CONSTRUCTION INDUSTRY COUNCIL 建造業議會

HONG KONG CONSTRUCTION INDUSTRY TRADE TESTING CENTRE
香港建造業工藝測試中心

Refrigeration/Air-conditioning/ Ventilation Mechanic (Unitary System) Trade Test Practical Test Mock Paper

(Version：EAU-PM-EN-02)

此文件關於空調製冷設備技工（獨系統）技能測試實務測試模擬試題。

如需索取中文版本，請致電 2100 9000 與香港建造業工藝測試中心聯絡。

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Enquiries

Enquiries on this material may be made to Hong Kong Construction Industry Trade Testing Centre (HKCITTC) at:

Address: 95 Yue Kwong Road, Aberdeen, Hong Kong
Tel: (852) 2100 9000
Fax: (852) 2100 9090
Email: hkcittc@cic.hk
Website: www.cic.hk

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Refrigeration/Air-conditioning/Ventilation Mechanic (Unitary System) Trade Test Practical Test Mock Paper

Title: Refrigeration/Air-conditioning/Ventilation Mechanic (Unitary System)

Skill level: Skilled Worker

Test Requirements and Duration:

Procedures and requirements	Duration
1. <u>Dynamic risk assessment prior to work</u> Conduct dynamic risk assessment on worksite environment, equipment and tools, materials and safety equipment prior to work, including identification of potential hazards and taking countermeasures to ensure that potential hazards are eliminated and/or risks are reduced before commencement of work.	5 minutes
2. <u>Preparation prior to work and protection to work site</u> Review the worksite delivered by the person-in-charge / worker of the previous work process, and perform proper protection as well as appropriate preparations before commencement of work according to the worksite environment and the conditions of the workpiece etc.	5 minutes
3. <u>Practical Test</u> Carry out the works in accordance with the requirements, specifications and drawing(s), and complete the specified works at the designated locations. **Test Content** **1. Fabrication of Refrigerant Piping** i. Fabricate the refrigerant piping assembly in accordance with Working Drawing (1). Upon completion, notify the Invigilator for inspection and complete the Leak Test Record Form ii. After verification by the Invigilator, connect and tighten the hand valve and adapter to the flare fitting, and carry out a leak test using nitrogen gas at 1,380 kPa (200 psi). Note: The dimensional tolerance of the refrigerant piping shall be within ±2 mm	3 hours and 15 minutes

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Refrigeration/Air-conditioning/Ventilation Mechanic (Unitary System) Trade Test Practical Test Mock Paper (Con't)

Test Requirements and Duration (con't):

Procedures and requirements	Duration
Test Content (Con't) **2. Installation of Split-Type Air Conditioner according to Working Drawing (2)** i. Install and securely fix the outdoor unit and mounting bracket ii. Install and securely fix the indoor unit iii. Connect the refrigerant copper tubing between the indoor unit and the outdoor unit iv. Apply suitable insulation material to the refrigerant copper tubing v. Connect the power supply cable to the power supply terminal block and connect the electrical wiring between the indoor unit and the outdoor unit vi. Install the indoor unit condensate drain pipe (PVC pipe) <u>The following procedure shall only be carried out after the Invigilator has verified that Items 1 to 6 have been installed correctly.</u> vii. Conduct a system pressure test using nitrogen gas at 4,140 kPa (600 psi) and check for leakage using a soap solution or other approved leak detection methods: a. The system pressure shall not drop within a 10-minute test period b. The candidate shall notify the Invigilator to commence timing at the start of the pressure test. Upon completion of the 10-minute test period, the candidate shall notify the Invigilator for inspection.	Refer to previous page

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Refrigeration/Air-conditioning/Ventilation Mechanic (Unitary System) Trade Test Practical Test Mock Paper (Con't)

Test Requirements and Duration (con't):

Procedures and requirements	Duration
Test Content (Con't)	Refer to previous page

2. Installation of Split-Type Air Conditioner (con't)

Pressure Test Record

Test Attempt	Test Start Time	Pressure Gauge Reading (Start)	Test Completion Time	Pressure Gauge Reading (End)	Result	Candidate's Signature	Invigilator's Signature
First Attempt					Pass / Fail		
Second Attempt					Pass / Fail		
Third Attempt					Pass / Fail		

viii. Perform system evacuation using a vacuum pump for 10 minutes. After the vacuum pump has been stopped, the system vacuum shall be maintained at 29.5 inHg or above. (To be verified by the Invigilator)

Vacuum Evacuation Record

Test Attempt	Evacuation Start Time	Vacuum Level	Evacuation Completion Time	Vacuum Gauge Reading	Result	Candidate's Signature	Invigilator's Signature
First Attempt					Pass / Fail		
Second Attempt					Pass / Fail		
Third Attempt					Pass / Fail		

ix. Keep the system in a vacuum condition for 5 minutes

Completion Time:		Candidate's Signature:		Invigilator's Signature:	

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Refrigeration/Air-conditioning/Ventilation Mechanic (Unitary System) Trade Test Practical Test Mock Paper (Con't)

Test Requirements and Duration (con't):

Procedures and requirements	Duration
Test Content (Con't)	Refer to previous page

2. Installation of Split-Type Air Conditioner (con't)

x. Release refrigerant from the outdoor unit into the system and perform an operational test. Record the following test results:

Operating Current	A	Indoor Unit Air Outlet Temperature	℃
Low-Side Refrigerant Pressure	kPa / psi	Indoor Unit Air Inlet Temperature	℃
		Outdoor Unit Air Outlet Temperature	℃
		Outdoor Unit Air Inlet Temperature	℃

xi. Release refrigerant from the outdoor unit into the system and perform an operational test. Complete the following assessment report: Determine whether the refrigerant charge in the system is adequate:
☐ Adequate (State reason: _____)
☐ Inadequate (State reason: _____)

xii. If the refrigerant charge is insufficient, connect the refrigerant cylinder to the system and prepare to add refrigerant.
(The candidate must allow the Assessor to verify that the system connections are correct before opening the refrigerant cylinder and charging refrigerant.)

Refrigerant refilling time:		Candidate's Signature:		Invigilator's Signature:	

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Refrigeration/Air-conditioning/Ventilation Mechanic (Unitary System) Trade Test Practical Test Mock Paper (Con't)

Test Requirements and Duration (con't):

<table>
<tr><th>Procedures and requirements</th><th>Duration</th></tr>
<tr><td>

Test Content (Con't)

2. Installation of Split-Type Air Conditioner (con't)

xiii. After refrigerant charging, carry out an operational test and complete the following test report:

Operating Current	A	Indoor Unit Air Outlet Temperature	℃
Low-Side Refrigerant Pressure	kPa / psi	Indoor Unit Air Inlet Temperature	℃
		Outdoor Unit Air Outlet Temperature	℃
		Outdoor Unit Air Inlet Temperature	℃

xiv. Refrigerant Pump-Down : Pump down the system and store the refrigerant in the outdoor unit.

3. Install the push-in Anchor bolts

According to the requirements of the Working Drawing (3), select the appropriate tools and install an angle onto the concrete block as instructed. Tighten the screws to a torque of 20 Nm.

</td><td>Refer to previous page</td></tr>
<tr><td>

4 . <u>Housekeeping after work and final touch-up on work before handover</u>

After completion of work, clean and tidy up the worksite, equipment, tools and materials, and review the quality of workpiece taking into account of the possible impact on the upcoming work process. The finished workpiece should be properly handled in preparation for delivery along with the worksite.

</td><td>5 minutes</td></tr>
</table>

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Refrigeration/Air-conditioning/Ventilation Mechanic (Unitary System) Trade Test Practical Test Mock Paper (Con't)

Note:

1. Candidates should read the attached "Notes to Candidate" before commencement of work and comply with all test related rules and requirements.

2. Practical test assessment framework is comprised of "Technical Assessment" and "Dynamic Risk Assessment and Safety Practice Assessment". Candidates must fulfil the passing requirements for both assessment parts to achieve an overall "Pass" grade in the practical test.

Passing Requirement for "Technical Assessment"	Passing Requirement for "Dynamic risk Assessment and Safety Practice Assessment"
Achieve 60 marks out of 100 marks; and meet the specific requirement(s) in the critical assessment items of the technical assessment.	Achieve 60 marks out of 100 marks; and meet the specific requirement(s) in the critical assessment items of "Dynamic Risk Assessment and Safety Practice Assessment".

Precautions

This document is provided as reference for test preparation only. Under all circumstances all content in the official test papers, including but not limited to the terms and conditions therein, prevails.

There are different versions of the test paper, content include but not limited to tools, materials, equipment, drawing, construction details or procedures and different simulated site environments. Candidates should refer to the official test documents during testing. The CIC reserves the right, at its sole and absolute discretion, to change, update or delete the contents in this document at any time without prior notice.

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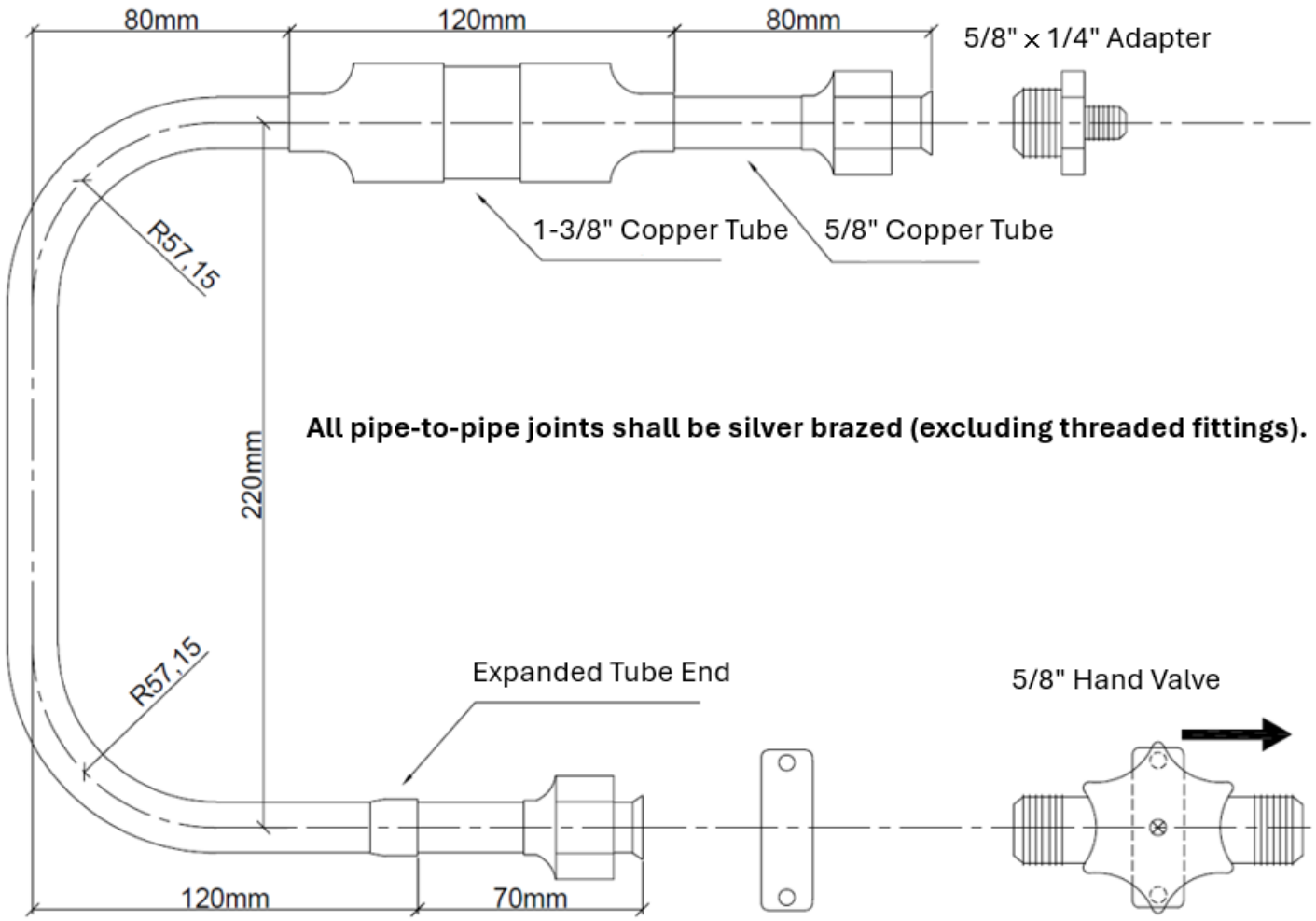
Working Drawing (1)



Note :

① Drawing not to scale. Dimensions are in millimeters.

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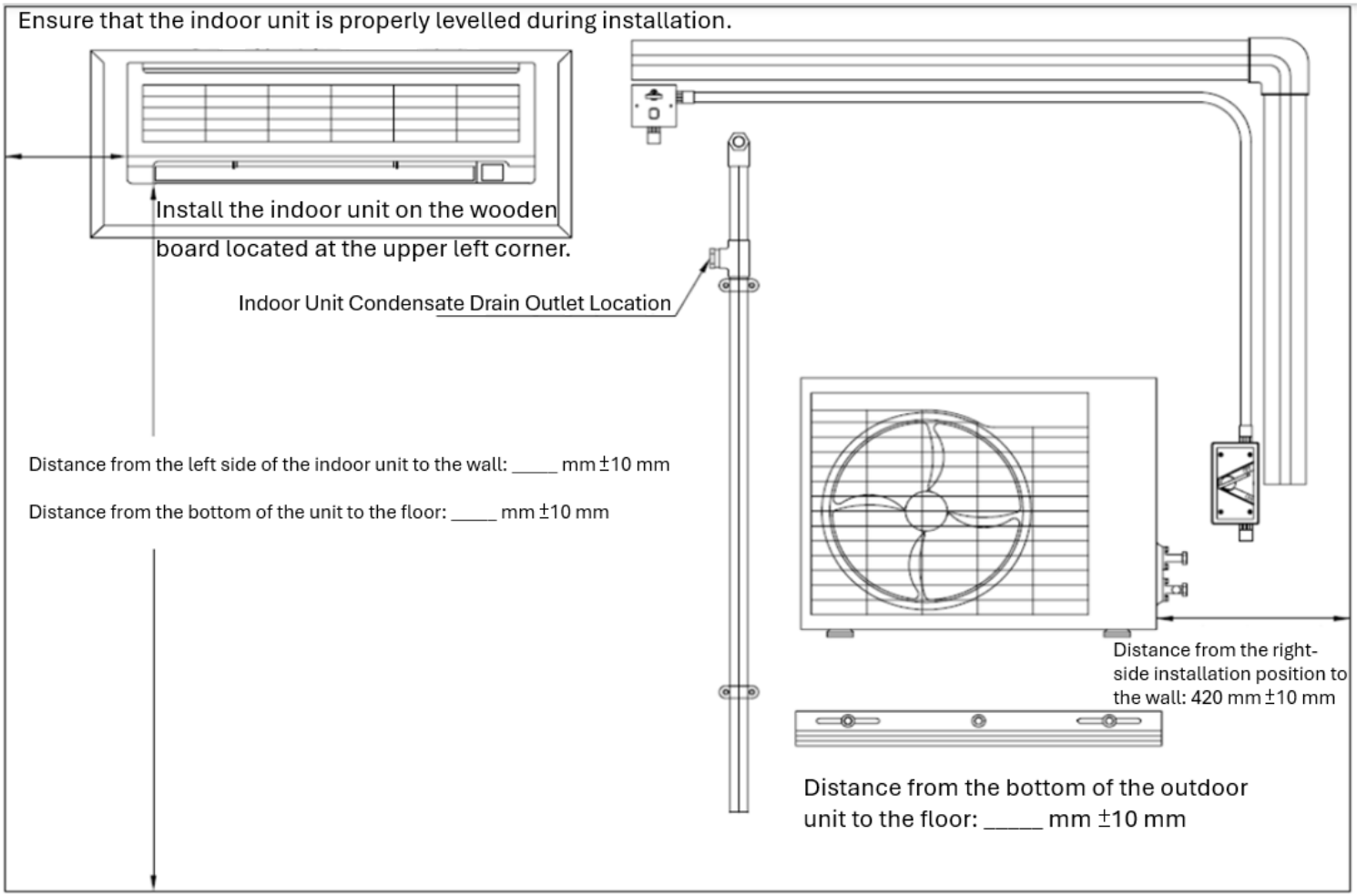
Working Drawing (2)



Split-Type Air Conditioner Installation Drawing

Note :

① Drawing not to scale

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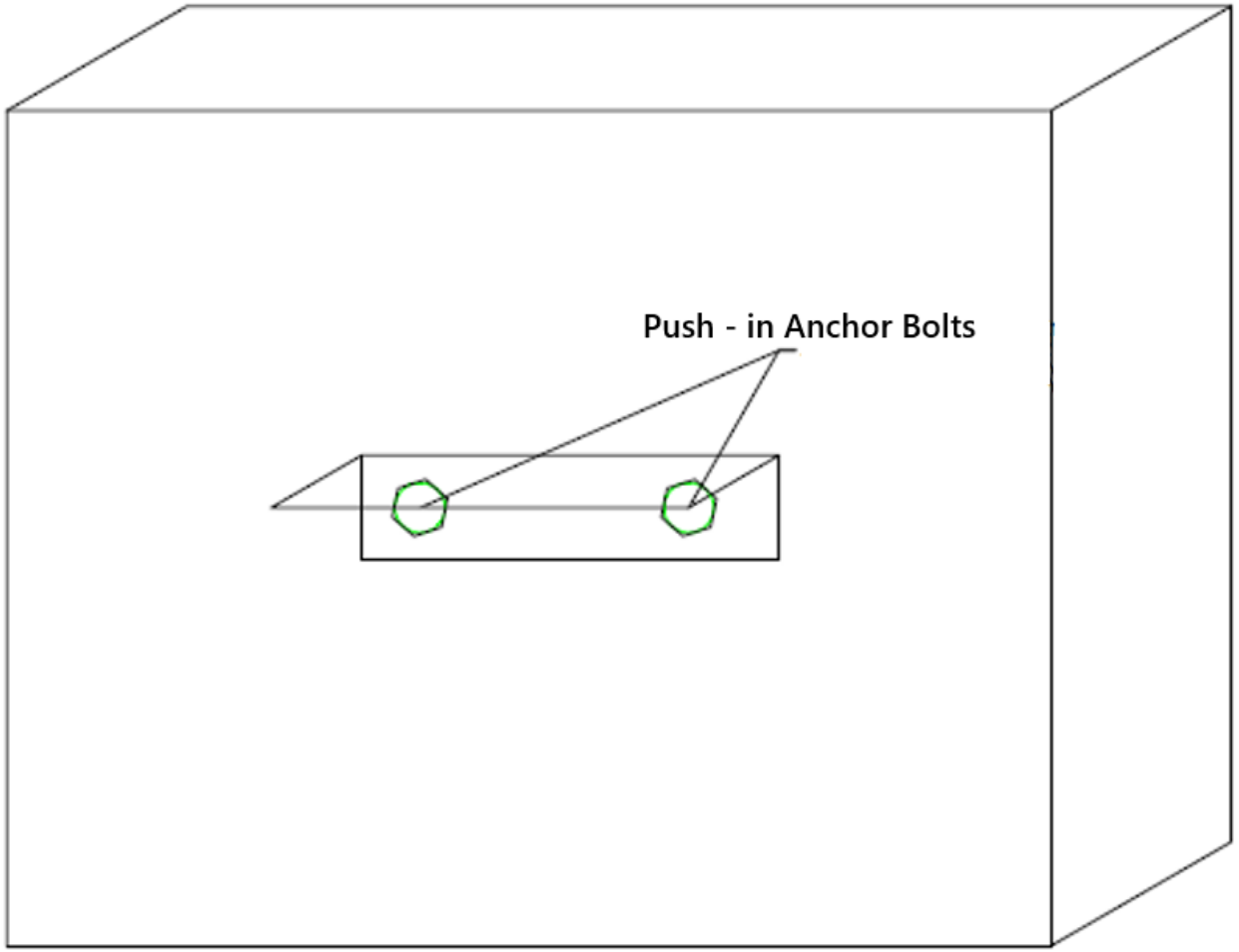
Working Drawing (3)



Note :

① Drawing not to scale

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Notes to Candidate

1. Candidates should read the test papers carefully and ask the invigilator for any queries.
2. The practical test making scheme is based on the following criteria:
   a. Understanding of drawing and specification
   b. Preparation work before commencement of test
   c. Working procedures, accuracy and quality of work
   d. Proper handling and use of materials
   e. Proper use of tools and equipment
   f. Housekeeping after completion of test
   g. Safety precautions
3. Candidates should study the drawings and specifications attached to the test paper, if any, before the test begins.
4. Candidates should carry out the test according to test papers, working drawings and specifications provided.
5. Candidates should bring their own safety shoes and appropriate workwear, other safety equipment will be provided by HKCITTC. Candidates must take all necessary safety precautions to ensure work safety.
6. All tools and materials required by the test will be provided by HKCITTC, candidates should check and ensure their adequacy and quality. All the tools must be returned to HKCITTC after the test. The candidates may ask the invigilator for any problems.
7. Candidates are required to handle and move the tools and materials for use in the test, and to carry out associated work.
8. All candidates must stop when time is up.
9. Candidates are required to return the test paper to invigilator after the test.
10. Invigilators will take record photos periodically during the test.
11. Candidates are not allowed to take any photo or video with cameras or mobile phones.
12. Candidates are not allowed to use their mobile phones during the trade tests, except for in an emergency.
13. Offering bribes to an invigilator is an offence in law and HKCITTC will report to the ICAC for any such case.
14. Subject to certain situations and/or conditions of the date of event, trade tests/courses could be at any moment suspended or postponed at discretion of the invigilators. Examples of such situation/condition could be, but not limited to, (a) sudden operation disruptions to classrooms, test venues, test equipment or tools etc. due to unforeseeable mishaps; (b) sickness or injury of candidates, students or elated staff of the HKCITTC; (c) adverse weather conditions. HKCITTC will rearrange another appointment, for free, with the candidates/students affected. Whilst every effort is made to ensure the smooth running of trade test/courses, the HKCITTC will not resume any liability any loss/damage directly or indirectly related to such arrangement.

In the event that the candidate fails to take any necessary safety precautions and / or works in any dangerous situations, he / she will be deemed failed.

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