STRUCTURAL FIREMAN PROFESSIONAL SERIES

STRUCTURAL ENGINEERING PRACTICE & HKIE MCQ MASTERY

FOR GRADUATE ENGINEERS

AND HKIE STRUCTURAL EXAMINATION CANDIDATES

VOLUME 2

CONSTRUCTION, BUILDING CONTROL AND PROFESSIONAL JUDGEMENT

SITE SEQUENCE • TEMPORARY WORKS • QUALITY CONTROL

STATUTORY CONTROL • CONTRACTS • PROFESSIONAL DUTIES

BY STRUCTURAL FIREMAN

INDEPENDENT STRUCTURAL ENGINEERING STUDY GUIDE

Inside This Sample

Four curated selections show how the book connects construction-stage behaviour, statutory control and professional judgement. Printed page numbers refer to the full volume.

The complete volume also includes 18 chapters, chapter reviews, mock papers, source notes and appendices.

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Description

Introduction

HKIE Structural Examination 的筆試分為兩節：Section 1 為一小時的 Multiple Choice Questions，Section 2 為 Design Questions。考生須分別通過兩節，才算通過筆試。本書集中處理 Section 1，其考核範圍包括 Structural Engineering Concept、Construction Skills、Building Control、Contract and Construction Management，以及經濟、健康、安全和法定規定等課題。HKIE 列出的是主要範疇，並沒有逐項列明所有可能出現的知識點；考生需要在掌握基本概念之餘，懂得自行查閱相關的 Code、PNAP 及法例。

這些課題看似分散，實際上都與結構工程師的日常判斷有關。設計時要理解 load path，以及 support 和 member 的實際行為；施工時要考慮 temporary condition、construction sequence 和現場條件；處理圖則、法定要求或合約事項時，則要分清各方的責任及決策依據。Section 1 的題目通常篇幅不長，但一個被忽略的條件，已足以改變答案。

Section 1 容許使用參考書、筆記及指定電子設備，但 open-book 考試並不代表考生有時間從頭翻閱每份文件。本書也不可能涵蓋所有 Code 細節；例如 reinforcement lap length 或 structural glass design，考生須知道應查閱哪份文件，並理解找到的條文在甚麼條件下適用。準備考試時，宜預先整理可搜尋的 Codes of Practice、PNAP 及相關法例，核對文件版本，建立清楚的檔名和索引，並練習以關鍵字找出所需資料。考試當日可使用甚麼設備及資料，仍須以當屆 HKIE 指引為準；不要預設試場提供網絡連線。

本書分為兩冊。Volume 1 集中討論 structural behaviour 和 engineering judgement；Volume 2 涵蓋 construction、building control、site practice 及 professional practice。各章的 MCQ 不應只用來記住答案字母。讀者更應留意答案成立所依賴的條件，並思考其他選項為何不成立。當 load、support、construction stage 或責任界線改變，即使題目表面相似，所需的判斷也可能不同。

Volume 2 著重考生能否在施工、地盤管理及合約情境中作出正確判斷。本冊涵蓋 construction sequence、temporary stability、site practice、inspection and testing、building control、professional responsibility、procurement 及 contract administration。結構的安全不只取決於完成後的設計；施工中的 load path、temporary support、工序、授權、紀錄及溝通，同樣可能是決定性因素。

答題時，應先判斷題目所處的施工階段或合約背景，再辨識真正需要處理的 technical risk、責任界線或控制程序。尤其要避免把一般工程慣例誤當成法定要求，或把某份合約的程序當作所有項目的通用規則。各 section 內的 Example MCQ 適合即學即答，用作建立判斷框架；每章末的 Chapter Review MCQ 則適合在完成該章後集中作答，練習在較短時間內連續判斷不同課題。

Chapter 1 Construction Planning and Sequence

本章由 construction-stage structural behaviour 出發，連結 sequence、temporary stability、site logistics、survey control、floor cycle、partially completed loading、trade interfaces 與 safe system of work。重點是：永久結構的最終設計不能代替對每個施工階段的判斷。

1.1 Construction Sequence and Temporary Conditions

Construction sequence 不是把工序排成時間表便完成。結構在施工期間會經過多個 temporary conditions；每個階段的 geometry、restraint、材料強度、支承及荷載均可能不同。設計者及 site team 應把每個 stage 視為一個獨立結構狀態，確認其 load path、stability、compatibility 及 release criteria。

Permanent works 在完成後可能穩定，但未閉合的 core、尚未連接的 precast members、未達強度的 concrete 或已拆除的 temporary support，均可令中間階段成為 governing condition。施工計劃因此需要把 programme activities 轉換成可分析的 structural stages。

實務上可先列出每次改變支承、剛度或荷載的 event，再問三個問題：當刻有哪些荷載；荷載經哪條路徑落地；下一步可否在有明確證據下 release temporary works。

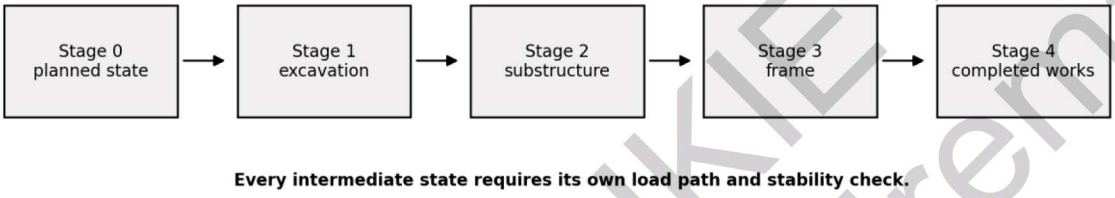


Figure 1.1 Construction stages as separate structural states

Worked Scenario 1.1 — Missing Temporary Load Path

A steel frame is stable in the completed model because the floors act as diaphragms. During erection, only two beams of the first bay are connected and the metal deck is not fixed. A wind warning is issued.

Engineering response: Treat the erected frame as a separate structural stage. Confirm temporary bracing, its connections and anchorage before work continues. The completed diaphragm cannot be credited before it exists.

Exam Trap: Completed-structure stability does not prove stability at every construction stage.

Example MCQ 1.1A

Which statement BEST describes a construction-stage structural check?
A. It verifies only the final permanent load combination.
B. It treats every programme activity as structurally identical.
C. It examines the load path and stability of a defined intermediate state.
D. It assumes all permanent connections are immediately effective.
E. It is required only for demolition works.

Answer: C
Explanation: An intermediate state may have different geometry, restraint, strength and loading from the completed structure, so it requires its own load-path and stability assessment.

Example MCQ 1.1B

A completed frame relies on floor diaphragms for lateral stability. During erection, the diaphragms are incomplete. What is the MOST appropriate action?
A. Ignore wind until the roof is complete.
B. Credit the future diaphragm in the erection model.
C. Remove all temporary bracing to improve access.
D. Provide and verify a temporary lateral load path.
E. Increase the permanent beam dead load.

Answer: D
Explanation: The permanent diaphragm cannot be relied upon before it is complete and connected; a verified temporary system is required.

2.2 Principles of Earth Lateral Support

ELS 通常由 retaining wall、embedded toe、walers、struts、rakers 或 anchors 組成。土及水壓先作用於 wall，再透過 wall bending 和 support reactions 傳至支撐及其承托系統。Wall toe 的 soil resistance、strut end connection 及 anchor bond zone 都屬 load path 的一部分。

Active earth pressure 需要適當 wall movement 才可 mobilise；stiff multi-propped wall 的 pressure distribution 不能一律假定為 Rankine triangular active pressure。Excavation 卸載、strut installation 及 preload 會重新分配 wall moments 和 support loads。Water pressure 須按相應 groundwater 條件另行考慮。

Design 須涵蓋 ULS stability 與 SLS movement，並採用一致的 design basis。香港 PNAP APP-57（July 2026）容許所列 GFM 或 PFM 途徑，並要求清楚標明採用方法；不能把兩套方法任意混用。

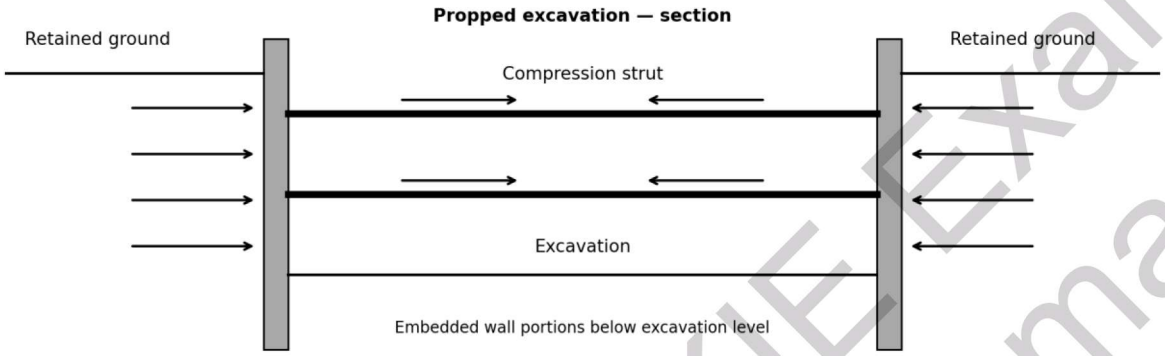


Figure 2.1 — Conceptual propped excavation section. Struts act in compression; retained soil and water load the walls towards the excavation. Toe resistance is not shown.

Worked Example 2.2

A wall support level carries a supplied horizontal line reaction of 120 kN/m. Struts are spaced at 4.0 m along the wall. Assume equal tributary widths and no load redistribution. Estimate the compression in an internal strut.

The estimated strut force is 480 kN in compression. Connection eccentricity, buckling, temperature and construction tolerances require separate consideration.

Exam Trap — A strong wall cannot compensate for a missing support reaction or an incomplete connection.

Example MCQ 2.2A

Which pressure assumption is LEAST justified for a stiff, multi-propped excavation wall?
A. Earth pressures should be assessed with regard to the wall movement and excavation stage.
B. Installation and preloading of supports may redistribute wall moments and support reactions.
C. Lateral water pressure should reflect the groundwater conditions adopted for the stage.
D. Rankine active pressure may be adopted without checking whether the restrained wall can develop the required movement.
E. The embedded wall may mobilise soil resistance below the excavation level.

Answer: D
Explanation: Active pressure requires compatible deformation. Restraint and staged construction may produce a different pressure distribution. A, B, C and E are relevant considerations and do not justify adopting active pressure without that check.

2.9 Base Heave, Piping and Uplift

Base heave 常指 soft clay 等 ground 在 excavation unloading 後的 undrained shear instability，與一般 elastic rebound 並不相同。Retained ground weight 及 surcharge 可驅使 soil 繞 wall toe 向坑內移動。深 wall 未必自動消除較深的 failure mechanism。

Hydraulic heave 涉及 upward seepage 令 effective stress 降低至接近零；piping 則涉及 seepage 引致土粒流失並形成或擴展 flow path，兩者相關但不可視為同一機制。

Uplift 可作用於 base slab 或低 permeability soil plug。要比較向上 water force 與相應 stage 的可靠抵抗，不得預先計入尚未建成的上蓋 weight。Three mechanisms 可能同時需要檢查；加大 pump rate 亦不一定是正確解決方法。

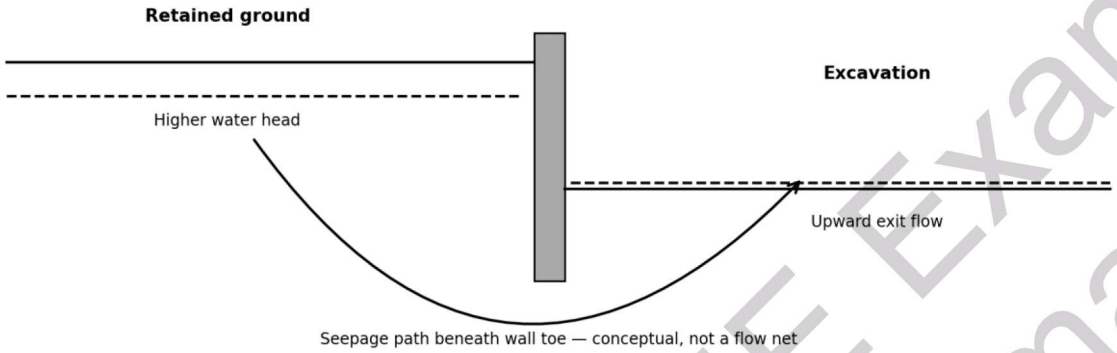


Figure 2.3 — Conceptual seepage beneath an embedded wall. Flow can rise towards the excavation base; local exit conditions require assessment.

Worked Example 2.9

For a simplified uniform soil column, the submerged unit weight is 10 kN/m³ and water unit weight is 10 kN/m³. The upward head loss is 3 m over a 5 m vertical flow length. Estimate the average gradient and the ratio of critical gradient to average gradient. Assume uniform one-dimensional upward flow.

The ratio is 1.67 for the stated idealisation. It is not a substitute for a real excavation seepage and local exit-gradient assessment.

Exam Trap — Adequate strut strength does not prove adequate resistance to base heave or hydraulic failure.

Example MCQ 2.9A

A completed base slab is checked for uplift before any superstructure is built. Which resistance should not be assumed without a specific effective load path at that stage?
A. The slab's actual self-weight.
B. The future weight of the unbuilt superstructure.
C. An installed and verified tension foundation system.
D. A reliably present permanent dead load already transferred to the slab.
E. The actual weight of connected completed construction included in the stage model.

Answer: B
Explanation: Future construction has no current stabilising weight. Uplift resistance must correspond to the actual stage and an effective load path.

3.1 Formwork and Falsework

Formwork 決定 fresh concrete 的幾何形狀及表面，而 falsework 把 formwork、fresh concrete、施工人員、設備及局部堆載傳往可靠支承。兩者在硬化前均屬 temporary works；其安全不能只依賴 permanent structure 的最終設計。

現場判斷應由 load path 開始：decking 把壓力傳至 joists 及 bearers，再經 standards、bracing、base plates 或 sole plates 傳到樓板或地基。檢查除構件尺寸外，還包括支承面承載力、連接、偏心、水平穩定、邊位約束，以及泵喉或不對稱澆築造成的局部作用。

Pour sequence 必須與 temporary works 設計一致。擅自移動支頂、刪去 bracing、集中卸料或改變澆築方向，都可能改變設計假設。發現 settlement、bulging 或異常聲響時，應停止相關工作並按 approved procedure 處理。

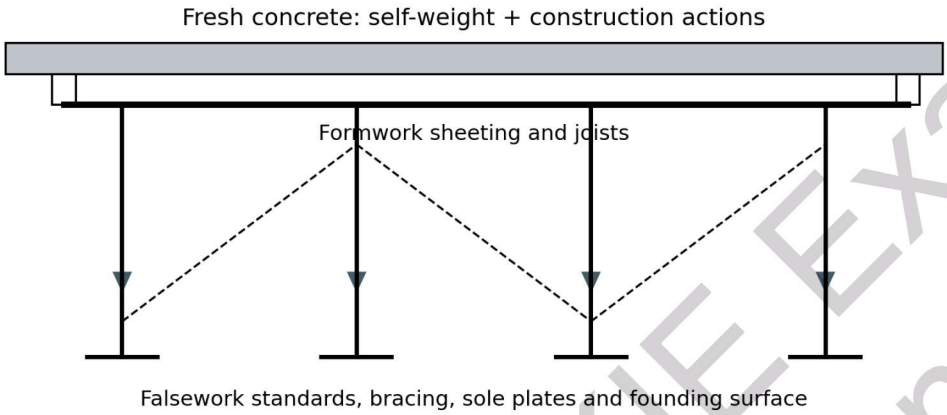


Figure 3.1 Typical temporary load path during a concrete pour

Exam Trap: Formwork 面板看似整齊，不代表 falsework 已具備完整 lateral stability 及可靠 founding。

Worked Site Scenario 3.1

During a slab pour, one row of standards shows visible settlement.

- Stop loading the affected bay and keep personnel clear.
- Preserve the temporary support condition; do not improvise removal.
- Report and obtain assessment of founding, bracing and load redistribution before resuming.

Example MCQ 3.1A

A slab formwork bay is stable under the planned pour. A pump hose is then parked at one corner and concrete is discharged there continuously. What is the most immediate structural concern?
A. The permanent slab has become over-reinforced
B. Local construction loading and lateral pressure may exceed the temporary-works assumptions
C. Concrete strength will automatically double
D. The column cover will reduce
E. The cube moulds will become inaccurate

Answer: B
Explanation: Concentrated discharge and an altered pour sequence can create local vertical and lateral actions that were not allowed for in the temporary-works design.

Example MCQ 3.1B

Which change most clearly requires a temporary-works reassessment?
A. Re-labelling a drawing
B. Moving a line of props to create access
C. Cleaning a delivery ticket
D. Marking a cube mould
E. Measuring air temperature

Answer: B
Explanation: Moving props changes the load path and potentially stability.

3.9 Striking Time and Back-propping

Formwork striking 應按 concrete strength、span、member type、loading、temperature、curing 及 temporary-works scheme 決定，而不是只按固定日數。Vertical side forms 與 soffit supports 承擔不同功能，移除條件亦可能不同。

Back-propping 把新樓層施工荷載分配至較低樓層，但整個系統的作用取決於各層 stiffness、concrete maturity、prop arrangement、installation sequence 及 load history。移除某一層 props 可能把荷載重新分配至尚未有足夠 capacity 的樓板。

Striking 及 re-propping sequence 須與 approved method 一致並由 competent supervision 控制。以「樓板已經硬」作判斷不足以證明可承受自身重量、施工堆載及上層澆築作用。

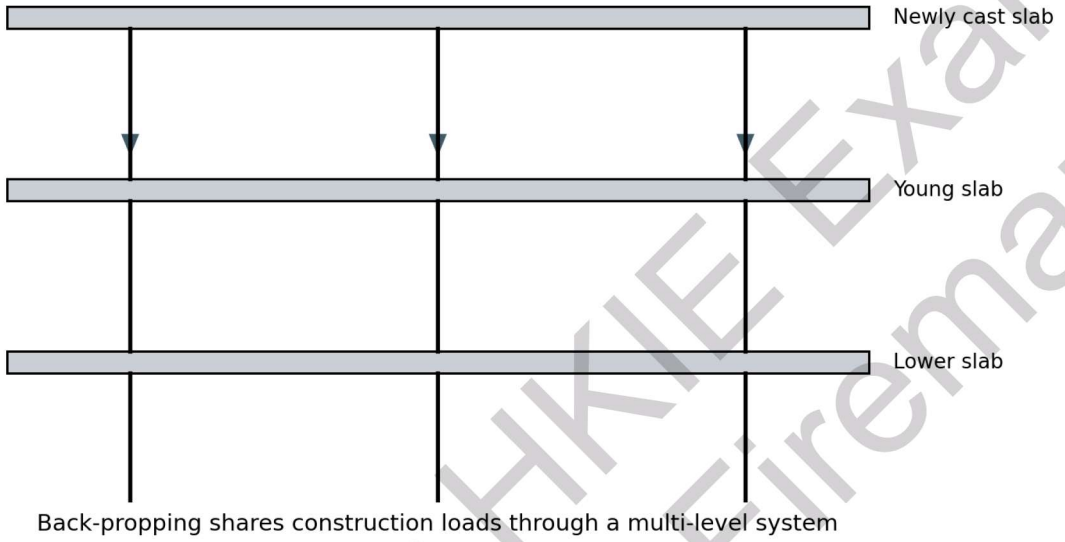


Figure 3.5 Multi-level load sharing with back-propping

Exam Trap: 固定日數不是普遍 striking rule；strength、load history 及 back-propping scheme 同樣關鍵。

Worked Site Scenario 3.9

The programme proposes early striking so props can be moved upstairs.

- Check achieved concrete performance and the approved sequence.
- Assess load redistribution across all affected floors.
- Change the sequence only after temporary-works authorisation.

Example MCQ 3.9A

Why is calendar age alone insufficient to authorise removal of slab soffit supports?
A. Achieved concrete performance and the construction-stage load path must also satisfy the approved striking scheme.
B. The specified 28-day concrete grade establishes the strength available at every earlier age.
C. Permanent design live-load capacity also verifies any concentrated construction load.
D. Props on lower floors guarantee that the newly struck slab carries no load.
E. A satisfactory slump result establishes that the slab is ready for striking.

Answer: A
Explanation: Striking changes load transfer. Achieved strength, deformation, curing and the assessed construction loads and support sequence must be considered. B confuses specified and achieved strength; C ignores construction load patterns; D ignores load sharing; E confuses workability with strength.

Example MCQ 3.9B

What is a key purpose of back-propping?
A. Increase slump
B. Support and distribute construction loads through selected lower levels
C. Replace permanent reinforcement
D. Cure cube specimens
E. Create cover

Answer: B
Explanation: Back-props form a temporary multi-level support system for construction loading.

4.3 Erection Sequence and Temporary Bracing

4.3.1 An Incomplete Frame Does Not Necessarily Provide Final Stability

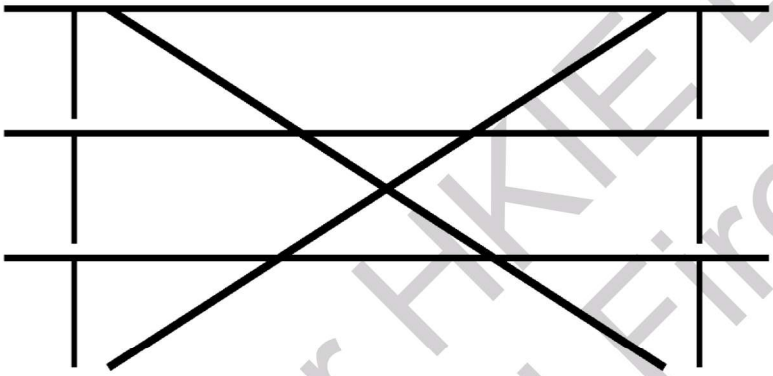
Permanent structural system 可能依賴 floor diaphragm、braced bay、moment connections 或 completed core；在 erection 中，這些 elements 可能尚未安裝或未形成有效 connection。Erection sequence 須界定每一 stage 的 load path，包括 wind、self-weight、construction load 及 accidental movement，並提供 temporary bracing、guy、propping 或 restrained bays。

若新增 brace 後的整體系統仍沒有至可靠支承的完整 force path，便不能視為已穩定；個別 member 可透過經設計的 bracing 及 connection 共同形成穩定系統。

4.3.2 Plumbing and Survey Must Not Compromise Stability

Erection 時常用 temporary bolts、drift pins 及 adjustment devices 協助 alignment，但各 stage 仍須有足夠 connection 及 bracing。Survey correction 應逐步進行，避免一次釋放多條 braces 而造成 sway mechanism。Weather limit、crane release point 及 handover criteria 要在 method statement 清楚列出。

Figure 4.3 Erection-stage braced load path



Collectors → braces → connections → anchorage → foundation

Conceptual schematic — verify project-specific design and sequence

Figure 4.3 An incomplete steel frame requires a temporary lateral load path until the permanent bracing or diaphragm system is effective.

Worked Site Scenario 4.3

A three-storey steel frame has columns and beams erected, but the permanent braced bay will be installed the next day. The supervisor proposes releasing the crane and leaving the frame overnight with only nominal beam-end bolts. What is the correct engineering response?

Do not release the frame into an unverified condition. Check the approved erection-stage stability scheme, install and inspect the specified temporary bracing and minimum connections, confirm foundations and anchors for the temporary forces, and consider the forecast construction-stage actions before handover.

Exam Trap

Final building 穩定不代表 partially erected frame 穩定。Temporary works 不是「施工方便」附件，而是該 stage 真正的 structural system。

Example MCQ 4.3

Why may a steel frame require temporary bracing during erection even if the completed building has adequate permanent stability?

A. Permanent members have no strength.
B. The final diaphragm or bracing load path may not yet be complete.
C. Temporary bracing is used only for appearance.
D. Wind cannot act during erection.
E. Bolts cannot carry any temporary load.

Answer: B

Explanation: The completed stability system may depend on elements or connections not yet effective. Temporary bracing provides the necessary stage-specific load path.

5.6 Pile Testing

Pile testing 必須先界定 question。Static load test 主要觀察在指定 loading programme 下的 load–movement response；dynamic test 以量測及分析估算 response；integrity test 用於辨認可能的 continuity 或 geometry anomaly；cores、samples 或施工資料可支持 founding 及 material verification。

Integrity indication 不等於 capacity proof，而滿足 load test 亦不代表所有施工缺陷均不存在。每種 method 都有 range、resolution、assumptions 及 interpretation limits，因此 test selection、test pile location 及 acceptance criteria 要與風險及 foundation system 配合。

Test anomaly 應由原始數據、installation record、ground profile 及其他 evidence 共同分析。未經評估便重做測試至得到「合格」結果，不能合理處理不一致。

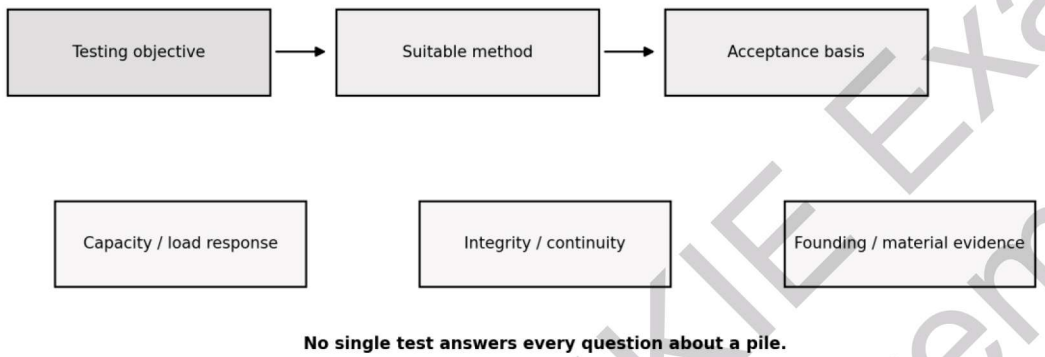


Figure 5.6 Select pile testing from the technical question

Worked Site Scenario 5.6 — Integrity Anomaly

An integrity test indicates a possible impedance change at mid-depth.

Engineering response: Do not infer either failure or adequacy from the trace alone. Check test quality, pile geometry, installation records and ground profile, then select proportionate supplementary investigation or assessment.

Exam Trap: Integrity, capacity and founding verification are different questions and may require different evidence.

Example MCQ 5.6A

Which statement is MOST accurate?
A. An integrity test always proves axial capacity.
B. A load test always proves perfect pile continuity.
C. Different pile tests answer different technical questions.
D. One satisfactory pile test validates every pile regardless of records.
E. Testing makes installation supervision unnecessary.

Answer: C
Explanation: Capacity response, integrity and founding verification are distinct questions with different evidence and limitations.

Example MCQ 5.6B

An integrity test shows a possible anomaly. What should be done NEXT?
A. Automatically condemn the pile.
B. Automatically accept the pile.
C. Review test quality with installation and ground records, then determine proportionate follow-up.
D. Repeat the plot until it looks smooth.
E. Ignore the result because the pile is underground.

Answer: C
Explanation: Interpretation must combine the trace with pile geometry, construction history, ground conditions and supplementary evidence where needed.

7.8 Approval, Consent and Occupation Permit

Approval of plans、consent to commence works 及 occupation permit 是不同階段的 regulatory decisions。Plans approved 代表 BA 接受所提交設計，並不表示工程可立即開始；commencement 一般還需就 approved works 取得 consent，並完成適用的 appointment 及 pre-commencement requirements。

For works resulting in a new building, completion certification and the applicable OP/TOP process are required before occupation of the relevant building or part. Works not resulting in a new building follow the applicable completion-certification procedure; they do not automatically require a new OP. The usual new-building approval-to-occupation pathway remains subject to the actual scope and applicable statutory procedure. Contractual practical completion is a separate matter.

最容易混淆的 sequence 是：submission -> approval -> consent -> construction and supervision -> completion documents -> OP/TOP。實際項目可能有 amendments、phased consents 或 staged occupation，因此每次決定均要核對當前 approved scope。

Table 7.6 Approval-to-occupation sequence

Sequence	Regulatory meaning
1 Submission	Prescribed plans and supporting information are lodged.
2 Approval	BA accepts the submitted design, subject to the applicable basis.
3 Consent	Permission is obtained to commence the approved works.
4 Construction	Approved works are executed, supervised and documented.
5 Completion	Required completion certificates and records are submitted.
6 OP or TOP	Statutory permission to occupy is considered for the relevant scope.

Worked Scenario 7.8 Approved but not ready to start

Building and structural plans have been approved, but consent to commence the works has not been obtained.

Recommended response: The contractor should not treat plan approval as permission to commence. The project team should complete the applicable consent and pre-commencement steps for the approved scope.

Exam Trap: Approval, consent and occupation permission are separate decisions at different stages.

Example MCQ 7.8A

Plans have been approved but consent to commence has not been obtained. What is the BEST action?
A. Start structural work immediately.
B. Treat approval as automatic consent.
C. Complete the applicable consent and pre-commencement process before starting the approved works.
D. Apply for an occupation permit first.
E. Issue a practical completion certificate.

Answer: C
Explanation: Plan approval and consent to commence are separate statutory steps.

Example MCQ 7.8B

Which statement about an Occupation Permit is MOST accurate?
A. It is the same as contractual practical completion.
B. It concerns statutory permission to occupy and is separate from contractual completion certification.
C. It authorizes every future alteration.
D. It replaces approved plans.
E. It is issued by the main contractor.

Answer: B
Explanation: An OP is a statutory building-control instrument and should not be confused with a contract certificate.

11.6 Temporary Support and Load Transfer

Temporary support 應視為一個獨立結構系統，具有自己的 load path、stability、foundation 或 bearing、connection、erection sequence 及 removal sequence。Props 的標稱 capacity 不足以證明 system adequacy；偏心、bracing、head/base restraint、load sharing 及 supporting floor capacity 同樣重要。

Load transfer 需要控制變形與 force pickup。Preload 或 jacking value 應以 supplied design basis、equipment calibration、實際 stiffness 及容許 movement 為依據，並由指定監測點驗證。過度 jacking 可令鄰近構件卸載或產生新裂縫，過少則不能可靠接載。

Method statement 應界定 hold points、inspection、communication、exclusion zone、contingency 及 trigger levels。任何 site deviation、unexpected movement 或 support settlement 都應立即停止下一階段，按 approved escalation route 評估。

Table 11.6A Temporary Support 及 Load Transfer framework

Sequence	Control objective	Evidence
Install and brace	Create a stable independent system	Inspection of support, restraint and bearing
Activate	Pick up load without harmful movement	Jack load, displacement and contact records
Alter or remove	Maintain load path at every step	Hold-point release and monitoring
Decommission	Return load to permanent system safely	Controlled release and final survey

Worked Scenario 11.6 — Settlement during propping

Situation: During preload, one prop base settles and a nearby crack gauge moves beyond the specified trigger.

Engineering response: Stop the sequence, secure the area, retain the temporary load path and escalate for engineering review. Do not add arbitrary jack pressure to chase the original reading.

Exam Trap: More props do not necessarily improve safety if their bases, bracing or load-sharing behaviour are not designed.

Example MCQ 11.6A

When selecting props to support an existing floor during an alteration, which basis is MOST complete?
A. The sum of the catalogue axial ratings, without checking the installed lengths.
B. The prop member resistance, with supporting floors assumed rigid.
C. The complete staged load path, including prop stability, bracing, head and base conditions, load sharing and supporting-floor capacity.
D. The number of props used successfully on a different project.
E. Equal load division between props, without checking contact or stiffness.

Answer: C
Explanation: C assesses the installed system. A omits length-dependent resistance; B omits bearing and supporting-floor effects; D does not demonstrate project suitability; E assumes unverified sharing.

Example MCQ 11.6B

A monitoring trigger is exceeded during load transfer. What should happen NEXT?
A. Continue because the permanent design is adequate
B. Reset the instrument to zero
C. Pause the operation and follow the defined escalation and contingency procedure
D. Remove all props immediately
E. Hide the reading from the record

Answer: C
Explanation: A trigger is a decision threshold established to protect the structure during a controlled operation.

12.2 Stability during Demolition

完成狀態穩定，不代表半拆狀態仍然穩定。Floor slab 可能提供 diaphragm action 或牆身側向 restraining；beam 亦可能 restrain column 或連接 bracing bay。移走其中一項後，即使自重減少，effective length 增加或 system 變成 mechanism，穩定性仍可下降。

每個 stage 須追蹤 vertical 與 lateral load path 至可靠 support，包括 wind 作用於新暴露的牆面、plant 動力效應、偏心 debris、cutting 時的 load redistribution 及意外 impact。未經驗證的 partition、cladding 或 scaffold 不能自動當作 structural restraint。

穩定狀態亦包括休工及惡劣天氣時的 configuration。不能依賴工人一直在場維持平衡，亦不能以「明天會拆掉」忽略今天留下的 slender wall 或未繫穩構件。監測只提供狀態資料，不能取代缺少的 bracing 或不完整的 load path。

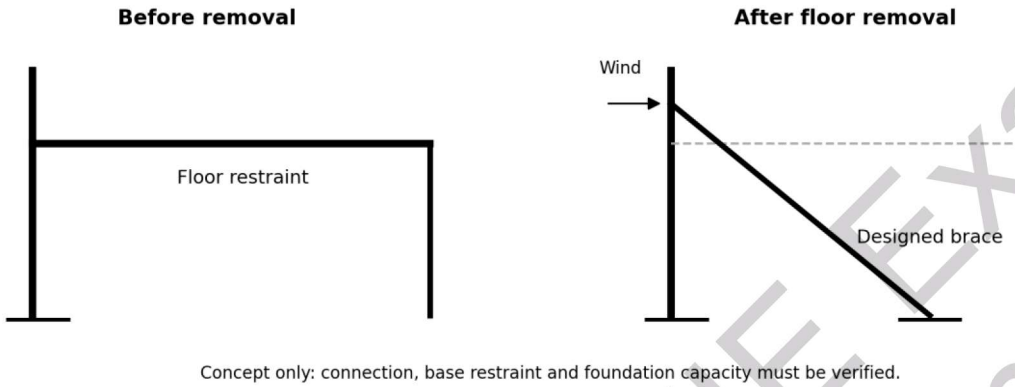


Figure 12.2 Replacement restraint before loss of floor support

Worked Scenario 12.2 Loss of wall restraint

A wall is laterally restrained by a floor that is to be removed. The wall remains exposed to wind overnight.

Engineering response: Provide and verify the designed replacement restraint before removing the floor connection. Check the retained wall, brace connections and supporting base for the temporary condition, including the unattended period.

Exam Trap: Less remaining weight can coincide with less stability when restraint is removed.

Example MCQ 12.2A

A floor providing lateral restraint to a retained wall is removed. Why can wall stability worsen despite reduced building weight?
A. The wall material necessarily becomes weaker
B. The wall thickness necessarily decreases
C. The wind pressure becomes zero
D. The unrestrained length and deformation mode may change
E. All wall loads necessarily double

Answer: D
Explanation: Loss of restraint can increase slenderness or create an unstable mode even when gravity load is reduced.

Example MCQ 12.2B

A partially demolished frame will remain unattended overnight. Which condition must be assessed?
A. The temporary configuration and environmental actions during the unattended period
B. Only the completed building condition
C. Only the next morning lifting operation
D. Only the weight already removed
E. Only worker access while demolition is active

Answer: A
Explanation: Temporary stability must be maintained while work is stopped as well as while crews are present.

14.5 Shop Drawings and Material Submissions

Shop drawings 把 design intent 轉化為 fabrication、installation 及 coordination information；material submissions 則提供 proposed product、performance、certificates、samples 及 compliance evidence。Submission 目的、review status 及 lead time 需按 contract 、specification 及 submission schedule 管理。

Reviewer 應在其 authority 及 discipline 範圍內核對 design intent、specified performance 及 interfaces。Review 或 comment 通常不應被理解為全面替代 contractor 對 dimensions、coordination、fabrication accuracy、construction method 及 contract compliance 的責任，除非 contract 明確另有分配。

Status wording 必須一致，例如 approved、accepted、reviewed、no objection 或 revise and resubmit 可能有不同 contractual effect 。不能把內部「technical comment closed」自動等同 contract approval 或採購授權。

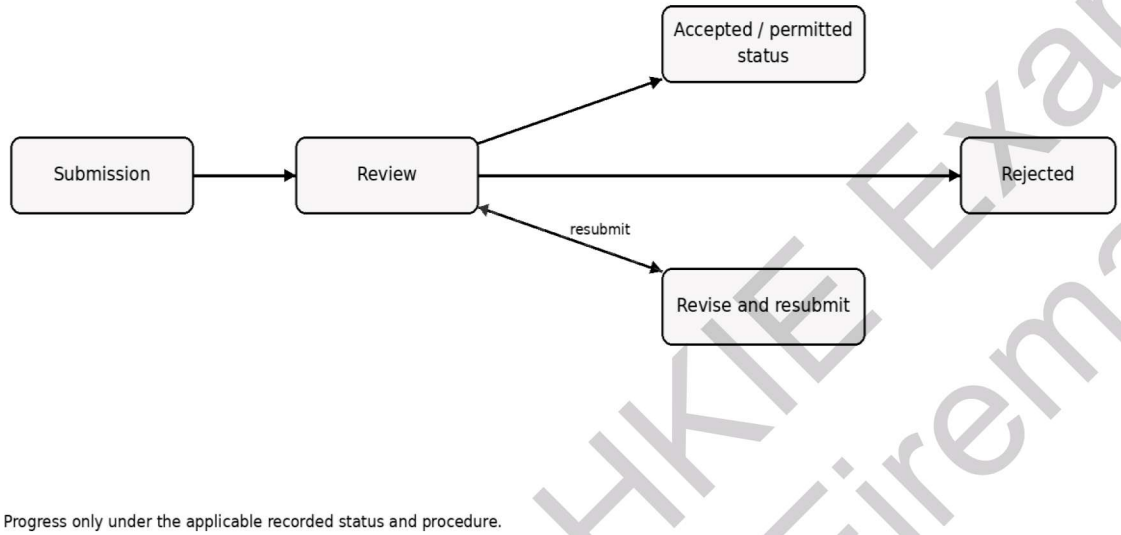


Figure 14.3 Shop-drawing and material-submission review

Worked Scenario 14.5 — Reviewed Shop Drawing

A steel shop drawing is marked reviewed, but a fabrication dimension conflicts with the contract drawing.

Contract administration response: Do not assume the review transferred responsibility. Resolve the discrepancy through the contract process and issue a corrected, coordinated submission before fabrication.

Exam Trap: Shop-drawing review does not automatically transfer fabrication and coordination responsibility.

Example MCQ 14.5A

A shop drawing is marked “reviewed”. Which conclusion is MOST defensible without further contract wording?
A. All contractor responsibility is transferred.
B. The drawing has undergone review; its acceptance status, permission to proceed and the parties’ responsibilities must be determined from the recorded comments and applicable contract.
C. Fabrication errors can no longer exist.
D. The material is automatically paid.
E. Every dimension has been independently measured on site.

Answer: B
Explanation: “Reviewed” confirms an examination step, but does not by itself establish acceptance, release for fabrication, payment or a transfer of responsibility. Read the defined status and comments.

Example MCQ 14.5B

What should a material submission primarily demonstrate?
A. Only the supplier name
B. The lowest price
C. That no inspection is required
D. Compliance with specified performance and relevant submission requirements
E. That the product is used on another project

Answer: D
Explanation: A material submission should give traceable evidence against the project requirements.

15.3 Float and Milestones

Total float 表示 activity 在不延遲相關 project completion constraint 下可容許的時間彈性；free float 則着眼於不延遲 immediate successor。兩者不可混用。Float 不是「免費日數」，更不必然屬 Employer 或 Contractor；ownership 與使用後果須查閱合約。

Milestone 是 project control point，可代表 section completion、handover、access、testing 或 interface date。某 milestone 是否 contractual、是否帶有 liquidated damages 或付款後果，取決於 contract documents；內部 target 不應被誤寫成 contractual completion obligation。

例：題目供應資料指某 activity 預計 Day 18 完成，而受約束 successor 最遲 Day 20 開始，且沒有其他 constraints。簡化 total float 為 20−18=2 日。此數值只在所給 logic 及 calendar 成立；若另有 resource 或 section milestone，結果可不同。

Figure 15.3 Float under supplied assumptions

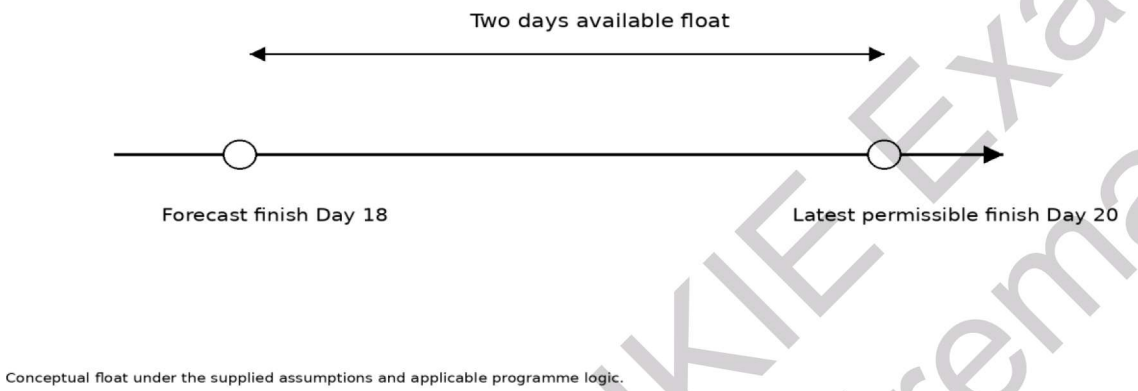


Figure 15.3 Supplied float to a successor milestone

Worked Example 15.3 — Milestone Float

Supplied basis: zero-lag finish-to-start link, one calendar, successor latest start Day 20, no earlier controlling constraint.

An activity forecasts Day 18 and its constrained successor may start no later than Day 20.

Engineering response: With no other constraint and one common calendar, simplified float is 2 days. Do not call the milestone contractual unless the documents say so.

Exam Trap: Float ownership and use are contractual questions; do not assume that float belongs exclusively to one party.

Example MCQ 15.3A

What does total float generally measure?
A. Time an activity may move without delaying the relevant project completion constraint under the model
B. The contract price contingency
C. The number of workers absent
D. A guaranteed EOT
E. The liquidated damages rate

Answer: A
Explanation: Total float is programme flexibility calculated from the network and constraints.

Example MCQ 15.3B

Which statement about milestone status is MOST accurate?
A. Every programme milestone is contractual
B. A milestone is contractual only if the applicable documents give it that status
C. Milestones never affect interfaces
D. Every milestone carries liquidated damages
E. Milestones replace activities

Answer: B
Explanation: Internal control points and contractual milestones must be distinguished by the contract documents.

18.7 Statutory Requirement vs Good Practice

解題前先判斷 requirement 來自哪一層。Statutory duty、contract requirement、project procedure 及 good practice 可以同時適用，但不能互相自動取代。題目提到「must」時，應找出它的法律、合約或明示假設來源。

Basis	What to identify	Common error
Statutory requirement	Applicable legislation, scope, duty holder and current provision	把 client instruction 當作法定豁免
Approval or consent condition	The actual project approval record and relevant condition	只讀 drawing stamp 而忽略 condition
Contract requirement	Applicable terms, authority, notices and valuation basis	把一份 standard form 當作所有合約通則
Project control	ITP, method statement, hold point and release authority	把 notification 誤當作 release
Good practice	Risk, competence, evidence and proportionate control	因未引用 clause 便認為可以忽略明顯風險

Worked classification scenario: The contract requires a test report before cover-up, while the question gives no statutory testing frequency. The report is still a stated project requirement. Its contractual status does not establish a universal statutory testing frequency.

對 approval 與 consent 的區分，本章採用 BD 對 ordinary private building works 的公開說明；不把該簡述擴大為所有豁免、minor works 或 emergency 情況的完整法律分析。

18.8 Common Distractors and Exam Traps

錯誤選項常把一項真實但不足夠的資料，誤當作完整證明。重溫時應寫出缺少的條件，而不是只記答案字母。

Final condition versus temporary stage

完成狀態的 capacity 或 stability，不能直接證明 erection、pouring、striking 或 demolition 中的每個 stage。先畫出當時實際存在的 support 及 load path。

Evidence versus conclusion

Certificate、test indication、monitoring reading 及 photograph 各有範圍。先問資料是否可追溯到相關位置，以及它真正支持甚麼結論。

Event versus entitlement

發生 delay event 不等於已證明 critical delay、EOT 或 money entitlement。分別檢查 contract basis、procedure、causation 及 quantification。

Authority versus attendance

出席 meeting 或身在地盤，不代表有權發出 variation、批准 design change 或提供 statutory consent。

Risk reduction versus risk elimination

較低 vibration、較大 exclusion zone 或更多 monitoring 可改變部分風險，但不能自動補回缺少的 structural support。

Initial cost versus value

較低 price 可能伴隨 scope exclusion、durability loss 或 higher lifecycle risk。用一致 requirements 比較方案。