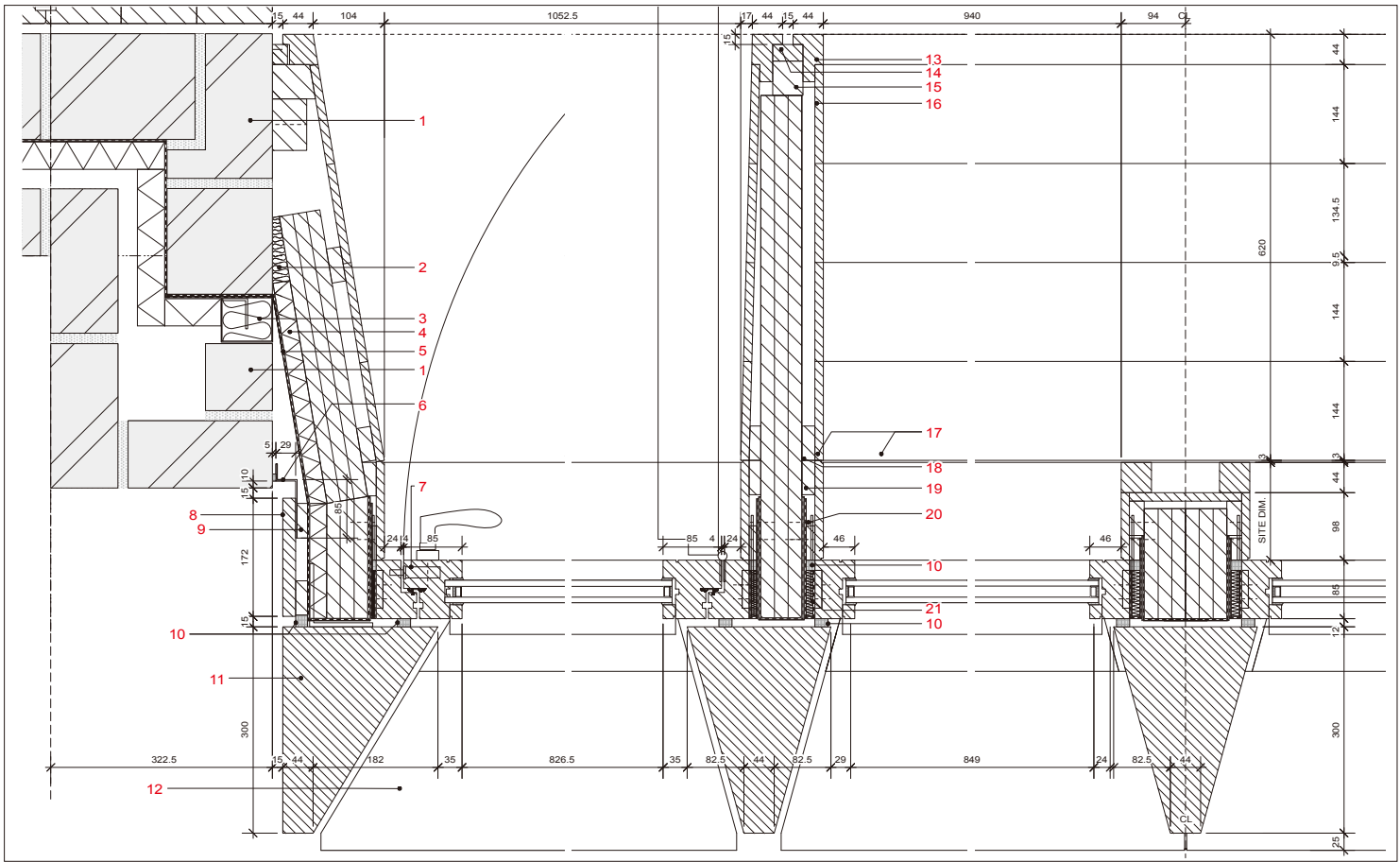
建築剖面圖 F-F' BUILDING SECTION F-F'



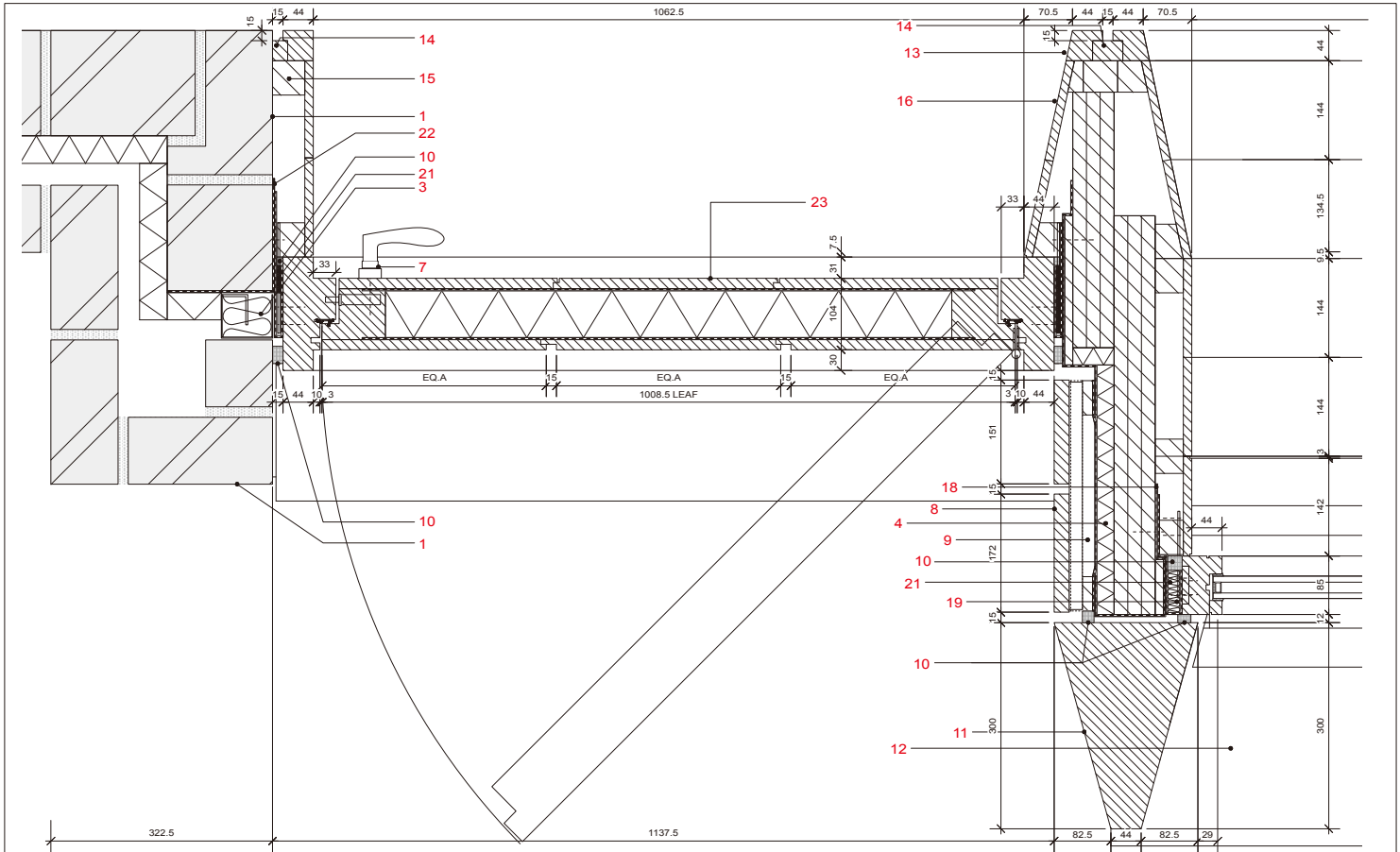
建築剖面圖 E-E' BUILDING SECTION E-E'

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| 1. brickwork | 13. solid HW nosing |
| 2. fill joint with expanding foam filler to provide flexible air-tight seal between brickwork and CLT | 14. solid HW backing to shadow gap |
| 3. cavity barrier | 15. SW support |
| 4. rigid insulation | 16. veneered MDF lining |
| 5. membrane | 17. 3×3 mm expressed joint align with blind box cover above |
| 6. PPC aluminium flashing screw fixed to SW support to weather boarding; joint with brickwork sealed with mastic | 18. self-adhesive waterproof and airtight membrane adhered to CLT |
| 7. lever handle and multi-point lock | 19. continuous window membrane wrapped around window fixing straps and sealed to membrane on CLT |
| 8. HW timber weatherboarding | 20. restraint strap fixing for window screw fixed to CLT |
| 9. support battens to provide drainage to cavity | 21. back-fill cavity with expanding foam filler |
| 10. flexible foam sealing strip | 22. self-adhesive waterproof and airtight membrane adhered to brickwork |
| 11. gluelaminated HW projecting screen | 23. timber shutter |
| 12. PPC aluminium cill | |

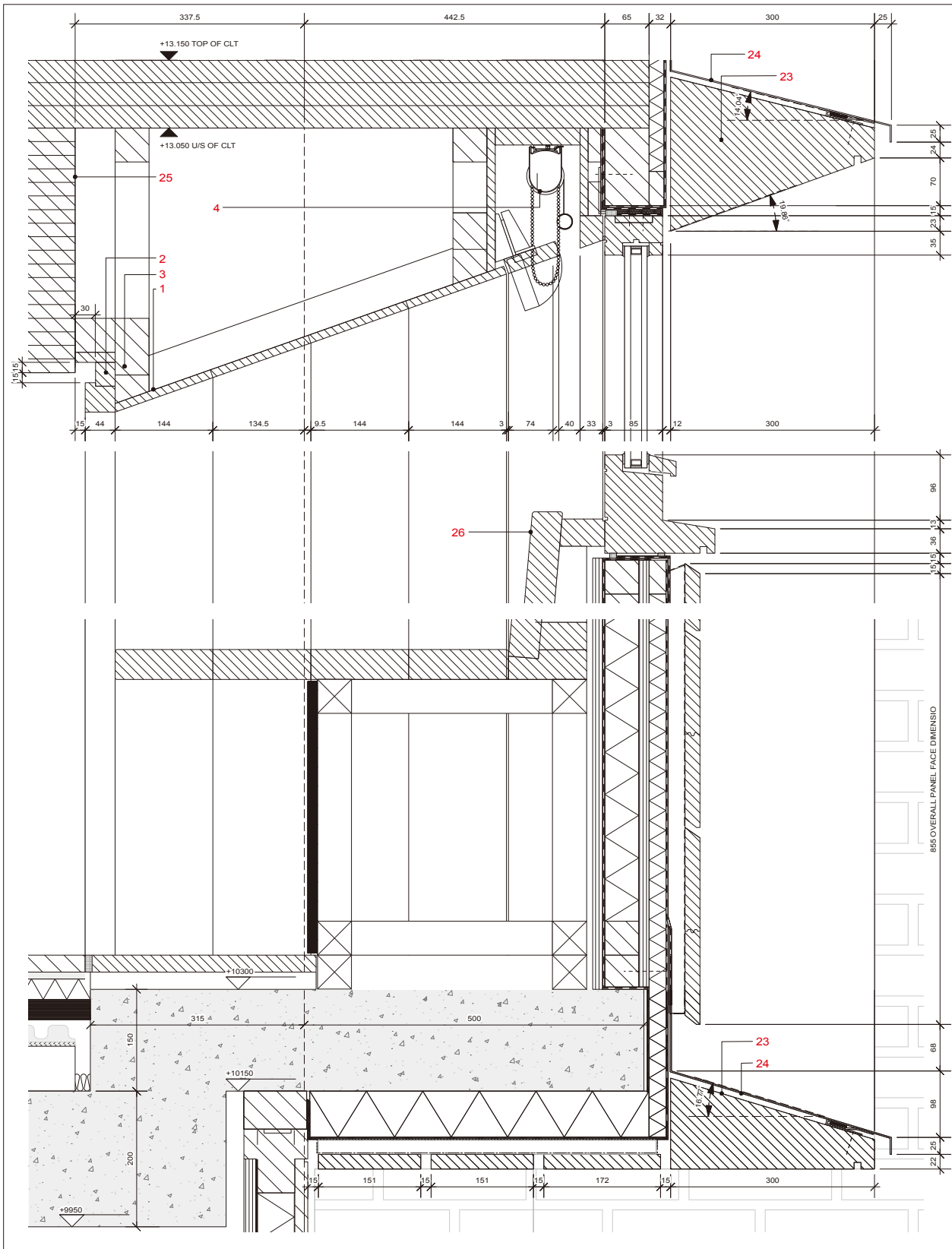
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| 1. 砌磚 | 13. 實心硬木前緣 |
| 2. 用膨脹泡沫填料填充接縫，以在砌磚和 CLT 之間提供靈活的氣密效果 | 14. 脫縫處的支撐材 |
| 3. 防火屏障 | 15. 支撐材 |
| 4. 泡沫隔熱板 | 16. MDF 貼面襯里 |
| 5. 膜 | 17. 3×3 毫米的明裝接頭與上面的盲盒蓋對齊 |
| 6. PPC 鋁製防水板，用螺絲固定在防水板上；磚砌體接縫用膠泥密封 | 18. CLT 自黏防水氣密膜 |
| 7. 槓桿手柄和多點鎖 | 19. 連續窗膜纏繞在窗戶固定帶上並密封到 CLT 上 |
| 8. HW 木材擋風板 | 20. 以鍍鋅角鋼固定 CLT 窗戶螺絲 |
| 9. 支撐板條為孔隙提供排水 | 21. 用膨脹泡沫填料回填孔隙 |
| 10. 泡棉條 | 22. 自黏防水氣密膜依附在磚牆上 |
| 11. 膠合硬質投影屏幕 | 23. 木百葉窗 |
| 12. PPC 鋁窗框 | |



細部圖 B DETAIL B

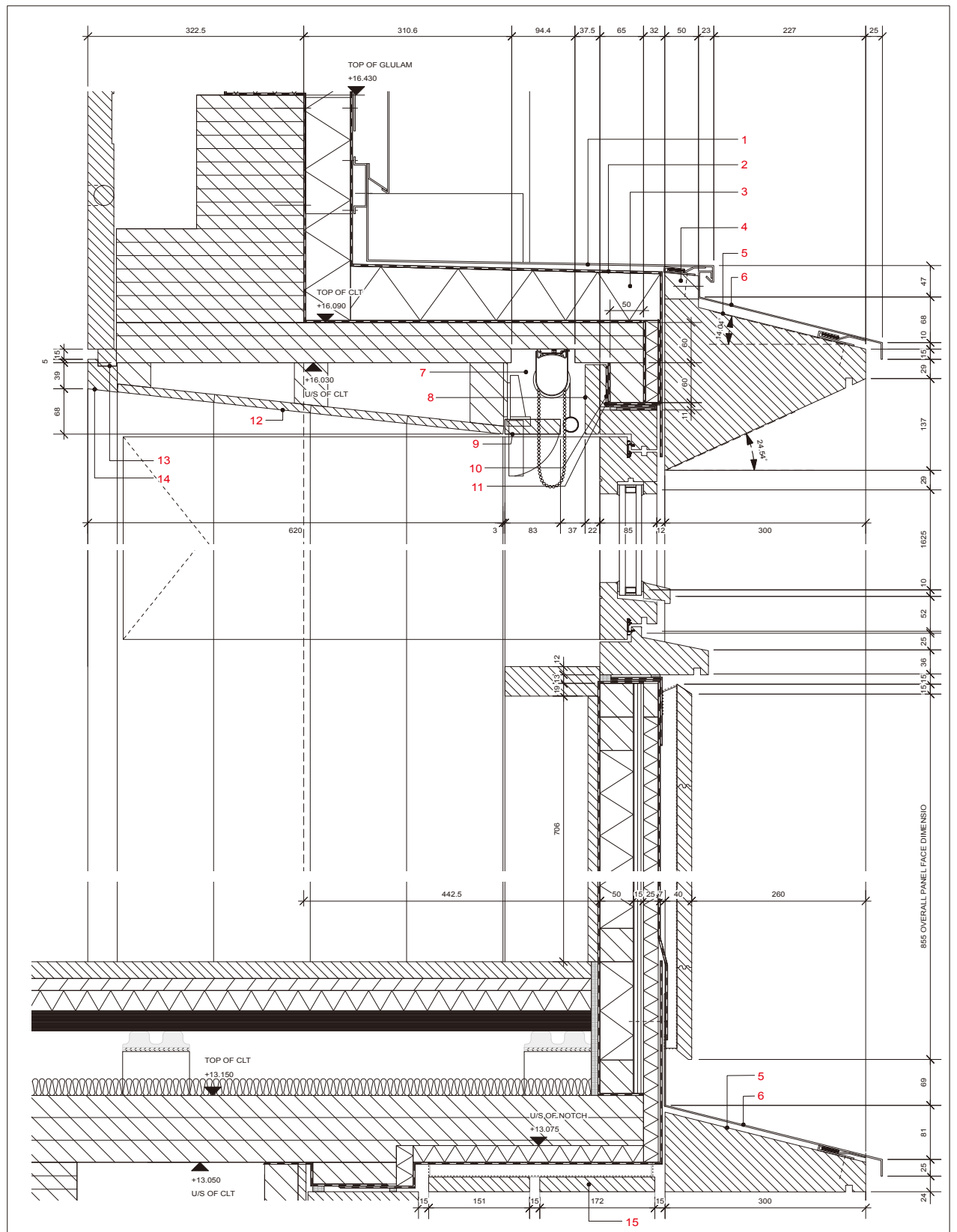


細部圖 C DETAIL C



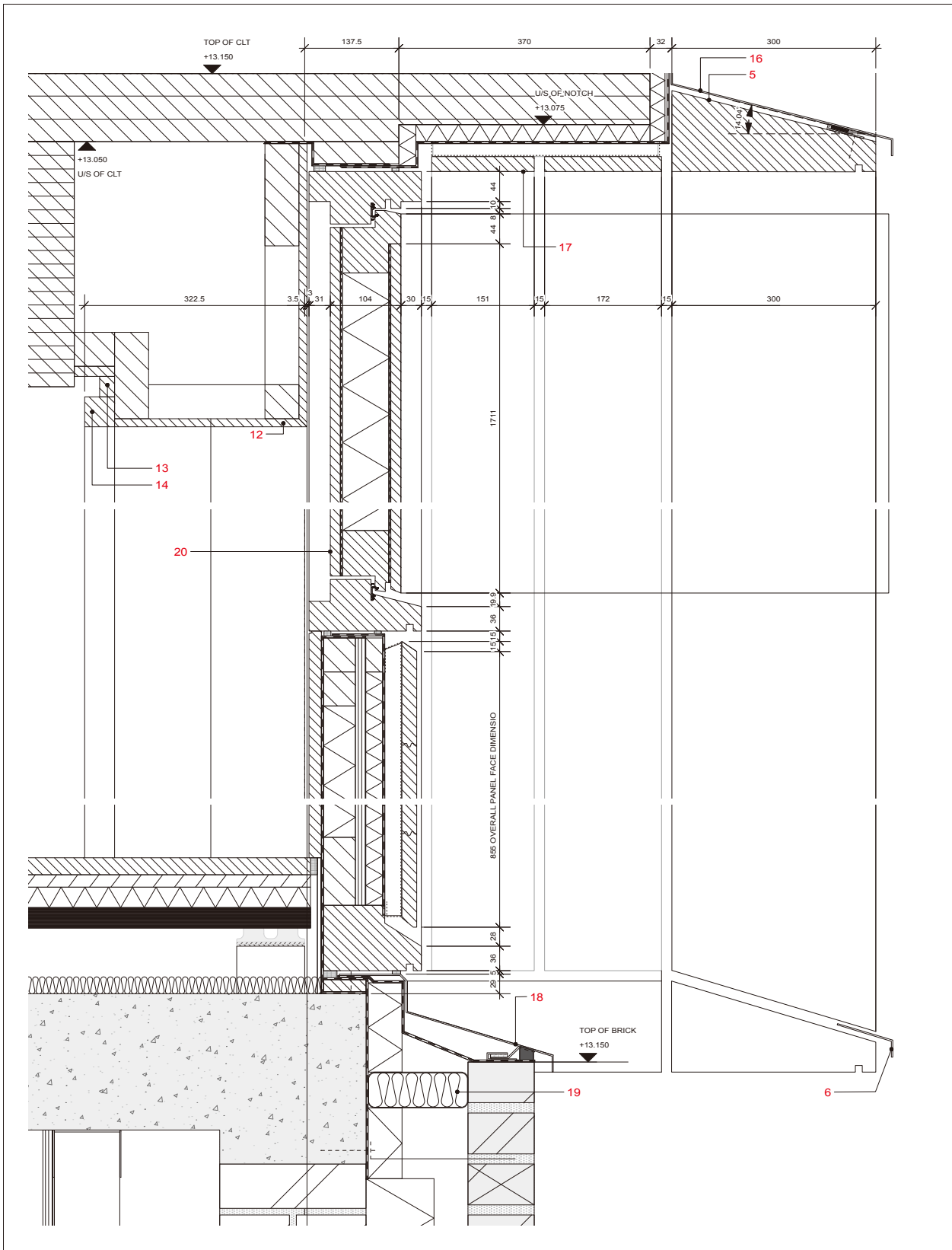
細部圖 E DETAIL E

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| <ul style="list-style-type: none"> 1. veneered MDF lining 2. solid HW backing to shadow gap 3. solid HW nosing 4. blinds 5. SW support for window head 6. HW lining to blind box 7. hinged blind cover on concealed hinges; notch at end to accommodate chain 8. self-adhesive waterproof and airtight membrane 9. desk light | <ul style="list-style-type: none"> 10. wood windows 11. fitted timber desk 12. stud wall framing 13. weatherboarding 14. cladding battens / Drained & ventilated cavity 15. breather membrane 16. insulation 25 mm thick 17. plywood sheathing 18. insect mesh backing to all intermediate & perimeter joints 19. aluminium weathering | <ul style="list-style-type: none"> 20. waterproof membrane 21. rigid tapered insulation 22. shaped treated SW support for flashing 23. gluelaminated HW projecting screen 24. PPC aluminium cill as H72/260 25. spruce glulam beam 26. bench seat |
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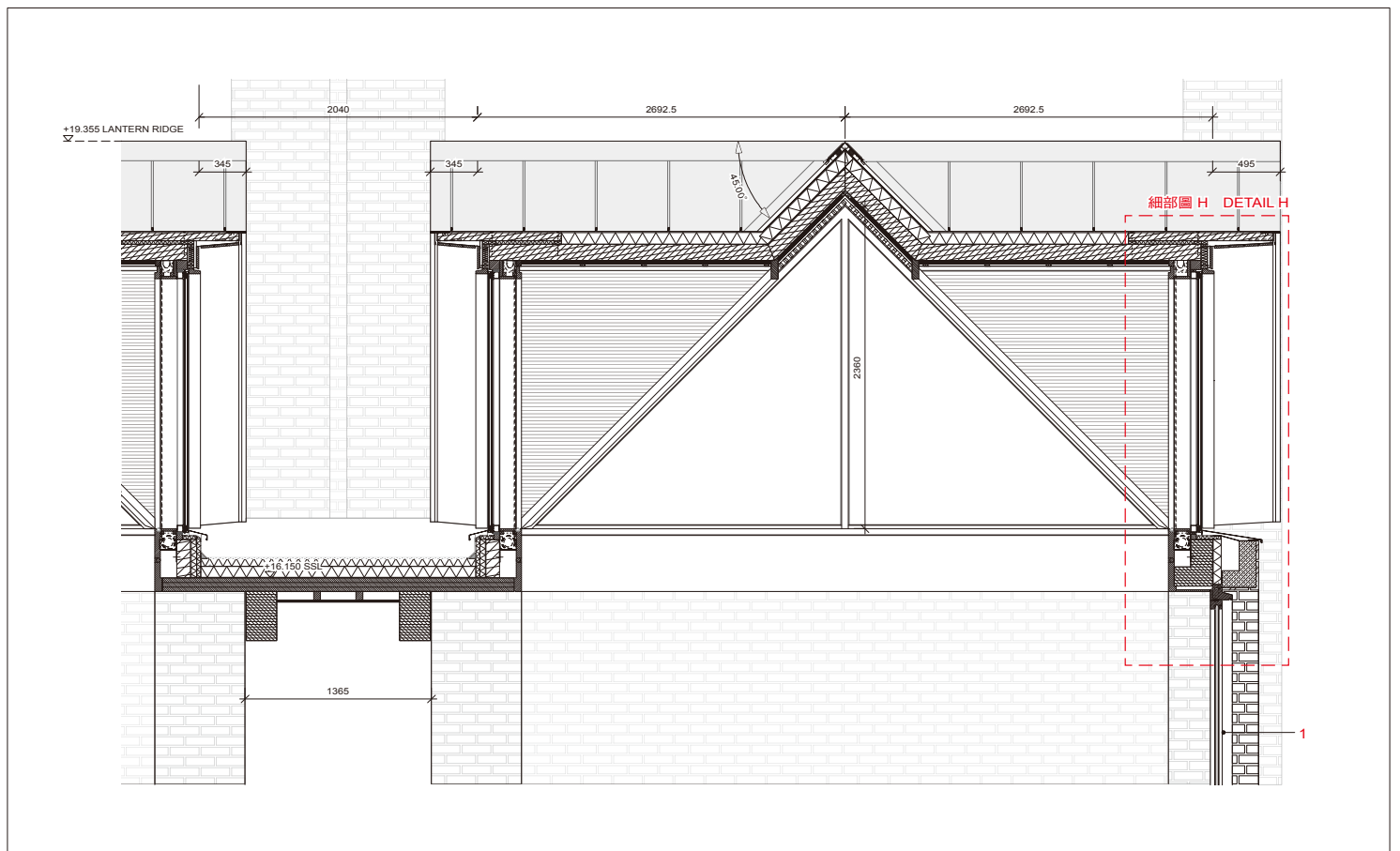
細部圖 F DETAIL F

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| 1. 風化鋁材 | 9. 隱藏式鉸鏈上的鉸接盲盒蓋；
鏈條末端有缺口 | 16. 鋁窗框 |
| 2. 防水膜 | 10. 自黏氣密防水膜 | 17. 屋簷底板；在經過處理的SW覆層板條
25×50；透氣膜；25毫米泡沫隔熱板 |
| 3. 錐形泡沫隔熱板 | 11. 泡棉條 | 18. PPC鋁窗框；後邊緣固定在
百葉窗面板下方的直立位置 |
| 4. 經成型處理的SW支撐防水板 | 12. MDF貼面襯里 | 19. 防火屏障 |
| 5. 膠合硬質投影屏幕 | 13. 脫縫處的支撐材 | 20. 木質百葉窗 |
| 6. PPC鋁窗框 | 14. 實心硬木前緣 | |
| 7. 百葉窗簾 | 15. 屋簷底板 | |
| 8. 硬質襯裡盲盒 | | |



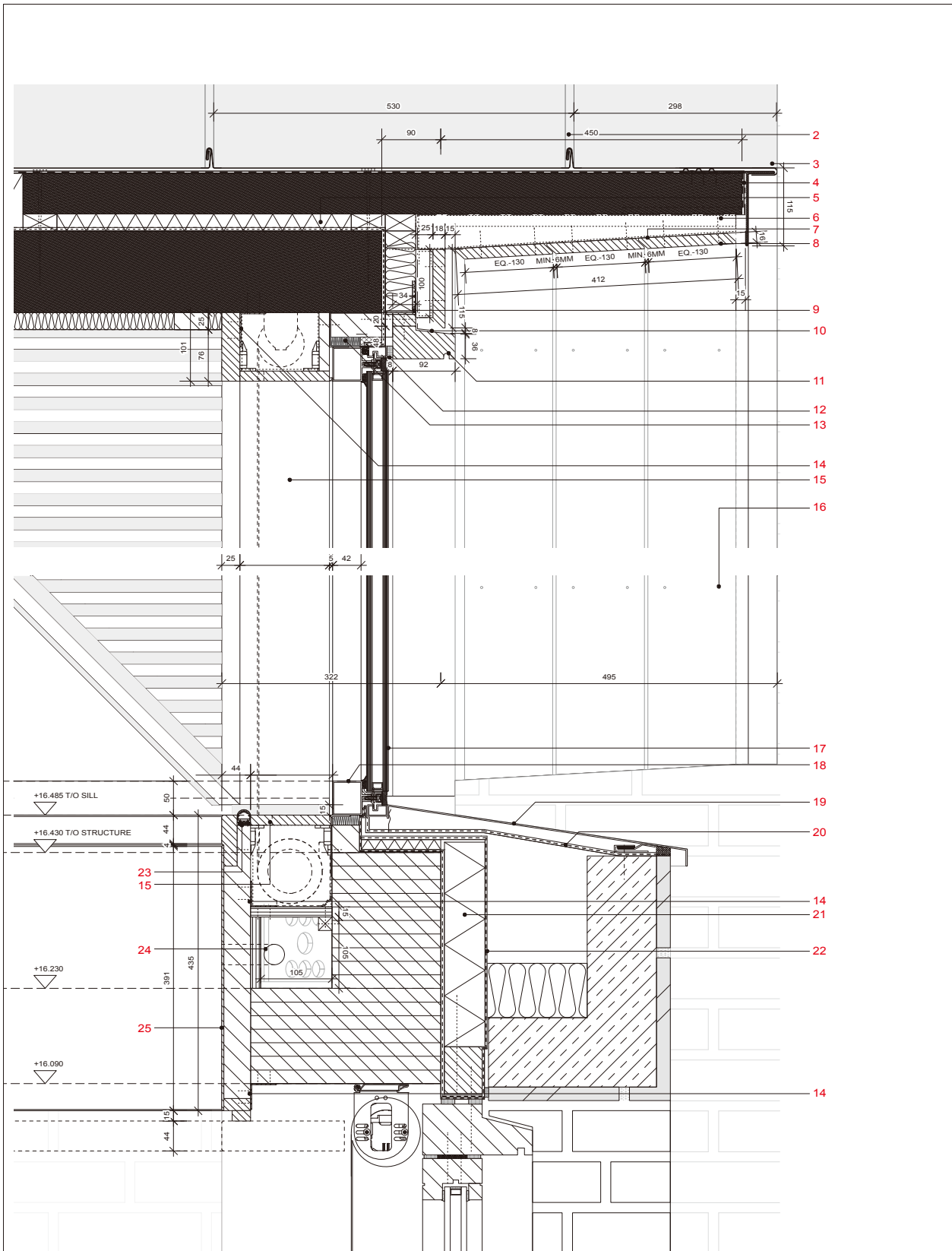
細部圖 G DETAIL G

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| <ul style="list-style-type: none"> 1. aluminium weathering 2. waterproof membrane 3. rigid tapered insulation 4. shaped treated SW support for flashing 5. gluelaminated HW projecting screen 6. PPC aluminium cill 7. blinds 8. HW lining to blind box | <ul style="list-style-type: none"> 9. hinged blind box cover on concealed hinges; notch at end for chain 10. self-adhesive airtight and waterproof membrane 11. flexible foam sealing strip 12. veneered MDF lining 13. solid HW backing to shadow gap 14. solid HW nosing 15. soffit cladding | <ul style="list-style-type: none"> 16. aluminium cill as H72/255 17. soffit cladding; on treated SW cladding battens 25×50; on breather membrane; 25 mm rigid insulation 18. PPC aluminium cill; back edge fixed to upstand below shutter panel 19. cavity barrier 20. wood shutter |
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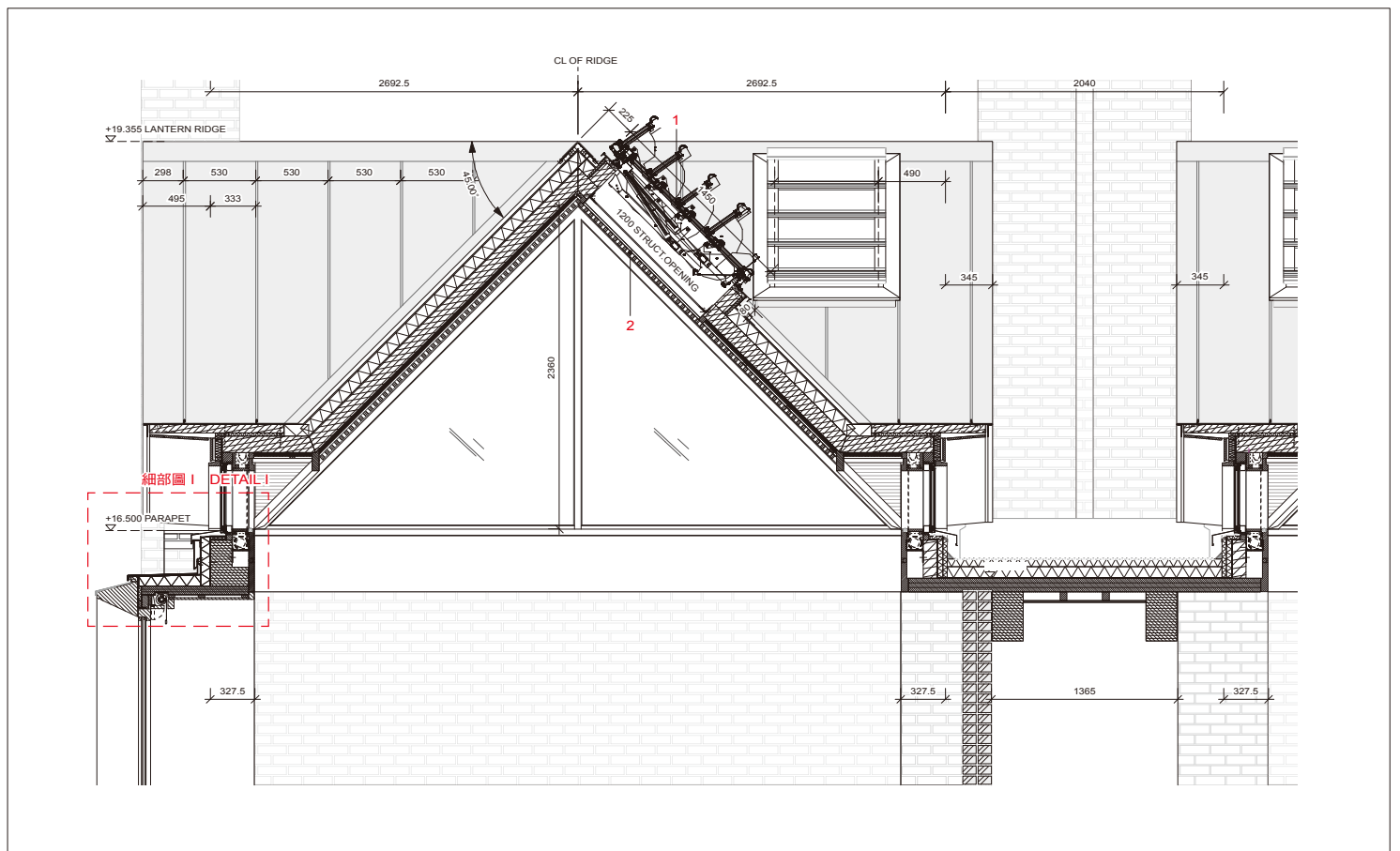
立縫鋅屋頂結構剖面細部圖 A STANDING SEAM ZINC ROOF CONSTRUCTION SECTION DETAIL A

- | | | |
|--------------------------------|-----------------------------|-------------------|
| 1. 木框窗 | 10. 透氣膜覆蓋在後方鉛框上
並用雙面膠帶密封 | 19. 沖壓鋁門檻 |
| 2. 立縫鋅屋頂 | 11. 窗戶用橡木框架 | 20. EPDM橡膠層，重疊防水膜 |
| 3. 連續鍍鋅屋簷 | 12. 複合泡沫膠帶 | 21. 絕緣體 |
| 4. 依附CLT之膜層 | 13. 縫隙用膨脹泡沫回填 | 22. 透氣膜 |
| 5. 30毫米泡沫隔熱板 | 14. 距離中心350毫米的角鋼 | 23. LED燈 |
| 6. 18毫米膠合板 | 15. 可拆卸橡木面板 | 24. 30毫米通風管 |
| 7. 昆蟲網 | 16. 不鏽鋼固定件 | 25. 橡木板，帶有橡木唇緣 |
| 8. 錐形板條上的橡木屋簷底板 | 17. 玻璃 | |
| 9. 由窗戶分包商製作的EPDM橡膠層
包覆在透氣膜下 | 18. 鋁幕牆系統 | |



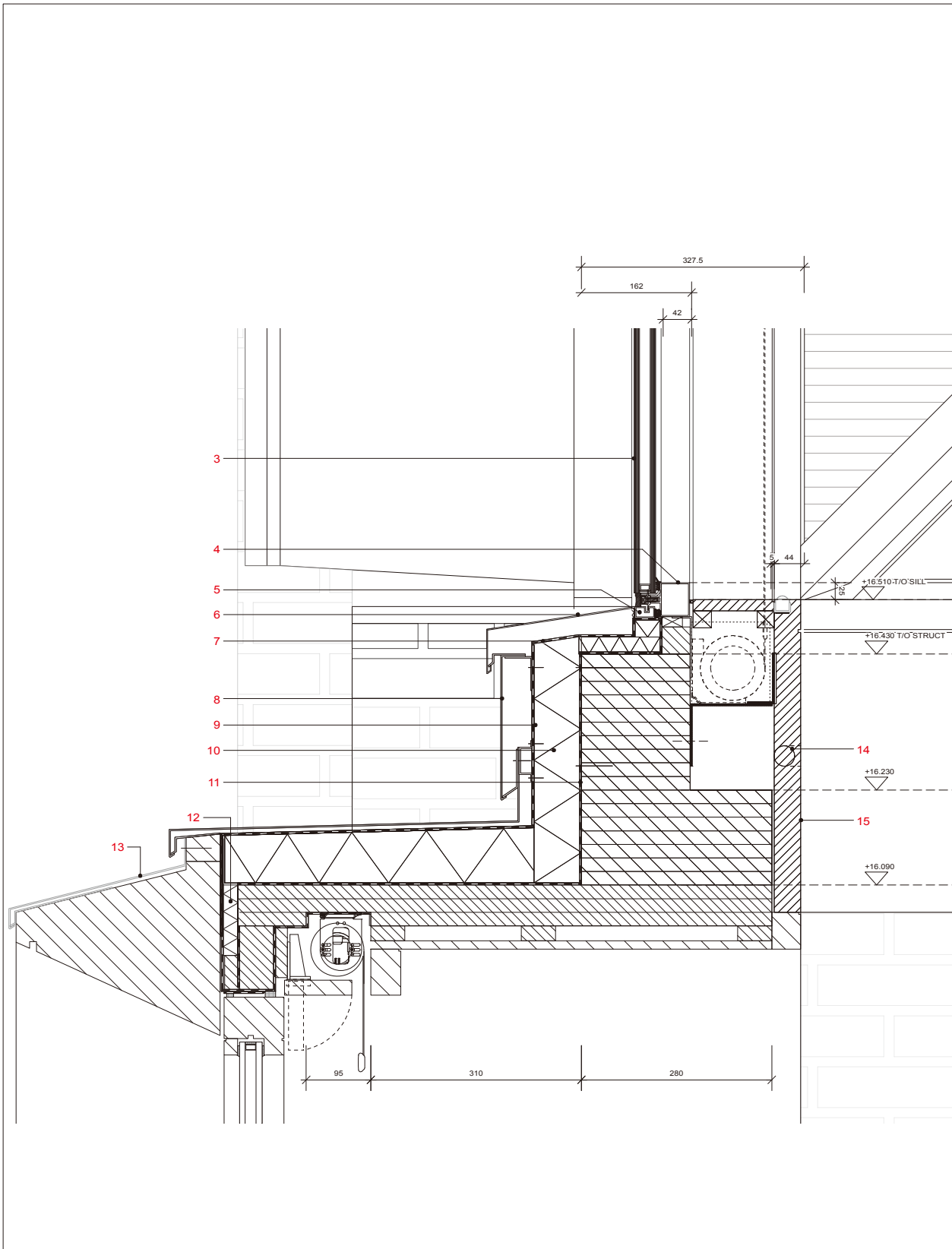
細部圖 H DETAIL H

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|--|---|---|
| <ul style="list-style-type: none"> 1. timber framed window 2. standing seam 3. continuous zinc eaves strip 4. membrane adhered to CLT 5. 30 mm rigid insulation 6. 18 mm plywood 7. insect Mesh 8. oak soffit lining on tapered battens 9. integral EPDM by window subcontractor lapped under breather membrane | <ul style="list-style-type: none"> 10. breather membrane to lap over cill behind fascia and sealed to cill with double-sided tape. 11. profiled oak framing to window as H21 12. compriband seal 13. gap to be backfilled with expanding foam 14. angle brackets at 350 mm centres 15. removable oak panel 16. stainless steel lost head nail fixings 17. glazing 18. anodised aluminium curtain wall system | <ul style="list-style-type: none"> 19. pressed aluminium sill 20. integral EPDM by window subcontractor lapped over waterproof membrane 21. insulation 22. breather membrane 23. LED light 24. 30 mm aspirator pipe 25. oak veneered fascia panel with concealed oak lipping to lanterns |
|--|---|---|



立縫鋅屋頂結構剖面細部圖 B STANDING SEAM ZINC ROOF CONSTRUCTION SECTION DETAIL B

- | | |
|-------------------------|----------------|
| 1. AOV系統百葉窗 | 8. 鋁材 |
| 2. 天花板上可拆卸的木板條面板 | 9. 防水膜 |
| 3. 玻璃 | 10. 60毫米泡沫隔熱板 |
| 4. PPC鉛幕牆系統 | 11. 防潮層 |
| 5. 窗戶承包商提供的防風雨底板封隔器 | 12. 將膠合木固定至CLT |
| 6. 鉛門檻 | 13. PPC鉛窗框 |
| 7. 窗戶承包商將EPDM橡膠層重疊在防水膜上 | 14. 30毫米通風管 |
| | 15. 可拆卸橡木板 |



細部圖 I DETAIL I

1. louvered AOV
2. demountable timber slatted panel in ceiling
3. glazing
4. PPC aluminium curtain wall system
5. weathertight insulated packer by window fabricator
6. aluminium sill
7. integral EPDM by window subcontractor lapped over waterproof membrane

8. aluminium
9. waterproof membrane
10. 60 mm rigid insulation
11. vapour barrier
12. fixing of Glulam fins to CLT
13. PPC aluminium cill
14. 30 mm aspirator pipe
15. removable oak fascia