MTR Corporation Limited

Tung Chung Cable Car Project

Nei Lak Shan Angle Station Proposal (Revision 5)

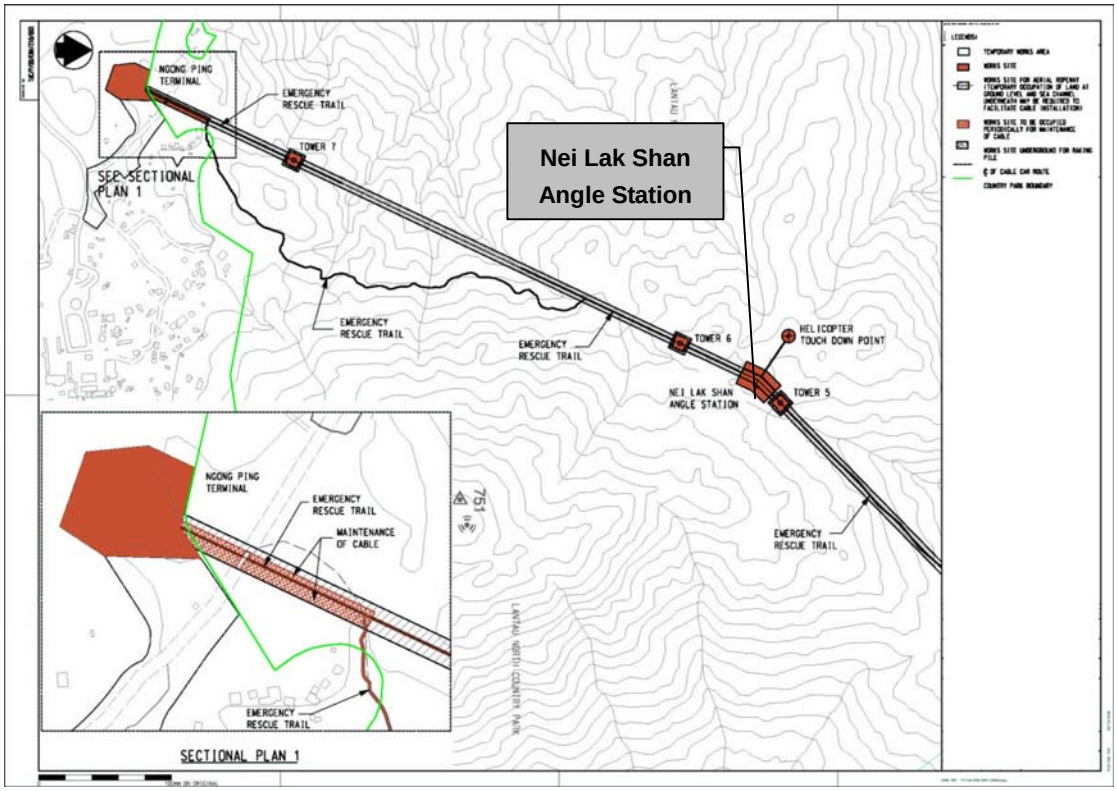
June 2006

1 Introduction

This Proposal gives a description on Nei Lak Shan Angle Station which will be provided as part of the cable car system to allow a change in direction.

2 Location and Design

The Nei Lak Shan Angle Station will be located within the Lantau North Country Park, see **Figure** below.



The following considerations are included in the design and positioning of the angle station:

- Minimize impact upon existing vegetation and natural terrain;
- Ensure the landscape and visual impacts are suitably mitigated. This will result in restoring disturbed country park area to a condition which resembles as close as possible the current natural condition;
- Providing screen planting to as much of the structure as possible. This will help achieve the effect that the structure has been incorporated within the landscape with as little disturbance as possible;

– In conjunction with the design of the structure, develop a chromatic scheme that will ensure the structure will fully visually integrate with the surrounding landscape.

The visual impact of the Nei Lak Shan Angle Station has been reviewed. Most significant surfaces of the angle station adopt a palette of recessive 'camouflage' colours, which allows it to better blend with the varying colours of Lantau hills – green in wet season and yellow-brown in dry season. GMS cable car equipment and associated concrete structures have not been coloured in order to simplify future maintenance in this remote location, however these surfaces will weather over time and become darker and more mottled. Please refer to **Appendix B** for the coloured elevations. As shown in the photomontages, see **Appendix C**, the angle station will be visually integrated with its environment. This is in line with the recommendations of the EIA that the angle station should be finished in a recessive colour scheme and respond to the seasonal change of vegetation colour to achieve visual integration with the surrounding terrain.

The previously designed high level timber screens have been omitted to promote better cross ventilation at the platform level of the angle station and increase the overall transparency of the structure, thereby reducing the visual impact. Deletion of the timber screens could also be considered as an environmental friendly measure since the timber would have a life of around twenty-five years and would need to be replaced in future, and there will be noise benefits to the sensitive receivers at Ngong Ping due to reduction in the amount of materials to be transported to the angle station by helicopters.

3 Impacts and Proposed Mitigation Measures

3.1 Water Quality

Construction Phase

Water quality concerns associated with the construction of the angle station mainly relate to the protection of water gathering ground and streams within the country park.

Proper drainage facilities as detailed in the Temporary Drainage Systems Proposal will be provided at the works site to control the construction wastewater. There will be bund wall at lower level of the site to stop runoff and a wastewater treatment system will be installed on site.

Operational Phase

Rain water will be collected through the outlets installed at the roof of angle station, which will then be directed to a recycling water tank. The storm water collected will be used as a supplementary water source for general cleansing purpose after filtration and UV-sterilization (or other treatment as appropriate). In compliance with the Building (Standards of Sanitary Fitments, Plumbing, Drainage Works and Latrines) Regulations, a gabion mattress channel of approximately 50m will be provided to convey rain water overflow from the recycling tank to the nearest stream course. Please refer to **Appendix D** for the location of the channel and its typical section.

The design of the channel has taken into consideration a range of issues including gradient of the existing slope, permissible design fall, material durability, roughness of the channel surface and visual impact. Use of gabion mattress can provide the durability and erosion protection whilst minimizing the environmental impacts. Excavated rocks will be used to form the gabions to reduce the extent of materials required and disposed of and to maintain the natural geological conditions. The alignment of the channel and its length are primarily governed by the design fall. The channel can neither be too gentle (not enough flow capacity) nor too steep (rapid flow causes excessive erosion). Though bends or meanders would be desirable, a catch pit is required for any change of flow direction in an open channel. From visual perspective, it is highly inappropriate to introduce a concrete box structure in middle of the channel.

Surface wastewater will be collected in a holding tank and pumped to a service cabin (via a sump pump system) on a regular basis for offsite discharge. Staff toilet facilities will be provided at the angle station, which will be manned by 1-2 staff. The toilet will be a self-contained composting unit (*Clivus Multrum* composting toilet system, Model M1). Waste from the toilet will be collected in a sealed container and transported by a service cabin for offsite disposal. Please refer to **Appendix E** for details.

3.2 Ecology, Visual and Landscape

The Nei Lak Shan Angle Station, which is positioned on a ridgeline, is located in grassland with scattered low shrub. This is a very widespread habitat in HKSAR with moderate to poor plant species diversity, and is previously identified in the EIA Report as of low ecological importance.

Further field surveys were undertaken by the qualified ecologist before commencement of the construction works at the angle station to ascertain the presence of any rare or protected flora species to be affected. As detailed in the Transplantation Plan, approximately 100 low shrubs of *Enkianthus quinqueflorus*, one colony of *Arundina graminifolia* and one fern of *Brainea insignis* were recorded within the work site. The species are protected under the Forestry Regulations of the Forests and Countryside Ordinance. All identified plant individuals had been transplanted in mid July 2004. The transplantation site, with similar environment as the original habitat, is nearby Tower 5 as agreed by AFCD.

In addition, an orchid species *Habenaria linguella* was identified at the temporary storage areas. The plant is retained on site by fencing it off at least 1m from the works areas with steel wire around four supports.

Permanent and temporary loss of grassland habitat arising from the construction of the angle station is presented in **Table 3.2.1** below. Note that the actual permanent habitat loss is dependent on the final design of the structure. Land used temporarily will be fully restored upon completion of the works, this is also the best landscape mitigation in minimizing the potential visual impact. The major objective of the landscape strategy is to retain as much of the existing vegetation as possible and reinstating disturbed areas caused by the construction. As detailed in the Landscape Plan, replanting of native species will be carried out at the angle station. Climber will be added surrounding the supporting columns to visually soften the vertical concrete base of the structure.

Table 3.2.1 Approximate Habitat Loss arising from Construction of Nei Lak Shan Angle Station

Habitat	Description and Location	Permanent Loss Area (ha)	Temporary Loss Area (ha)
Grassland	Nei Lak Shan Angle Station	0.20	0.29
	Temporary Storage Areas	-	0.15
	Surface Channel	0.02	0.01
Total Loss		**0.22**	**0.45**

Note: The Table provides an approximate indication of the potential habitat loss. The values listed are based on the immediate footprint of the permanent works and their respective anticipated construction areas.

4 Appendices

Appendix A – Revised Working Drawings

Drawing No.	Title
5201/W/04/LPT/A11/001B	Site Location & Layout Plan
5201/W/04/LPT/A12/001B	GA Plan- Lower Ground Level
5201/W/04/LPT/A12/011B	GA Plan- Ground Level
5201/W/04/LPT/A12/021B	GA Plan- Roof Level
5201/W/04/LPT/A13/001B	Section A-A & Section B-B
5201/W/04/LPT/A13/002B	Section C-C & Section D-D
5201/W/04/LPT/A14/001B	Elevation A
5201/W/04/LPT/A14/002B	Elevation B & Elevation C
5201/W/04/LPT/A14/003B	Elevation D
5201/W/04/LPT/A14/004B	Elevation E & Elevation F

Appendix B – Coloured Elevations A to D

Appendix C – Photomontages 01 to 03

Appendix D – Gabion Mattress Channel- Location & Typical Section

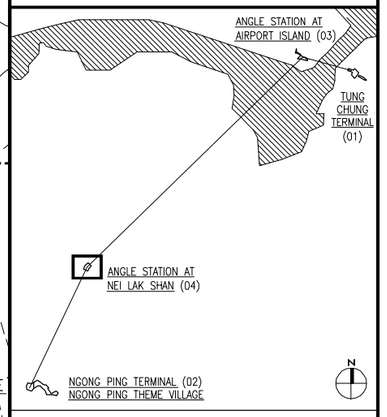
Appendix E – Clivus Multrum Composting Toilet Systems Manual

Appendix F – Landscape Planting Plan

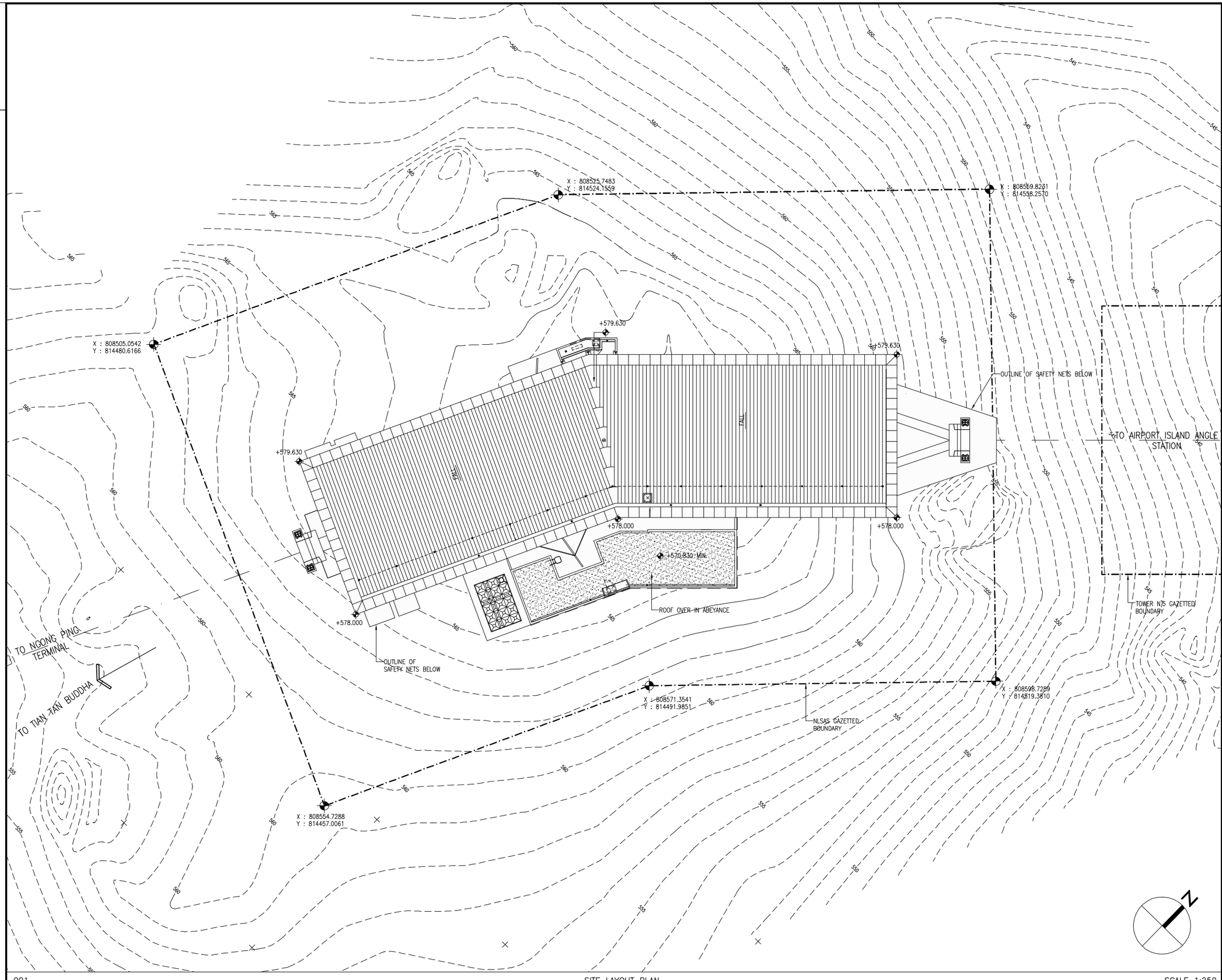
DRAWING NO
5201/W/04/LPT/A11/001

NOTES

1. FOR PROJECT NOTES AND ABBREVIATIONS REFER TO DWG 5201/W/00/LPT/A10/001. FOR MATERIALS AND SYMBOLS REFER TO DWG 5201/W/00/LPT/A10/002.
2. CHAINLINK FENCE SHALL BE ERECTED AROUND SITE BOUNDARY. EXACT EXTENT AND SETTING-OUT TO BE CONFIRMED.
3. FOR LAYOUT OF EXTERNAL LIGHTING, REFER TO OAP DRAWINGS.
4. FOR LAYOUT OF EXTERNAL COMBINED SERVICES, REFER TO DRAWING 5201/W/03/OAP/L01/001.



SITE LOCATION



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PROJECT 東涌吊車 TUNG CHUNG CABLE CAR

ORIGINATOR 凱達柏濤有限公司 Aedas Limited

TITLE

CONTRACT 5201

NEI LAK SHAN ANGLE STATION

SITE LOCATION AND LAYOUT PLAN

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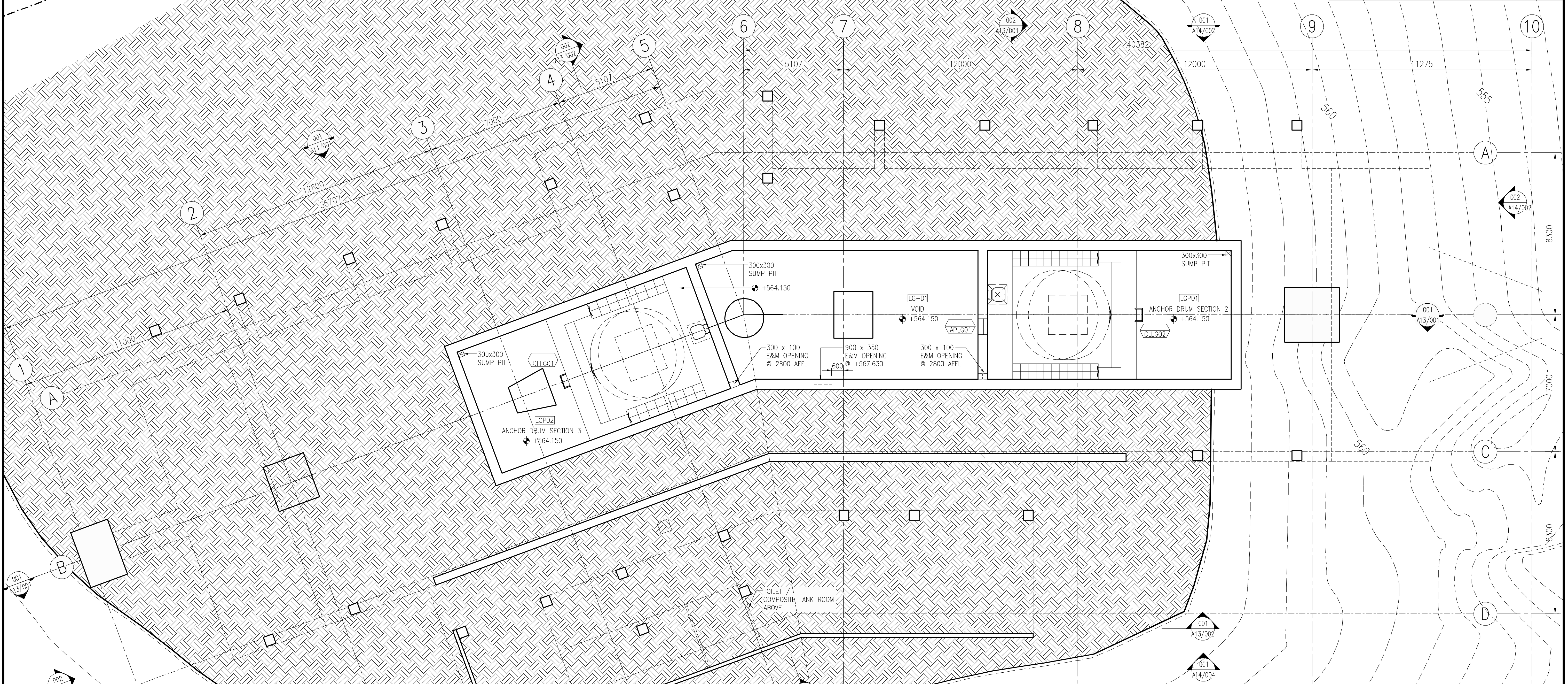

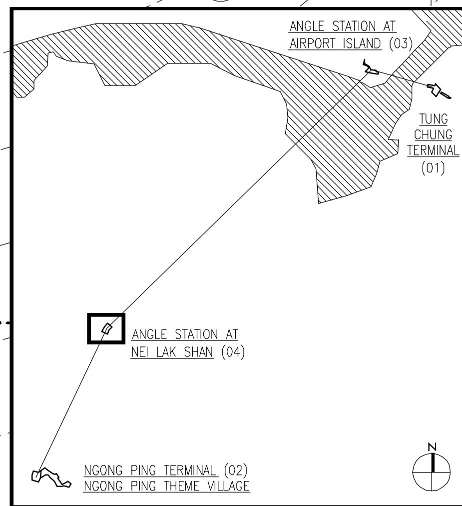

SITE LOCATION

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PROJECT
東涌吊車
TUNG CHUNG CABLE CAR

ORIGINATOR
凱達柏濤有限公司
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TITLE
CONTRACT 5201
NEI LAK SHAN ANGLE STATION
GA PLAN
LOWER GROUND LEVEL

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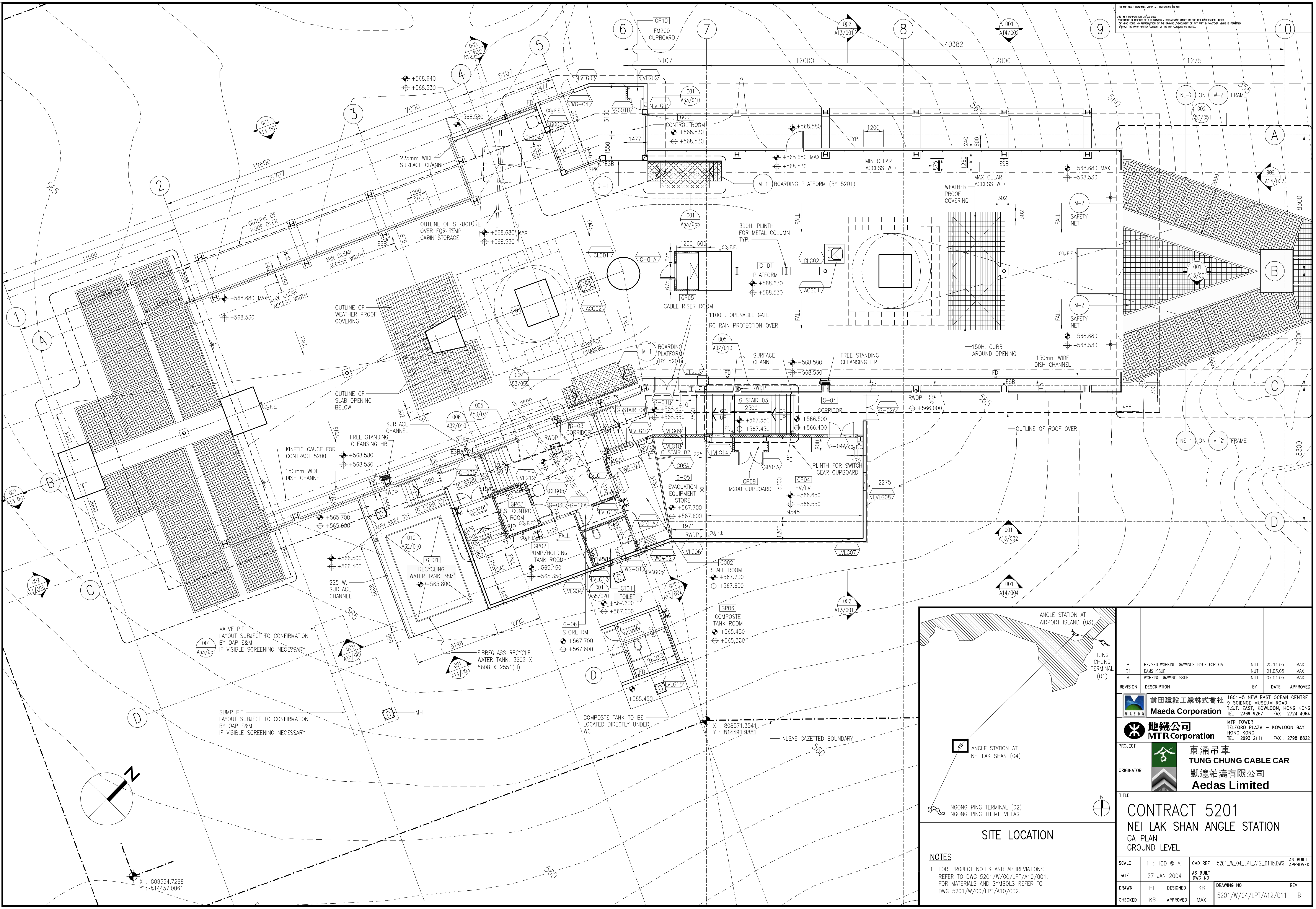
GP10
FM200 CUPBOARD
CONTROL ROOM
BOARDING PLATFORM (BY 5201)
CABLE RISER ROOM
PLATFORM
1100H. OPENABLE GATE
RC RAIN PROTECTION OVER
WEATHER PROOF COVERING
SAFETY NET
150H. CURB AROUND OPENING
150mm WIDE DISH CHANNEL
OUTLINE OF ROOF OVER
OUTLINE OF STRUCTURE OVER FOR TEMP CABIN STORAGE
MIN CLEAR ACCESS WIDTH
225mm WIDE SURFACE CHANNEL
OUTLINE OF WEATHER PROOF COVERING
OUTLINE OF SLAB OPENING BELOW
FREE STANDING CLEANSING HR
KINETIC GAUGE FOR CONTRACT 5200
EVACUATION EQUIPMENT STORE
FM200 CUPBOARD
HV/LV
PLINTH FOR SWITCH GEAR CUPBOARD
F.S. CONTROL ROOM
PUMP/HOLDING TANK ROOM
RECYCLING WATER TANK 38m²
STAFF ROOM
TOILET
STORE RM
COMPOSITE TANK ROOM
FIBREGLASS RECYCLE WATER TANK, 3602 X 5608 X 2551(H)
VALVE PIT LAYOUT SUBJECT TO CONFIRMATION BY OAP E&M IF VISIBLE SCREENING NECESSARY
SUMP PIT LAYOUT SUBJECT TO CONFIRMATION BY OAP E&M IF VISIBLE SCREENING NECESSARY
COMPOSTE TANK TO BE LOCATED DIRECTLY UNDER WC
NLSAS GAZETTED BOUNDARY
X : 808571.3541
Y : 814491.9851
X : 808554.7288
Y : 814457.0061
ANGLE STATION AT AIRPORT ISLAND (03)
TUNG CHUNG TERMINAL (01)
ANGLE STATION AT NEI LAK SHAN (04)
NGONG PING TERMINAL (02)
NGONG PING THEME VILLAGE

SITE LOCATION

NOTES

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PROJECT: 東涌吊車 TUNG CHUNG CABLE CAR

ORIGINATOR: 凱達柏濤有限公司 Aedas Limited

TITLE

CONTRACT 5201

NEI LAK SHAN ANGLE STATION

GA PLAN
GROUND LEVEL

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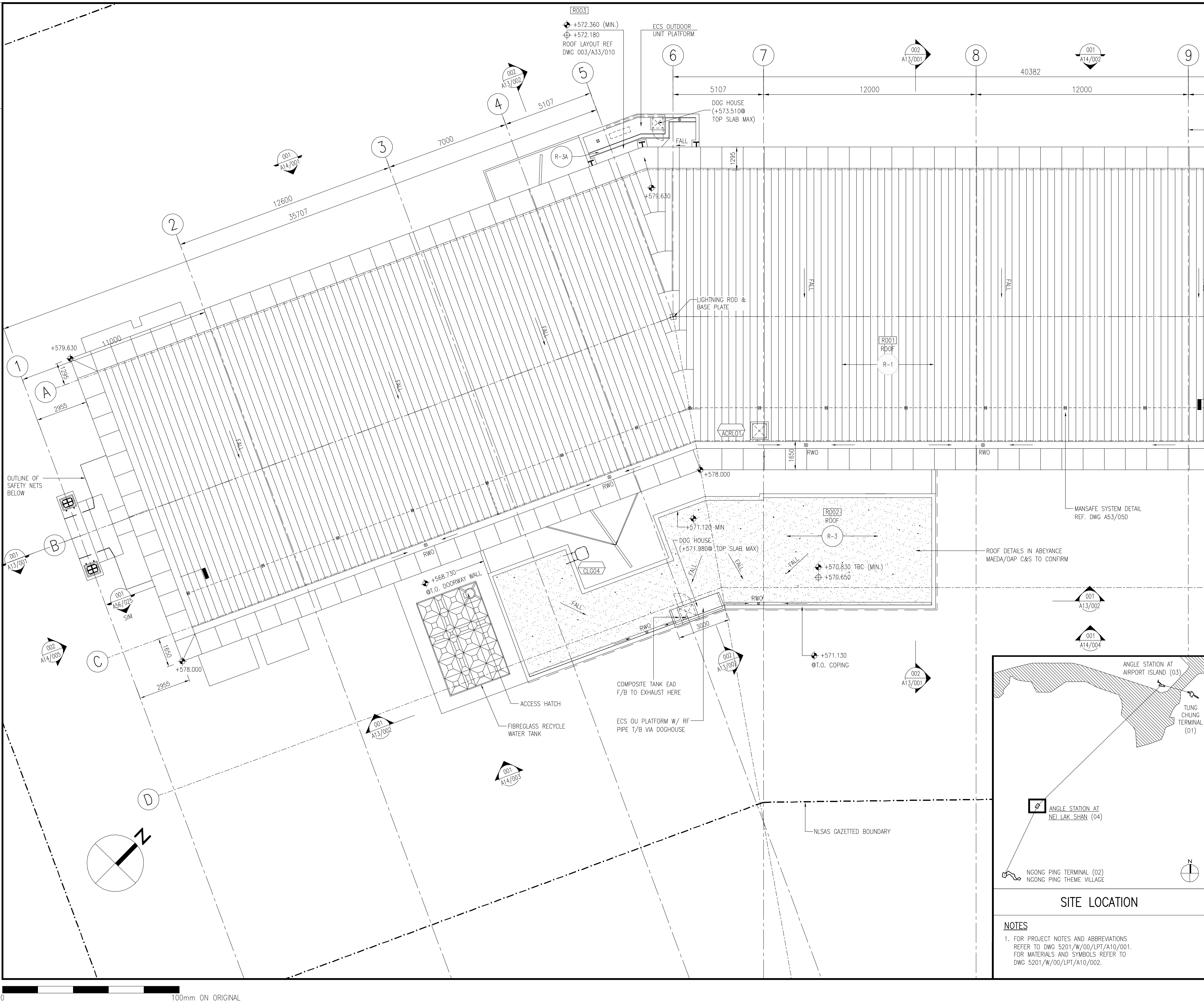
R003
+572.360 (MIN.)
+572.180
ROOF LAYOUT REF
DWG 003/A33/010
ECS OUTDOOR
UNIT PLATFORM
DOG HOUSE
(+573.510@
TOP SLAB MAX)
40382
5107
12000
12000
11275
3645
+579.630
1295
12600
35707
7000
5107
11000
2955
1650
8300
7000
8300
LIGHTNING ROD &
BASE PLATE
R001
ROOF
R-1
R-3A
ACRL01
RWO
FALL
+578.000
OUTLINE OF
SAFETY NETS
BELOW
R002
ROOF
R-3
+571.120 MIN
DOG HOUSE
(+571.980@ TOP SLAB MAX)
+570.830 TBC (MIN.)
+570.650
ROOF DETAILS IN ABEYANCE
MAEDA/OAP C&S TO CONFIRM
MANSAFE SYSTEM DETAIL
REF. DWG A53/050
+568.730
@T.O. DOORWAY WALL
CLG04
3000
+571.130
@T.O. COPING
ACCESS HATCH
FIBREGLASS RECYCLE
WATER TANK
COMPOSITE TANK EAD
F/B TO EXHAUST HERE
ECS OU PLATFORM W/ RF
PIPE T/B VIA DOGHOUSE
NLSAS GAZETTED BOUNDARY
N
0
100mm ON ORIGINAL
ANGLE STATION AT
AIRPORT ISLAND (03)
TUNG
CHUNG
TERMINAL
(01)
ANGLE STATION AT
NEI LAK SHAN (04)
NGONG PING TERMINAL (02)
NGONG PING THEME VILLAGE
N

SITE LOCATION

NOTES

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PROJECT
東涌吊車
TUNG CHUNG CABLE CAR

ORIGINATOR
凱達柏濤有限公司
Aedas Limited

TITLE

CONTRACT 5201
NEI LAK SHAN ANGLE STATION
GA PLAN
ROOF LEVEL

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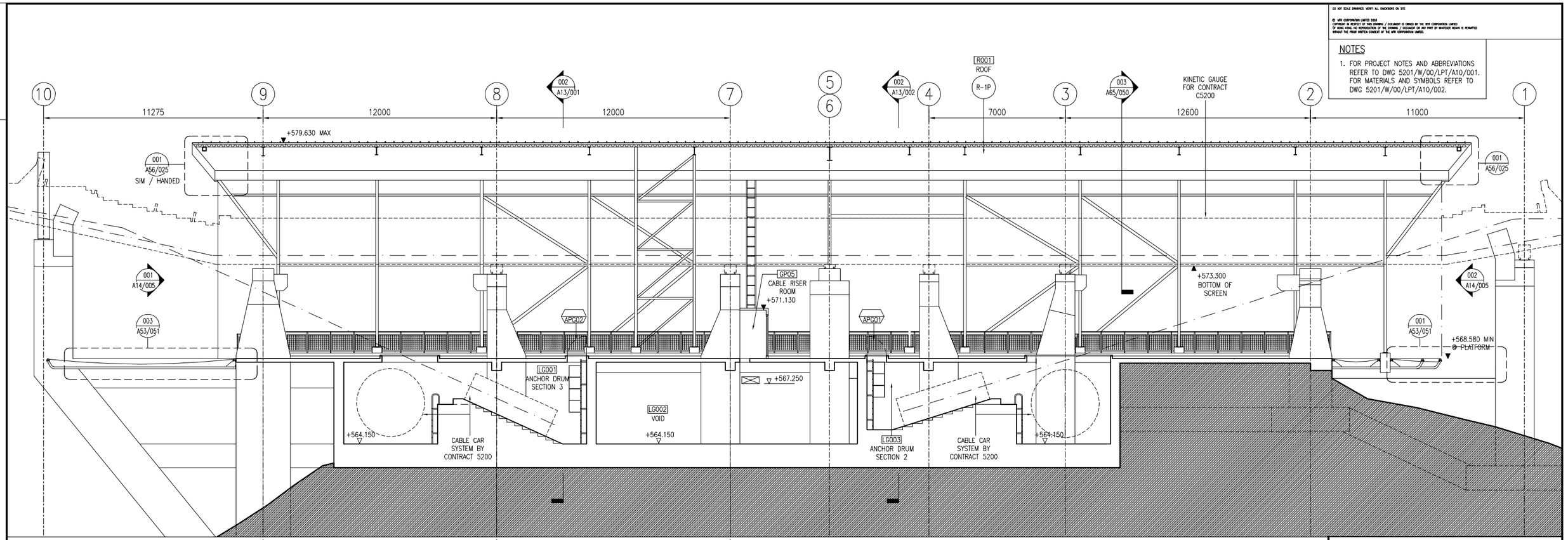

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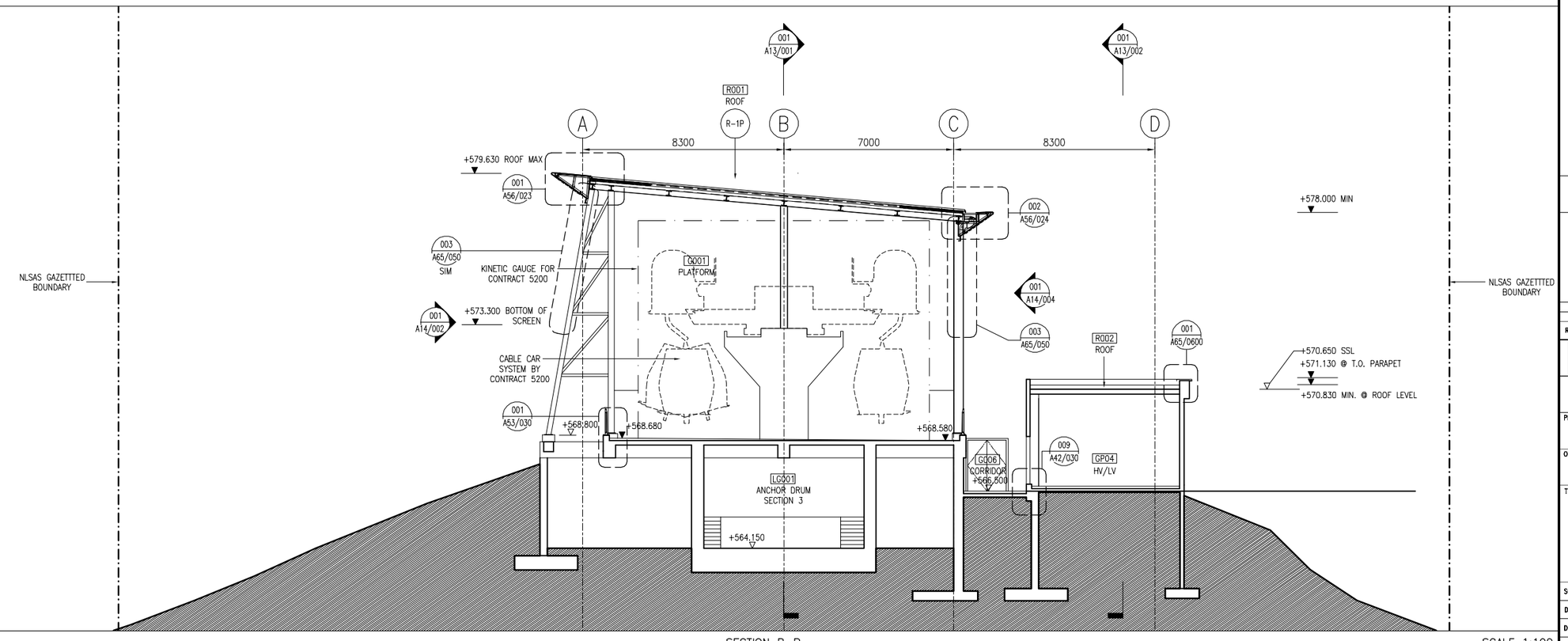

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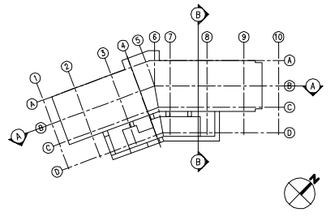

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PROJECT 東涌吊車 TUNG CHUNG CABLE CAR

ORIGINATOR 凱達柏濤有限公司 Aedas Limited

TITLE

CONTRACT 5201

NEI LAK SHAN ANGLE STATION

SECTION A–A
SECTION B–B

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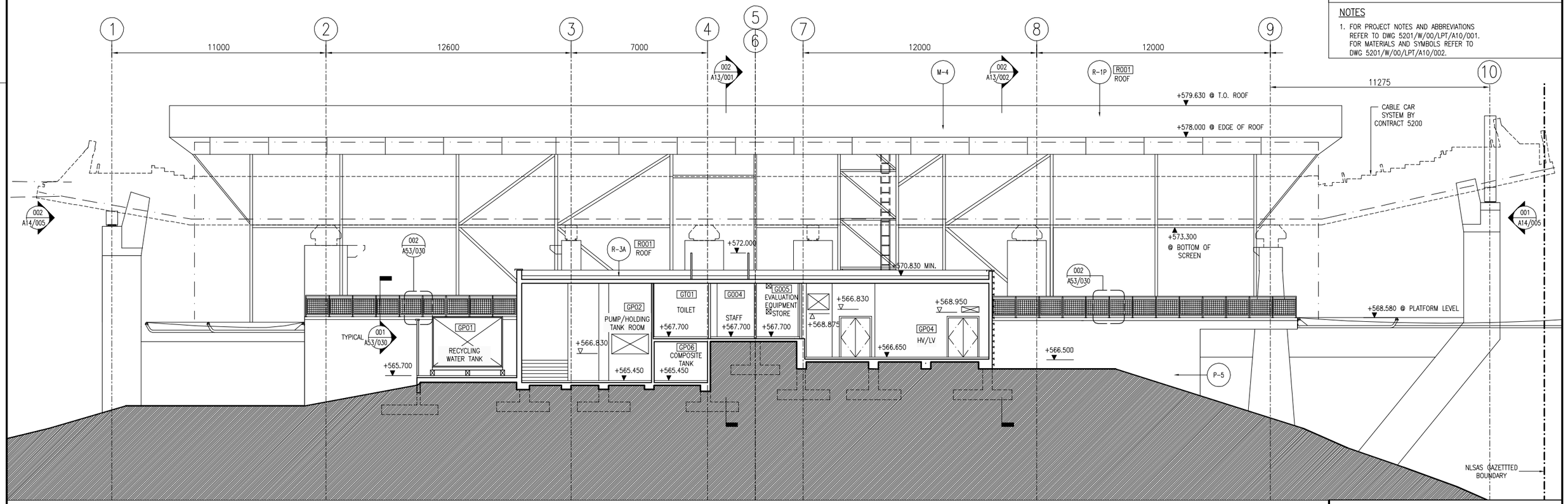

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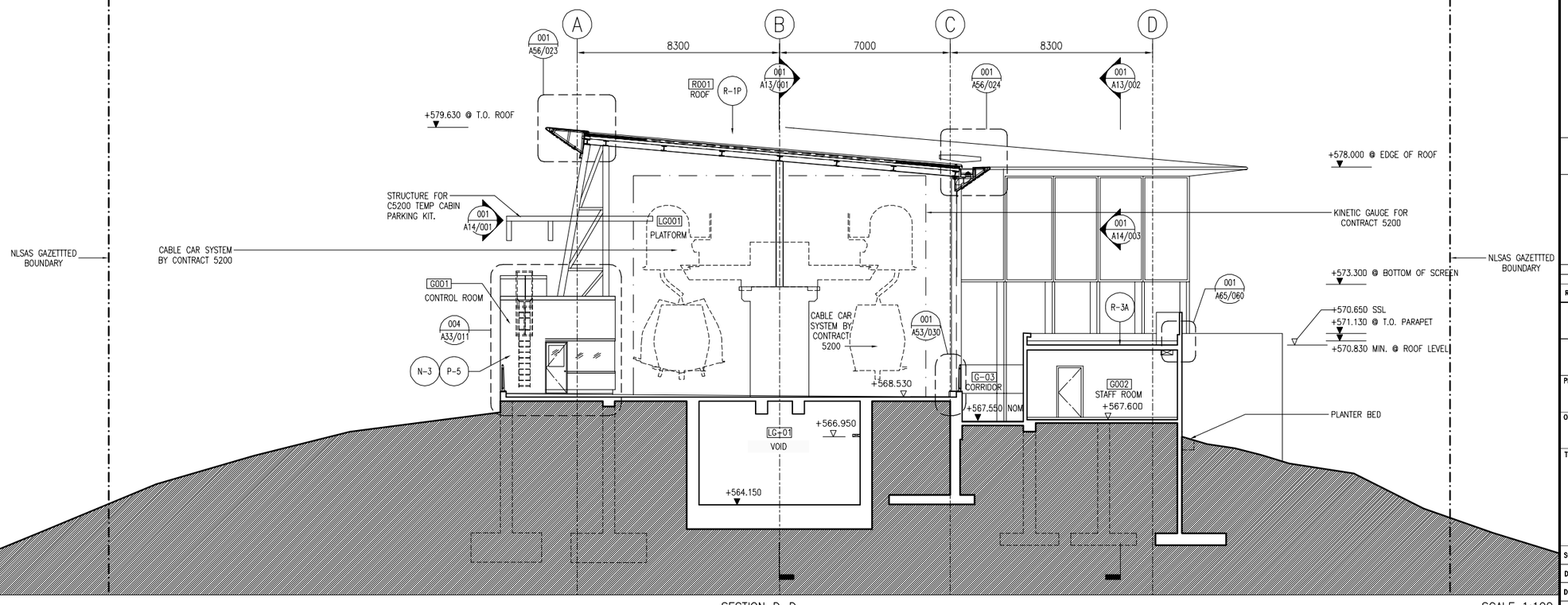

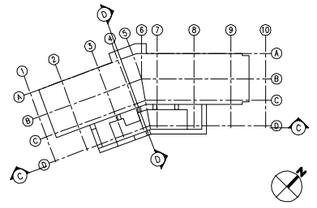

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PROJECT 東涌吊車 TUNG CHUNG CABLE CAR

ORIGINATOR 凱達柏濤有限公司 Aedas Limited

TITLE

CONTRACT 5201

NEI LAK SHAN ANGLE STATION

SECTION C–C
SECTION D–D

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DRAWING NO
5201/W/04/LPT/A14/001

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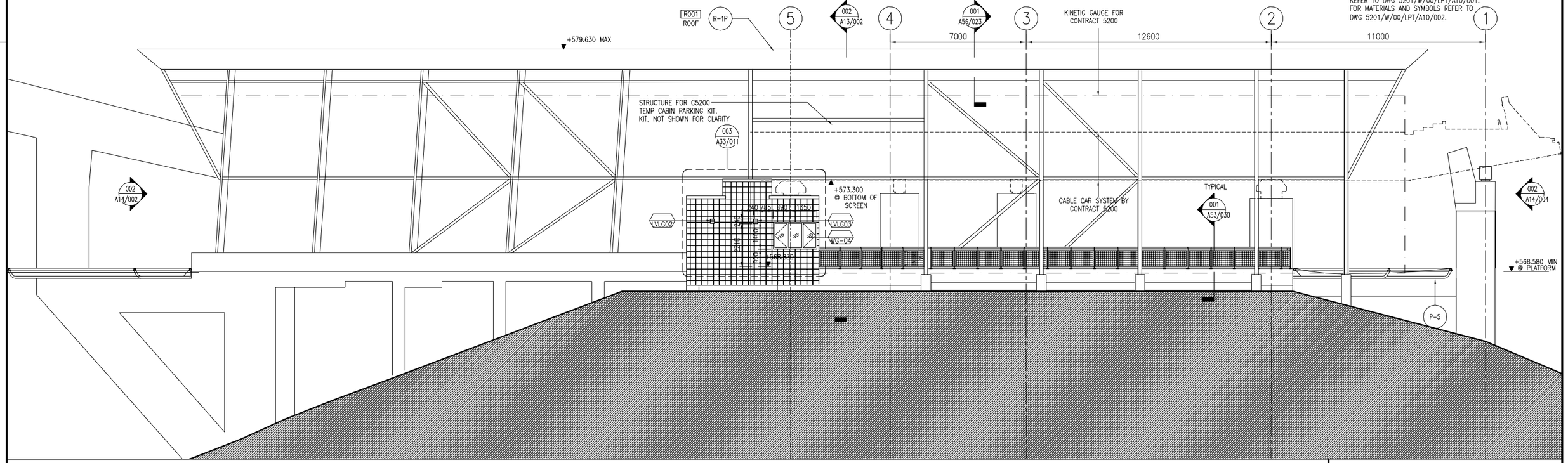

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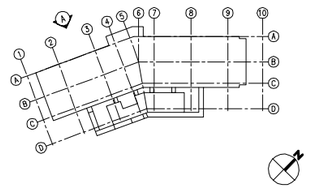

KEY PLAN

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A	WORKING DRAWING ISSUE	NUT	07.01.05	MAX

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Maeda Corporation
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MTR Corporation
MTR TOWER
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HONG KONG
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PROJECT
東涌吊車
TUNG CHUNG CABLE CAR

ORIGINATOR
凱達柏濤有限公司
Aedas Limited

TITLE

CONTRACT 5201

NEI LAK SHAN ANGLE STATION

ELEVATION A

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CHECKED	KB	APPROVED MAX			

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DRAWING NO 5201/W/04/LPT/A14/002

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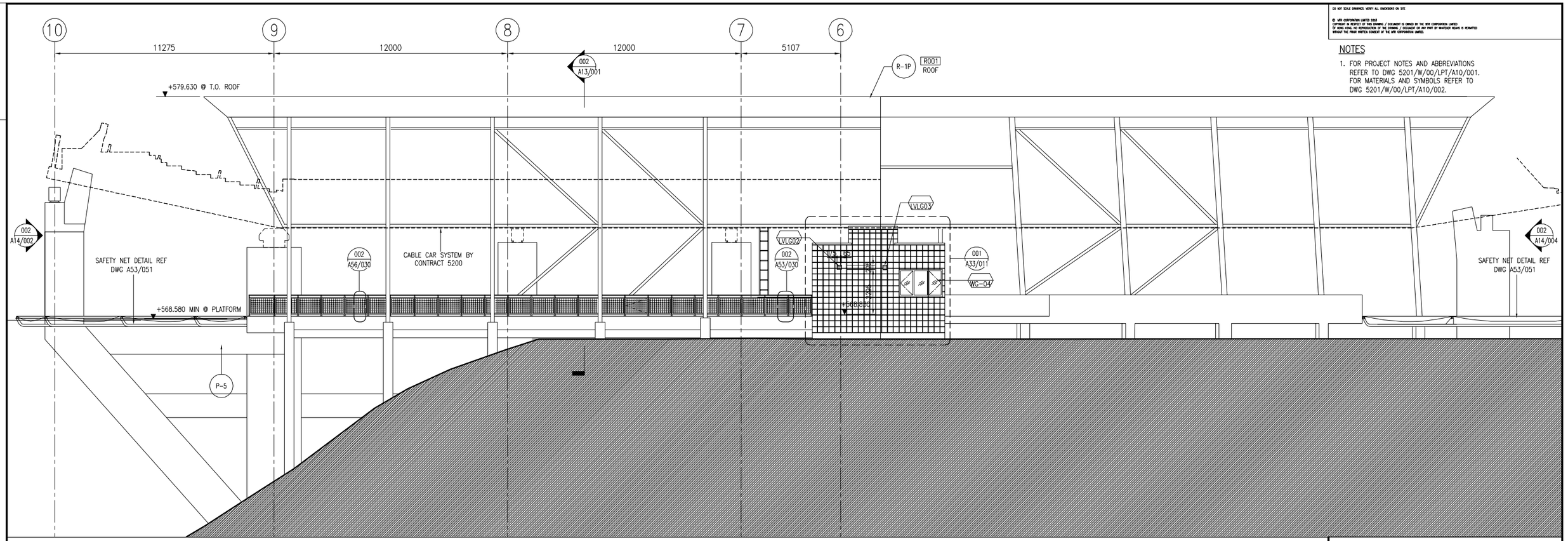

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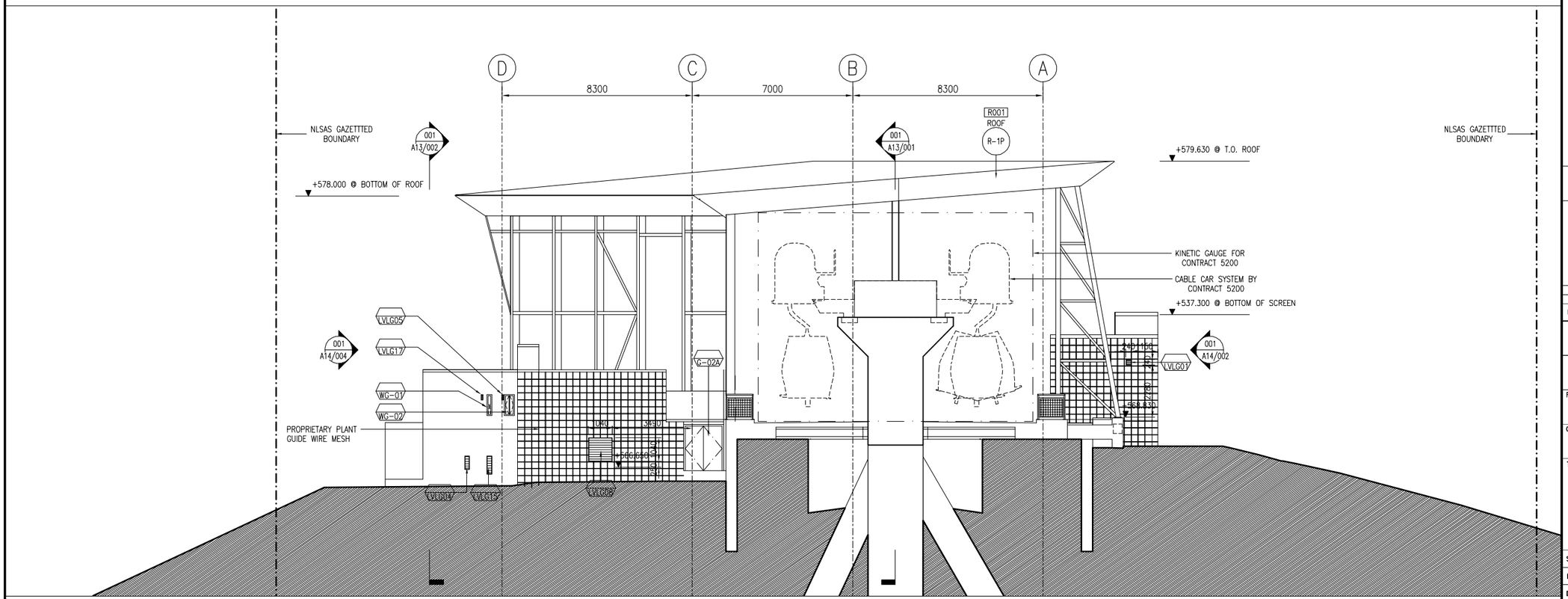

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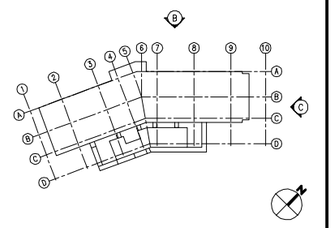

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A	WORKING DRAWING ISSUE	NUT	07.01.05	MAX

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PROJECT 東涌吊車 TUNG CHUNG CABLE CAR

ORIGINATOR 凱達柏濤有限公司 Aedas Limited

TITLE

CONTRACT 5201
NEI LAK SHAN ANGLE STATION
ELEVATION B
ELEVATION C

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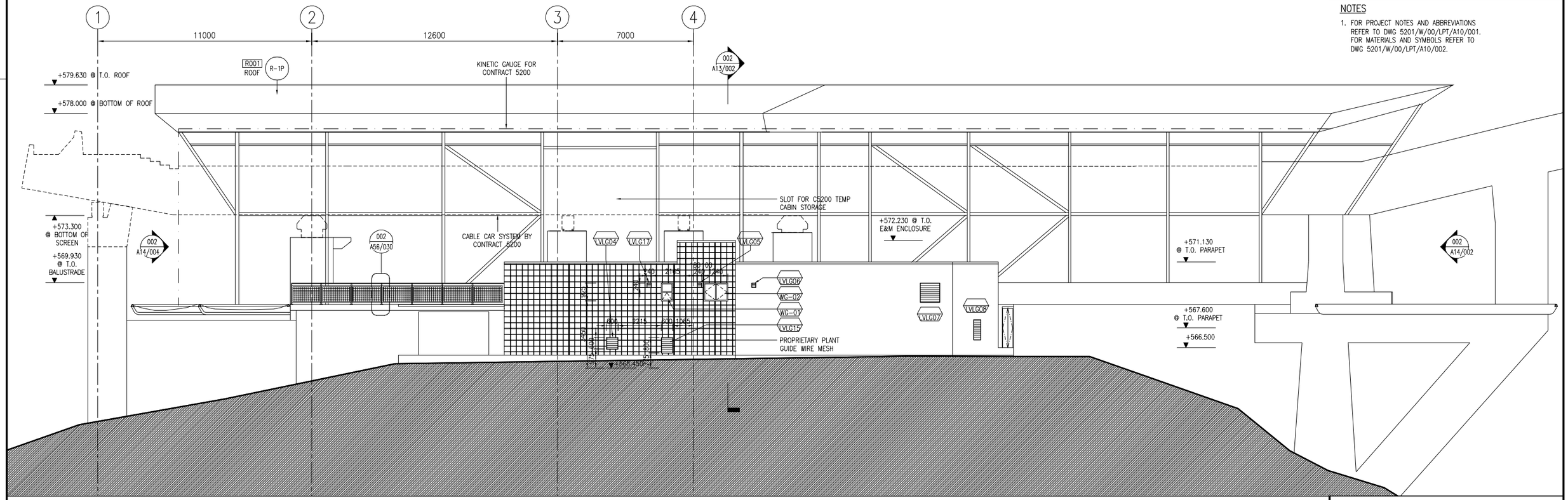

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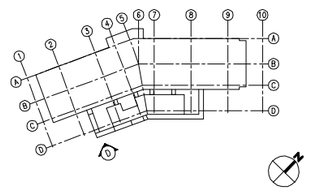

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PROJECT
東涌吊車
TUNG CHUNG CABLE CAR

ORIGINATOR
凱達柏濤有限公司
Aedas Limited

TITLE
CONTRACT 5201
NEI LAK SHAN ANGLE STATION
ELEVATION D

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DRAWING NO
5201/W/04/LPT/A14/004

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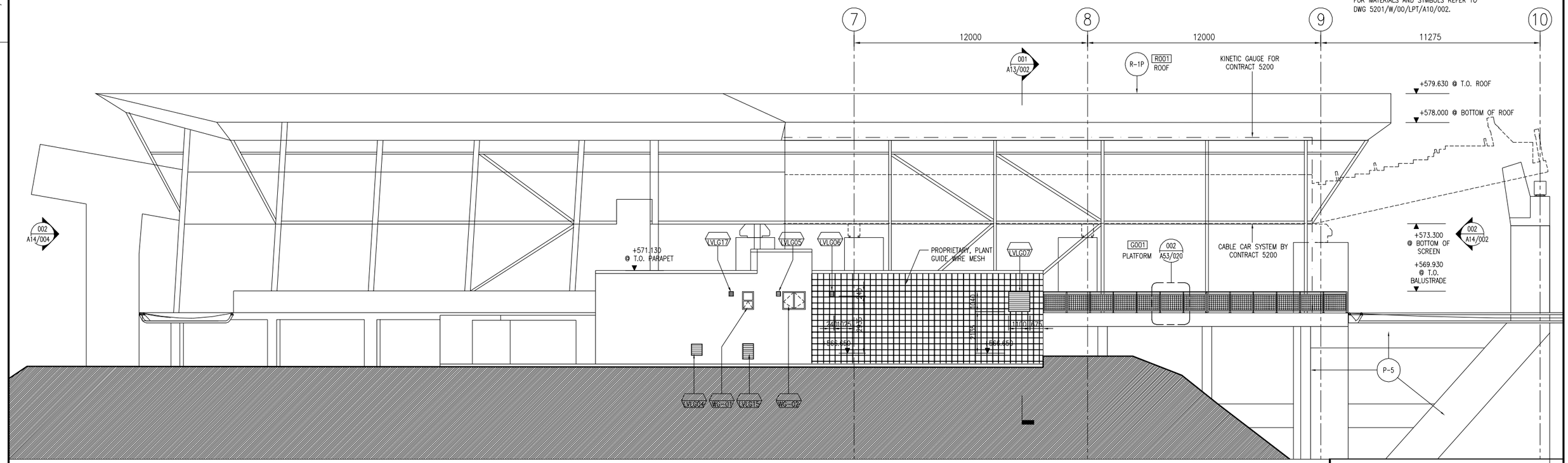

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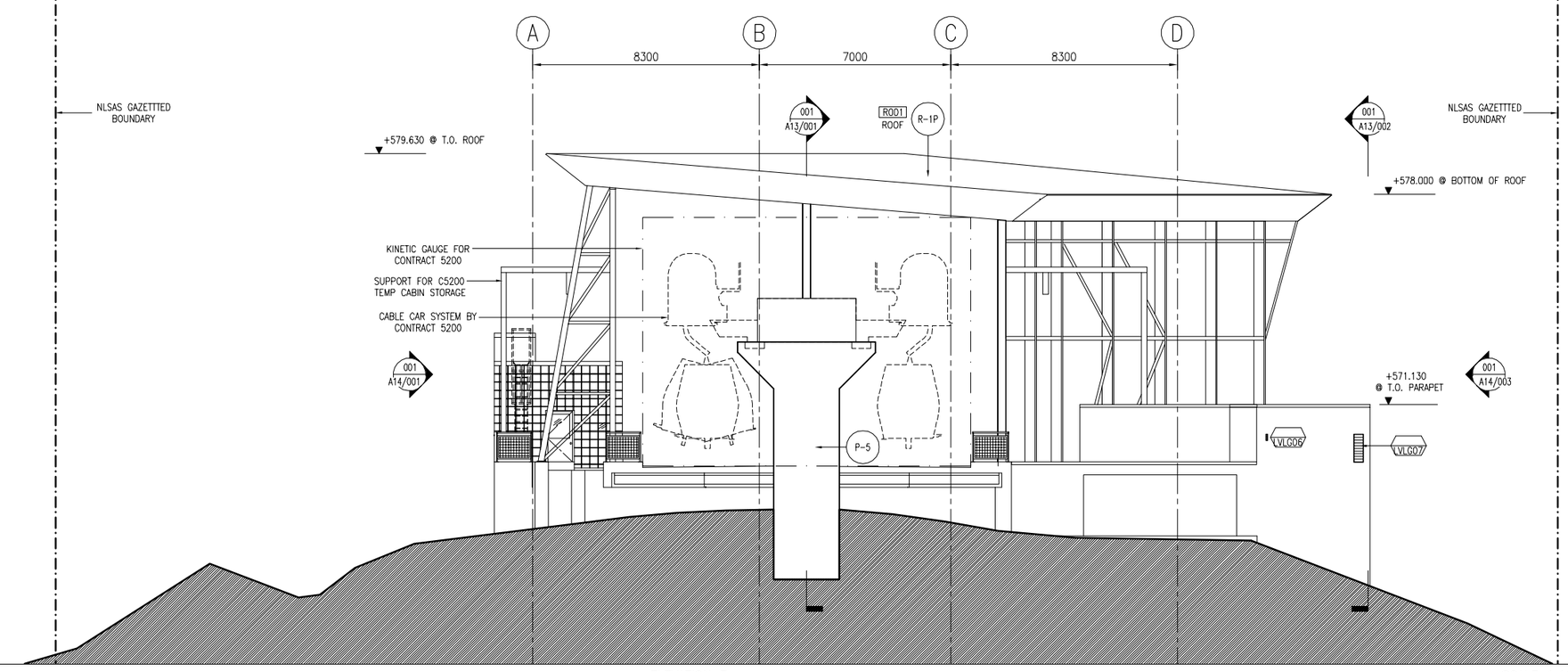

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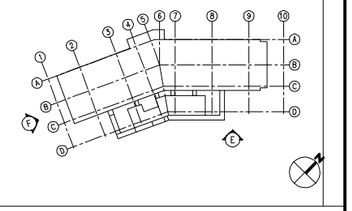

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A	WORKING DRAWING ISSUE	NUT	07.01.05	MAX

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MTR Corporation
MTR TOWER
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PROJECT
東涌吊車
TUNG CHUNG CABLE CAR

ORIGINATOR
凱達柏濤有限公司
Aedas Limited

TITLE

CONTRACT 5201

NEI LAK SHAN ANGLE STATION

ELEVATION E
ELEVATION F

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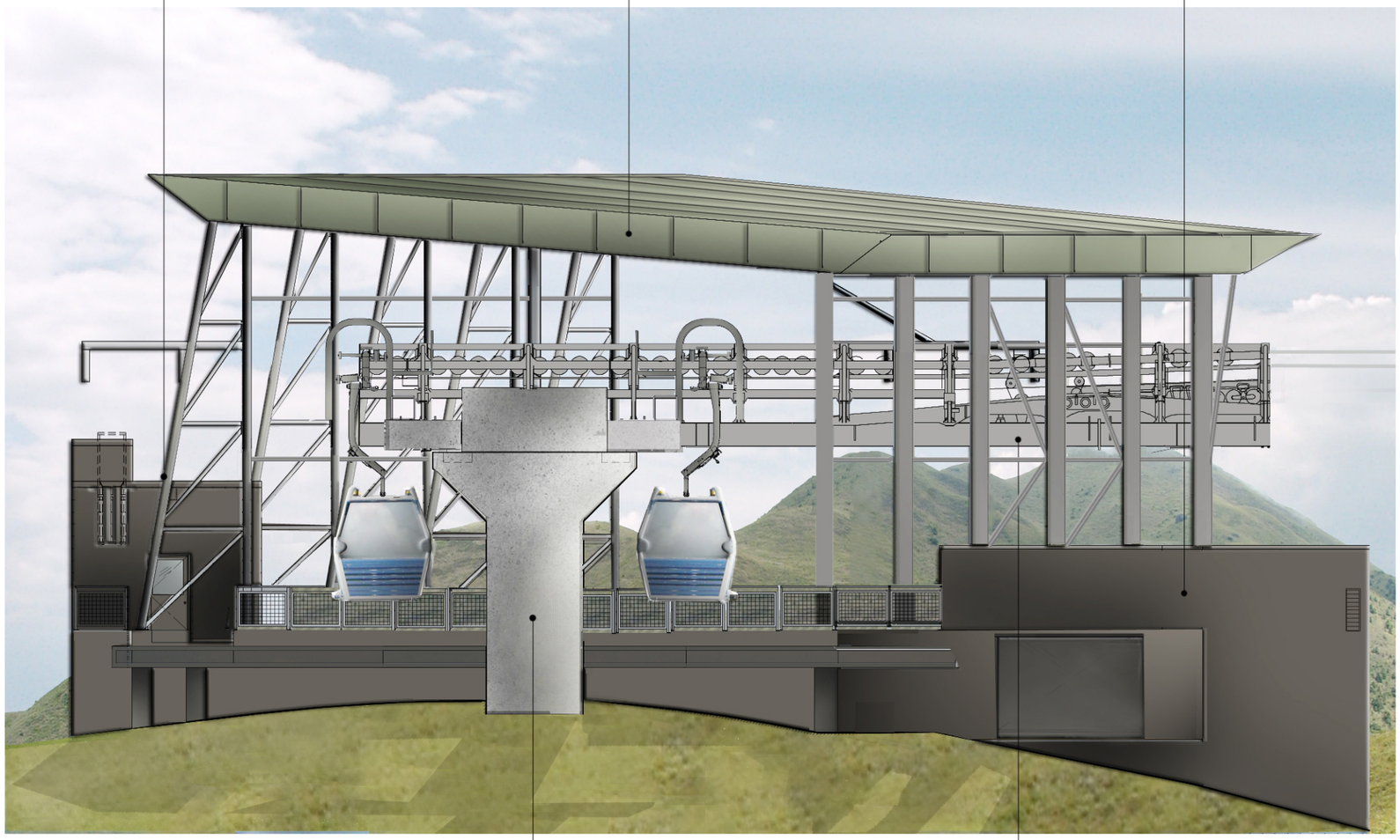
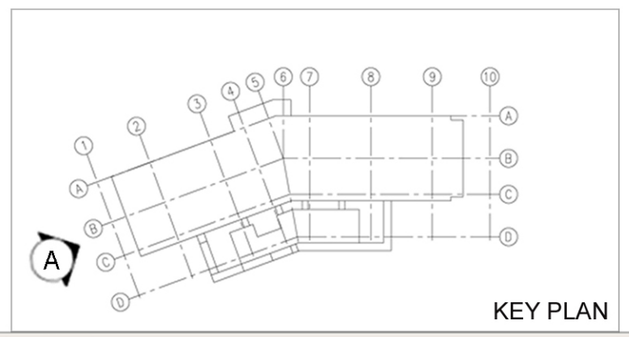




RAL 6013 - KHAKI GREEN FOR ROOF CLADDING
RAL 7030 - GREY-BROWN FOR STEEL STRUCTURE
RAL 7013 - DARK GREY-BROWN FOR CONCRETE
RAL 9016 - OFF-WHITE FOR SAFETY NET FRAME
CONCRETE (NATURALLY WEATHERED)
GALVANISED STEEL (NATURALLY WEATHERED)
CABLE CAR EQUIPMENT

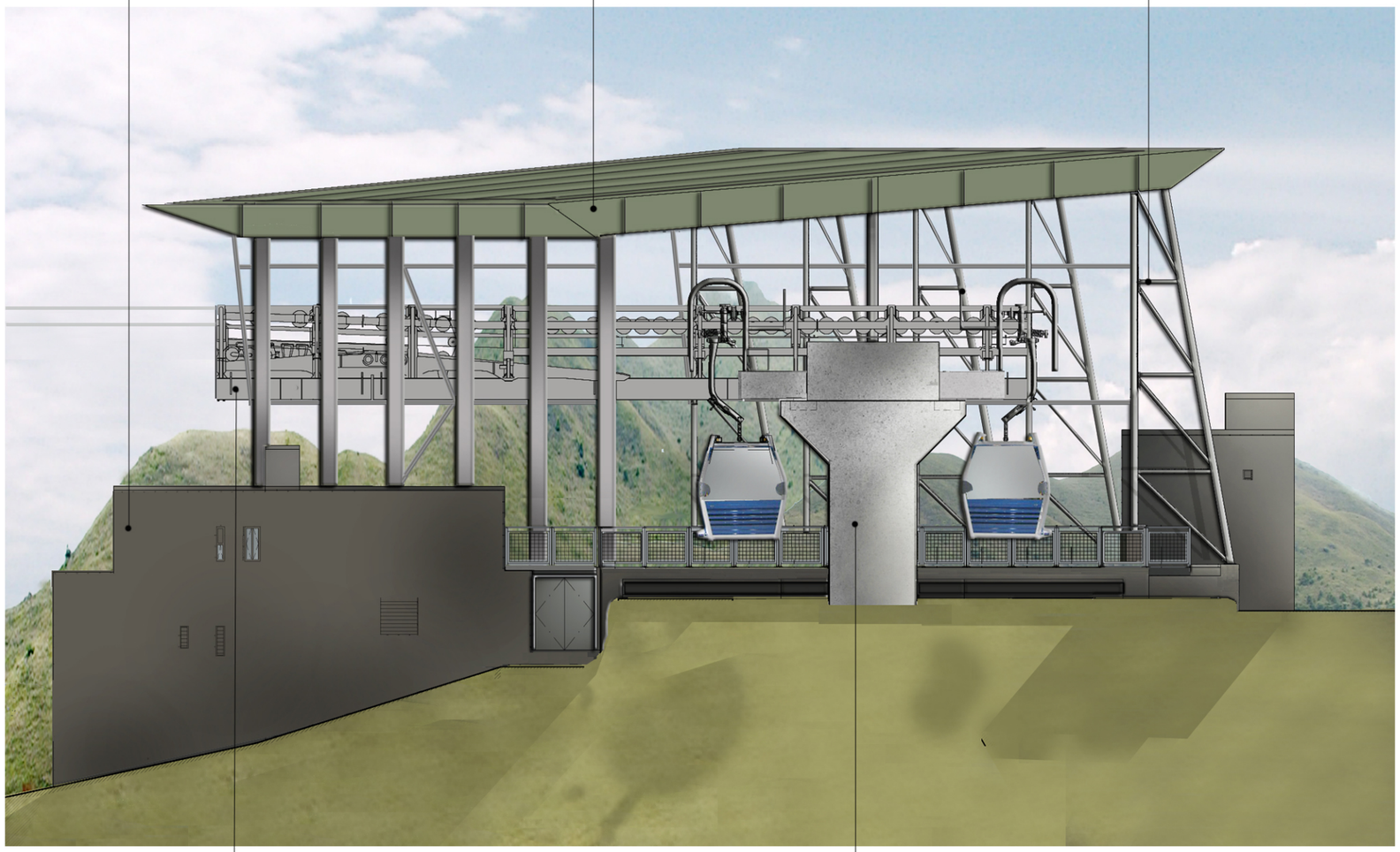
NEI LAK SHAN ANGLE STATION - FRONT ELEVATION A

TUNG CHUNG CABLE CAR PROJECT

PAINTED CONCRETE (RAL 7013)

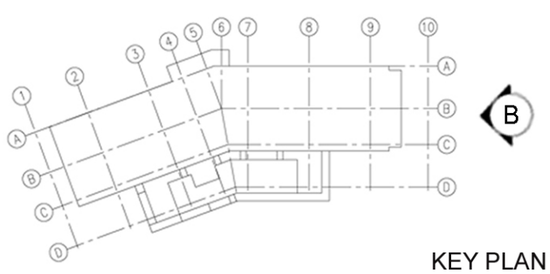
PAINTED KAL-ZIP ROOF CLADDING (RAL 6013)

PAINTED STEEL STRUCTURE (RAL 7030)



GMS CABLE EQUIPMENT (NATURALLY WEATHERED)

CONCRETE (NATURALLY WEATHERED)

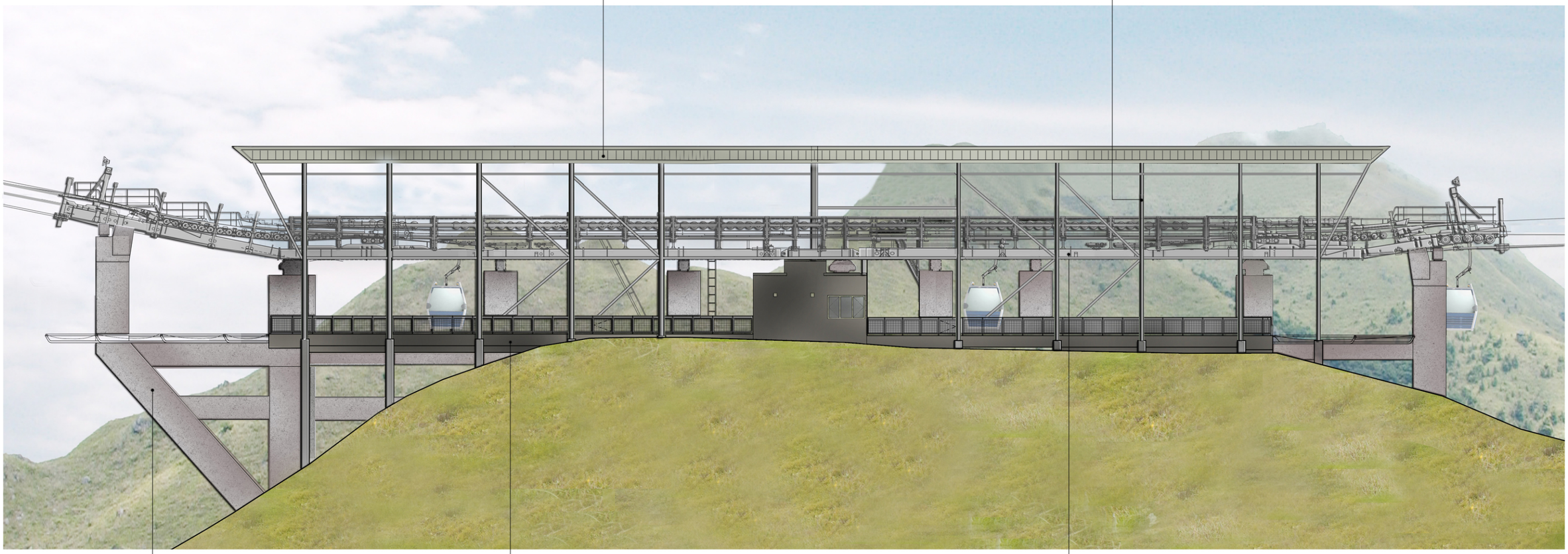


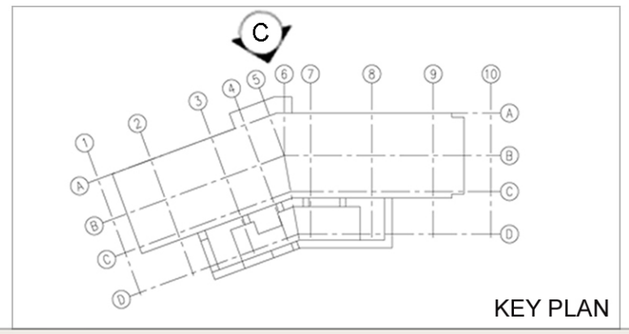
KEY PLAN

RAL 6013 - KHAKI GREEN FOR ROOF CLADDING
RAL 7030 - GREY-BROWN FOR STEEL STRUCTURE
RAL 7013 - DARK GREY-BROWN FOR CONCRETE
RAL 9016 - OFF-WHITE FOR SAFETY NET FRAME
CONCRETE (NATURALLY WEATHERED)
GALVANISED STEEL (NATURALLY WEATHERED)
CABLE CAR EQUIPMENT

NEI LAK SHAN ANGLE STATION - FRONT ELEVATION B

TUNG CHUNG CABLE CAR PROJECT

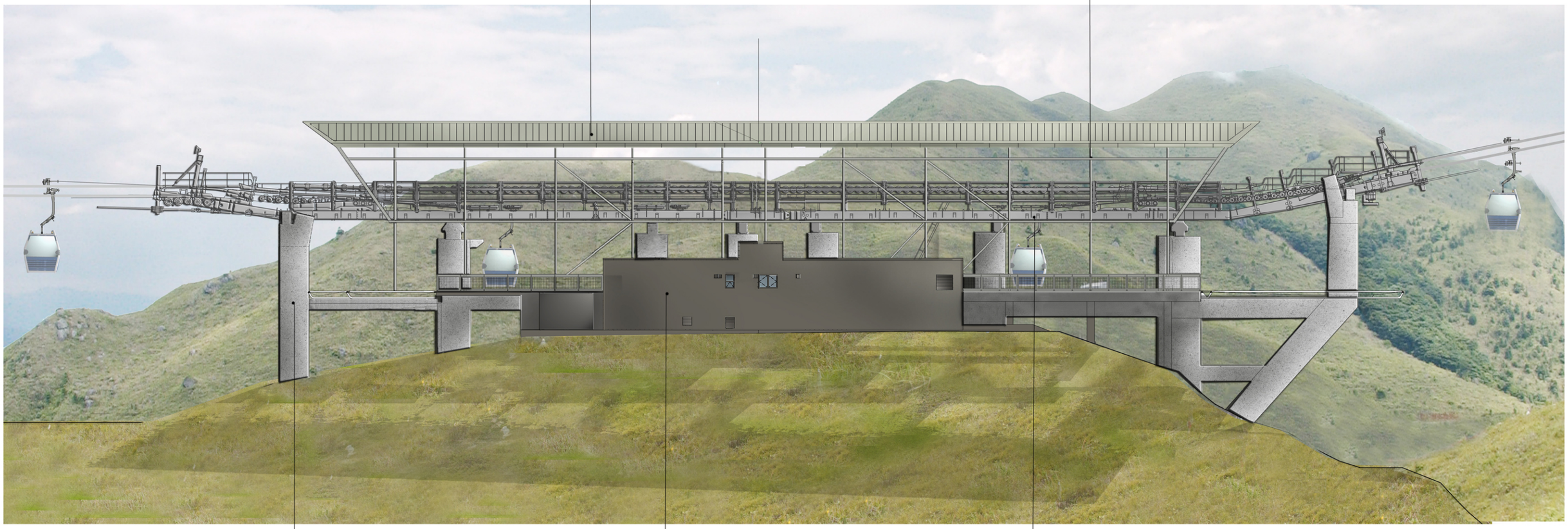




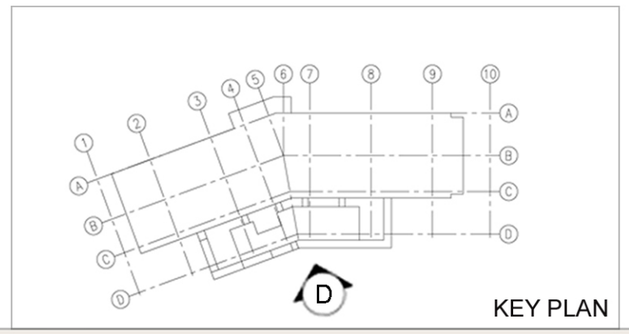
RAL 6013 - KHAKI GREEN FOR ROOF CLADDING
RAL 7030 - GREY-BROWN FOR STEEL STRUCTURE
RAL 7013 - DARK GREY-BROWN FOR CONCRETE
RAL 9016 - OFF-WHITE FOR SAFETY NET FRAME
CONCRETE (NATURALLY WEATHERED)
GALVANISED STEEL (NATURALLY WEATHERED)
CABLE CAR EQUIPMENT

NEI LAK SHAN ANGLE STATION - SIDE ELEVATION C

TUNG CHUNG CABLE CAR PROJECT



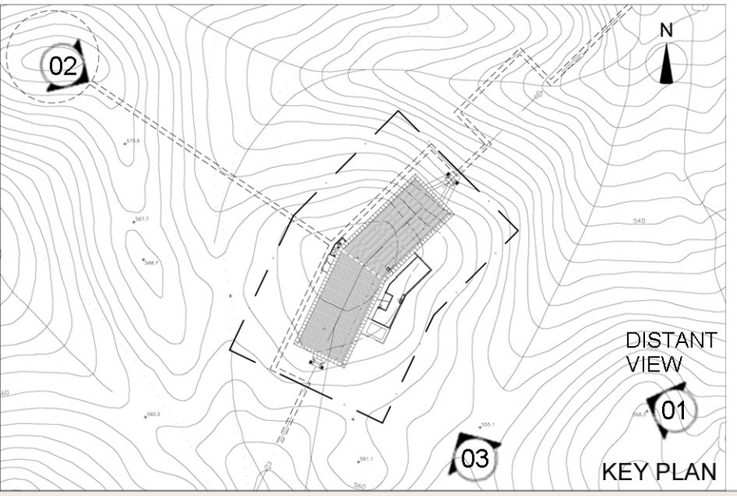
RAL 6013 - KHAKI GREEN FOR ROOF CLADDING
RAL 7030 - GREY-BROWN FOR STEEL STRUCTURE
RAL 7013 - DARK GREY-BROWN FOR CONCRETE
RAL 9016 - OFF-WHITE FOR SAFETY NET FRAME
CONCRETE (NATURALLY WEATHERED)
GALVANISED STEEL (NATURALLY WEATHERED)
CABLE CAR EQUIPMENT



KEY PLAN

NEI LAK SHAN ANGLE STATION - SIDE ELEVATION D

TUNG CHUNG CABLE CAR PROJECT



NEI LAK SHAN ANGLE STATION - PHOTOMONTAGE 01

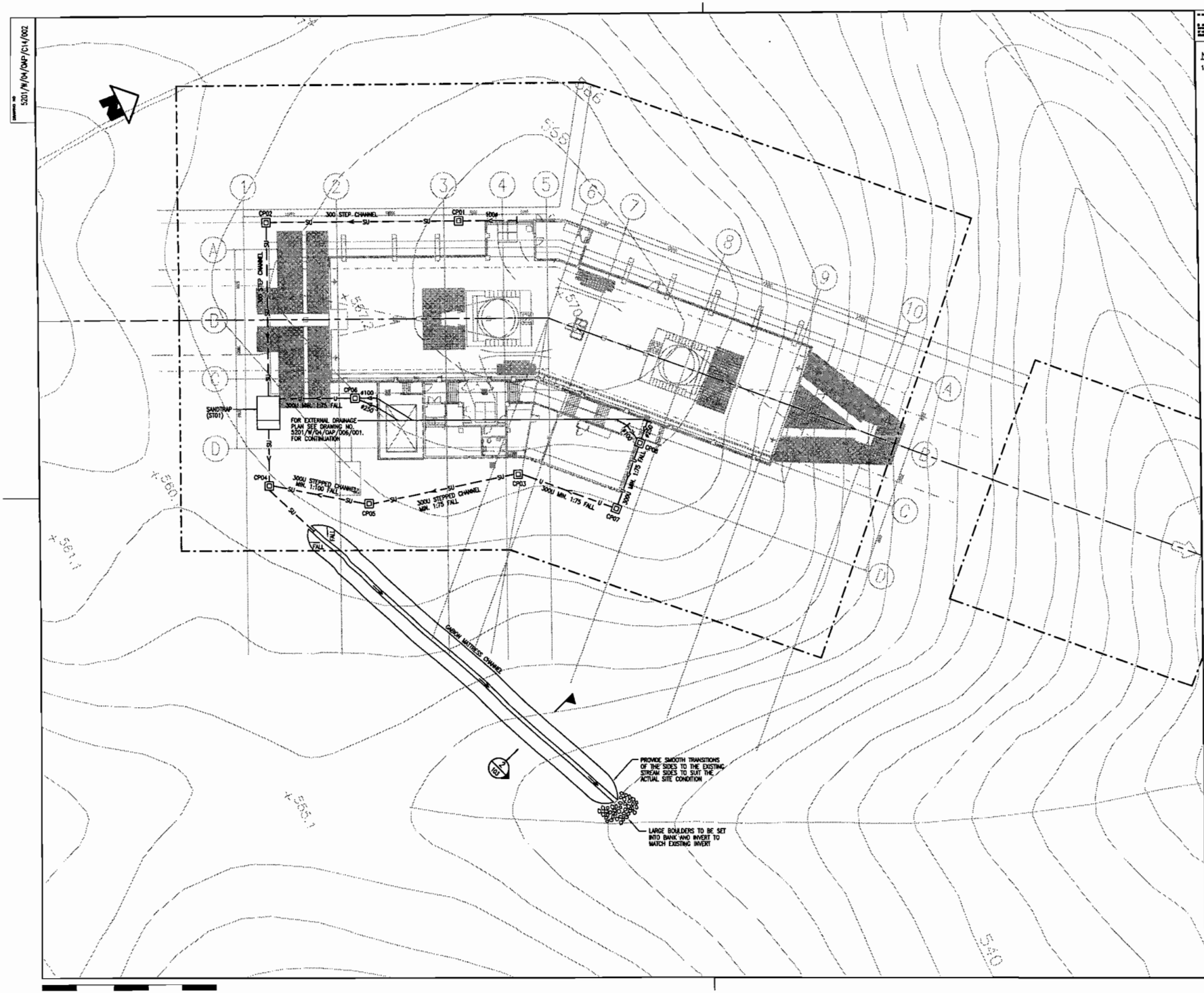
TUNG CHUNG CABLE CAR PROJECT

NEI LAK SHAN ANGLE STATION - PHOTOMONTAGE 02

TUNG CHUNG CABLE CAR PROJECT

NEI LAK SHAN ANGLE STATION - PHOTOMONTAGE 03

TUNG CHUNG CABLE CAR PROJECT



NOTE:

1. UNLESS OTHERWISE STATED, ALL CHANNEL INCLUDING STEPPED CHANNEL AND SURFACE CHANNEL SHALL HAVE MINIMUM OF FALL 1:100.

REVISION	DESCRIPTION	BY	DATE	APPROVED
A	ISSUED FOR CONSTRUCTION	VL	11/04	ST

地鐵公司 MTR Corporation
MTR TOWER TELFORD PLAZA – KOWLOON BAY HONG KONG
TEL : 2993 2111 FAX : 2796 8823

TUNG CHUNG CABLE CAR

CONTRACTOR: MAEDA CORPORATION

ORIGINATOR: ARUP Ove Arup & Partners Hong Kong Limited

TITLE

CONTRACT 5201

ANGLE STATION AT NEI LAK SHAN

DRAINAGE LAYOUT PLAN

SCALE	1 : 200	CAD REF	5201_W_04_DAP_C14_002A.DWG		AS BUILT APPROVED
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DRAWN	WM	DESIGNED	VL	DRAWING NO	REV
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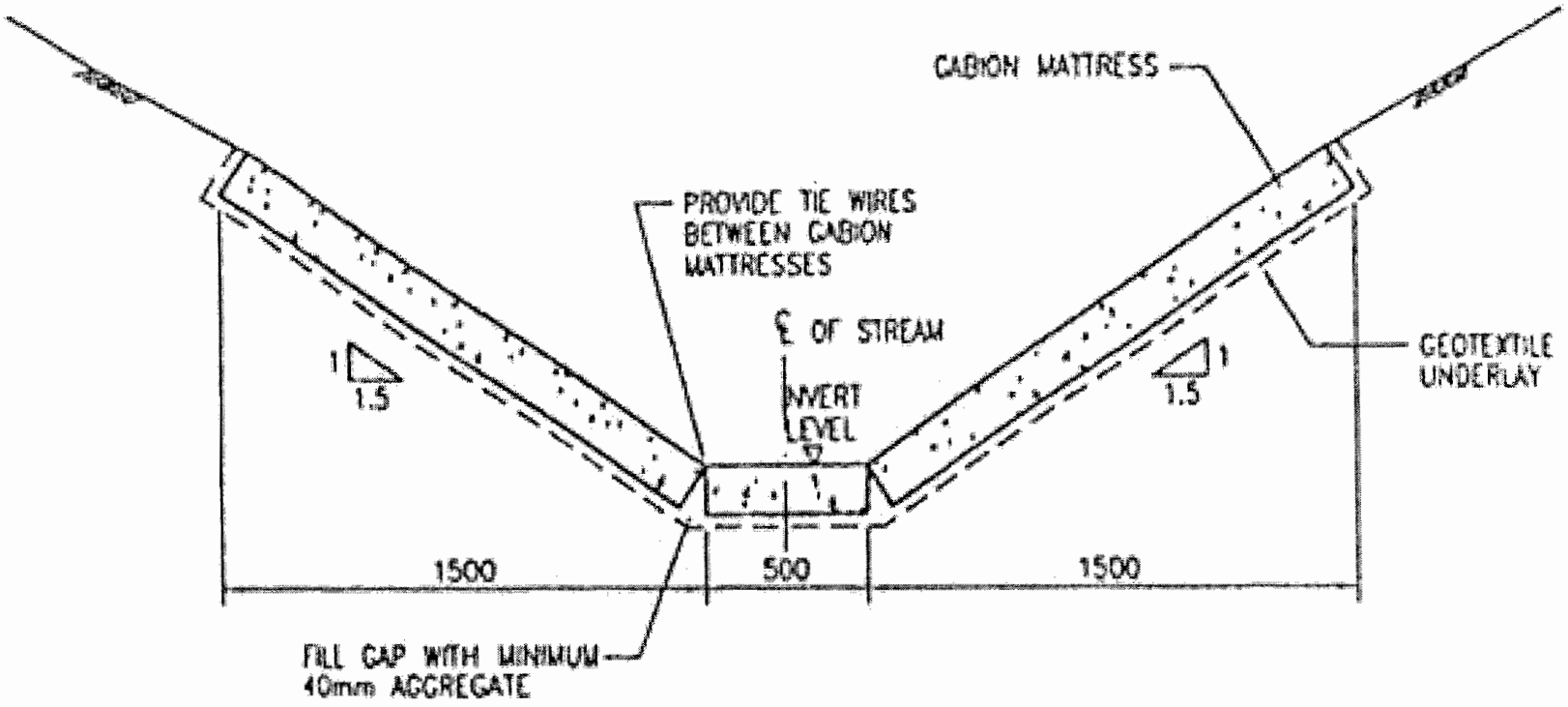
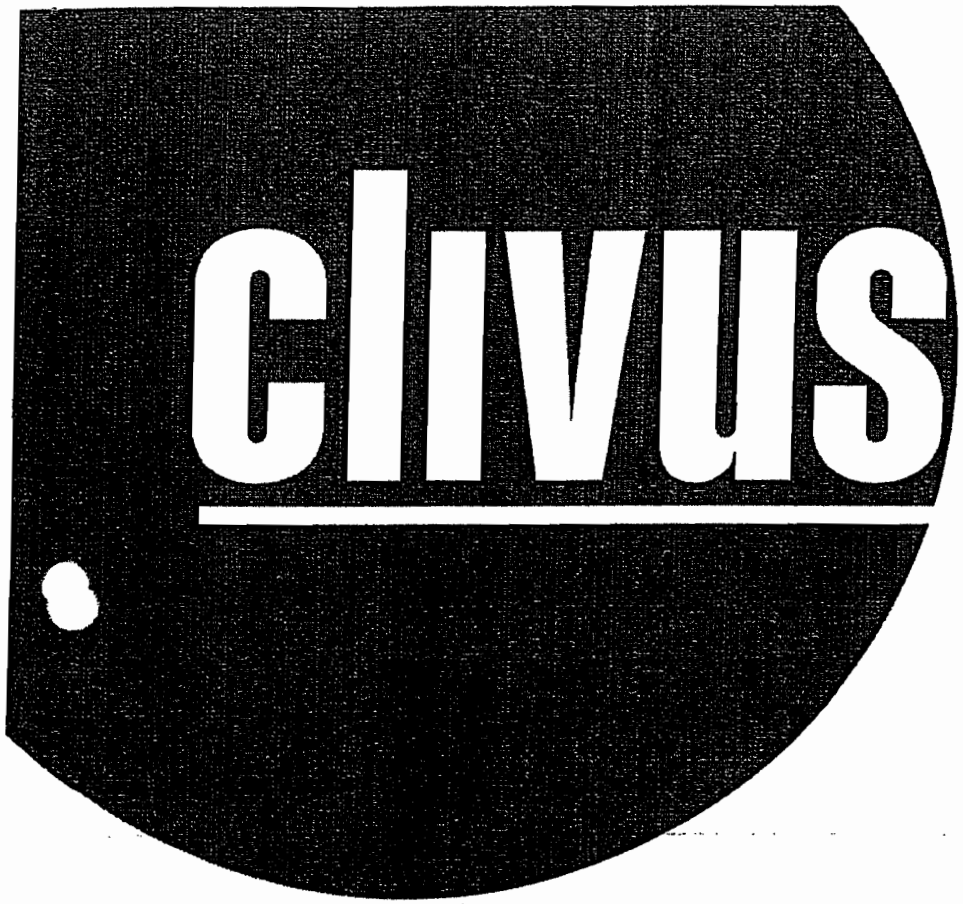


SECTION 2/002
1:25

GABION MATTRESS CHANNEL
TYPICAL SECTION



The Natural Solution

Residential Planning Manual

clivusmultrum
incorporated
15 Union Street
Lawrence, MA 01840
978.725.5591
800.425.4887
Fax: 978.557.9658

9/03

Table of Contents

Introduction

Overview

For more than fifty years, Clivus Multrum composting toilet systems have been used in homes, parks and commercial buildings as the sole method of treating toilet waste. The composting process is reliable, convenient and safe. Its results are both conservative and productive: water is saved from use as a carriage medium and the fertilizer content in excreta is made available for re-use.

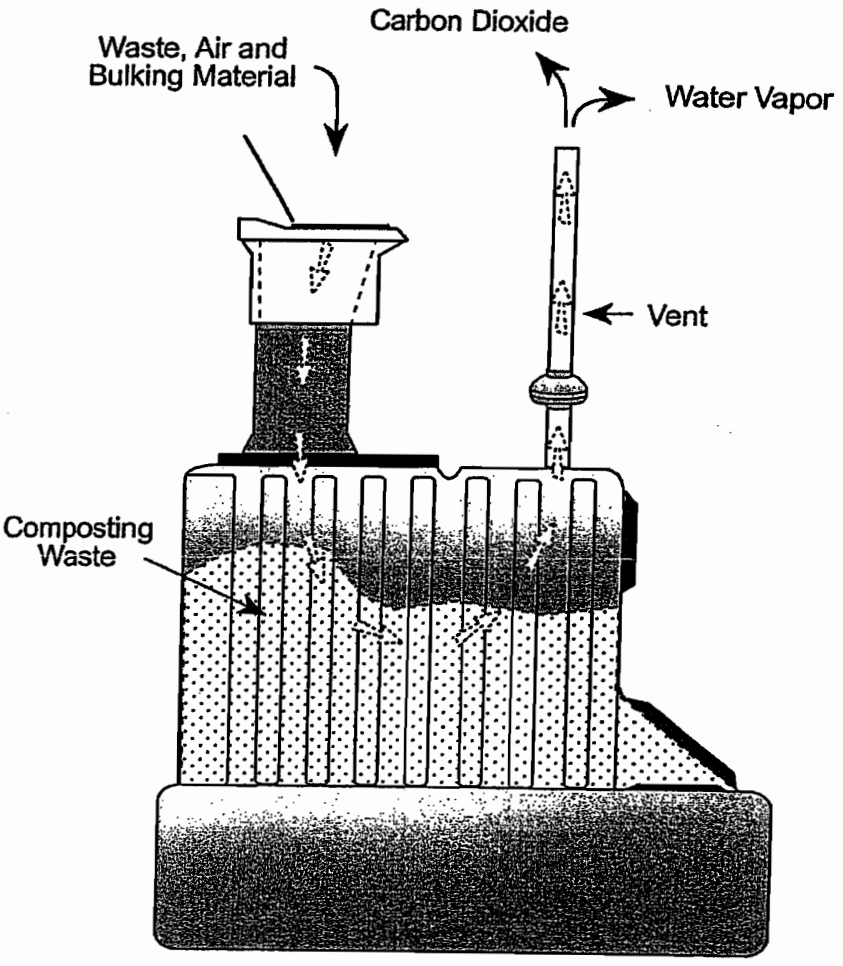
he following pages outline planning for the inclusion of the composting toilet within residential design projects. Although all general considerations are discussed in this manual, we recommend that you contact your Clivus representative to ensure that the particular characteristics of your design properly accommodate the Clivus system.

Process Description

The Clivus composter uses natural biological decomposition to convert human wastes into reusable end-products. The composter is the containment vessel for a living ecosystem: a forest floor in a polyethylene tank.

This ecosystem needs nitrogen, carbon and oxygen to thrive. The mixture of toilet waste (nitrogen) and bulking material (carbon), exposed to a onstant flow of air (oxygen), allows bacteria and ther beneficial organisms to convert the organic material to safe, usable compost and liquid fertilizer. Nature's way.

The compost end-product is rich in organic matter, with a bacterial composition similar to top soil. The liquid end-product (which begins as urine) becomes a concentrated fertilizer rich in plant nutrients after passing through the compost layers. The system releases two gases, carbon dioxide and water vapor, the same gases humans exhale.



Composter Capacity

Sizing the Composter

To estimate usage levels, follow these guidelines:

- Determine the expected number of full-time users of the system per day.
- Multiply the number of users per day by an average of five uses-per-person-per-day. This gives the average daily usage.

  OR
- Use health department occupancy rates of two persons per bedroom as the guide for sizing.

Ambient Temperature

Composter usage ratings are based on an ambient temperature around the tank of at least 65°F. This may require that the heating system for the bathroom supply the tank area as well, or that the area be heated separately. Higher temperatures will accelerate decomposition. If the composter is to be subjected to temperatures below 65°F on more than an occasional basis and it is not possible to supply heat, the decomposition rate will slow. Call Clivus Multrum for assistance in sizing the tank.

Choice of Model

You can now begin considering which model Clivus composting toilet system is appropriate for your needs. The Model M1 is primarily a vacation/seasonal use model; for full-time, family residences, Models M2, M3, M10 and M12 are appropriate (See Figure 2). Models M1 and M2 accomodate one waterless toilet, while the M3, M10 and M12 are suitable for two.

The waterless toilet must be located directly above the composter; if two toilets will be installed, they should be situated such that they enter the composter as far to the rear as possible. Toilets that will not be vertically aligned should be serviced by separate composters that are sized for the usage expected for each toilet.

In addition to tank capacity, the height of the composter may be a determining factor in the choice process. Available headroom in the proposed tank enclosure may limit options--the minimum is 12" above the tank top when the fan is mounted horizontally and 18" when mounted vertically.

The rated capacity of the composters allows for temporary increases in usage caused by guests, gatherings, etc. Also consider whether there will be a permanent increase in the number of users in the foreseeable future.

Building Design

Composter Enclosure

Sufficient space must be allotted directly under the toilet room to house the composter. The lower level floor must have a solid, stable surface, such as concrete, and would ideally have direct walk-out to the outdoors. The lower level should not be at risk of flooding due to high ground water or entry of water from any outside source. Proper drainage or a sump should be provided.

One foot of clearance on each side of the tank is needed for assembly. Once assembled, the tank can be positioned with its back against a wall and with a minimum of one inch of side clearance. A minimum of four feet should be left clear in front of the composter for general maintenance procedures to be carried out. Pipes, HVAC ducting, lights, etc. should not obstruct the maintenance access door.

For new construction, plan to place the compost tank into the lower level before it is closed up. If this is not possible, it will be necessary to allow adequate access to the composter enclosure area for tank placement after the toilet room floor is in place.

Access Requirements

Access should be directly to the outside. If a standard doorway is not possible, a Bilco-type bulkhead door and stairway can be used, or an existing slope may allow a doorway to be created at the lowest grade. Access from the toilet room via a manway or trap door is <u>not</u> recommended. See Figure 3.

This same opening will allow access for service, maintenance and the removal of finished end-products form the tank. Direct access from the lower level to the outside of the structure allows for routine maintenance and removal of end-products without intruding on the living space.

Headroom

A minimum clearance of one foot is needed above the composter for horizontal mounting of ventilation equipment (18" for vertical mounting) and the installation of toilet chutes. This should be measured to the bottom of any joists or beams supporting the floor above. Make sure that no other building systems (e.g. HVAC, plumbing, lighting) interfere with proper functioning and maintenance of the composter.

Storage Tanks

The Clivus system generates a liquid end-product that requires storage pending re-use or disposal. Models M1, M2 and M3 have liquid storage built into the composter base. For the M10 and M12, provision must be made for a separate storage tank. In temperate climates, twenty-five uses of the system will generate about one gallon of liquid; storage tank size will depend on how long liquid will be held.

Figure 2

Model	Usage Rating Daily	Usage Rating Persons	Headroom Required	Opening Width
M1	10	2	68-74"	34"
M2	15	3	78-84"	34"
M3	50	6	96-102"	34"
M10	60	6	72-78"	37"
M12	80	6	71-77"	38"

In the absence of a pressurized water line, it will be necessary to have a tank located near the composter to hold fresh water for compost pile moistening. See Appendix for tank sizes.

Air Supply

The Clivus compost toilet requires no make-up air in addition to what is conventionally available within the structure. It is important that there be no other exhaust fan in the toilet room that would compete with the composter fan.

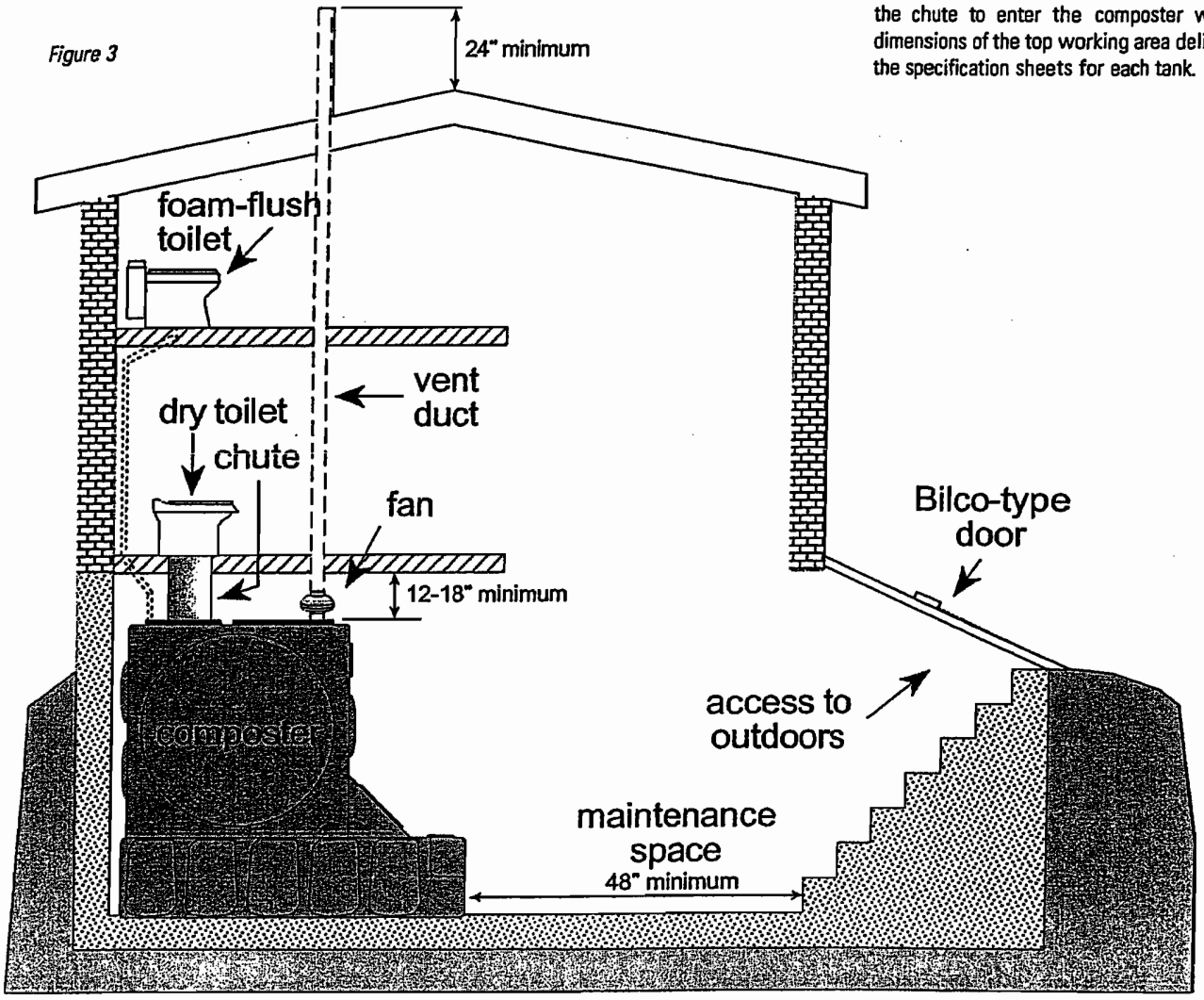
Toilet Room Floor Plan--Dry Toilet

Floor joists or concrete floors should be carefully planned to allow passage of toilet chutes (14" diameter)) and vent ducting (4" diameter, run with as few bends as possible). Additional care should be taken that no other building systems, such as HVAC ducting, interfere with placement or functioning of Clivus components.

During the design stage it is imperative that tank placement and toilet position layout be done together to ensure proper alignment of equipment. Critical dimensions to consider during this process are detailed in Figure 7. Measurements referring to the tank top are from the widest points on the composter body or cradle.

In general, tanks should be positioned relative to toilets such that the chutes enter the top of the composter as far to the rear as possible (Figure 4), with chutes side-by-side across the width of the tank (or length, in the case of the M3 and M10). With the exception of the M1 and M2, two is the preferred maximum number of dry toilets per tank. The toilet(s) may have to be located away from the wall of the bathroom to allow the chute to enter the composter within the dimensions of the top working area delineated in the specification sheets for each tank.

Figure 3



When determining layout, mutiple toilets on one tank can be oriented side-by-side or back-to-back when on the same floor level. If on different levels, the orientation of the toilets to each other is constrained only by the placement of the chutes. See Figure 5.

Figure 6 shows the lengths of the polyethylene chutes which attach the toilet to the tank. Each toilet will have one flanged chute for connection to the top of the tank; extension chutes may also be needed. Chutes are easily cut to custom length.

The total number of chutes needed is determined by adding together the following measurements:

- the distance from the composter top to the enclosure ceiling
- the thickness of the floor between the enclosure and toilet room
- the protrusion of the chute above the toilet room floor as shown in Figure 6.

Toilet Room Floor Plan--Foam Flush Toilet

The foam flush toilet fixture uses a small amount of soap and water to create a foam blanket in the bowl that moves waste down a 4" drain line to the composter. Since it is similar in look and function to a conventional toilet, it ensures user acceptance while retaining all the environmental benefits of the compost toilet. Each flush uses only three ounces of water.

Toilet drain is 4" diameter and must be Schedule 40 plastic to allow easy movement of waste to the composter. Additional care should be taken that no other building systems, such as HVAC ducting, interfere with placement or functioning of Clivus components (See Figure 5).

The foam flush drain line should be direct as possible. However, a slope of up to 45° is permissible. The drain should enter the top of the composter as far as possible to the rear of the tank in the area for toilet connections (see composter specification sheets). The number of foam toilets that can be connected to a single composter is based upon overall usage. Consult with Clivus to determine the number of fixtures possible.

Figure 5

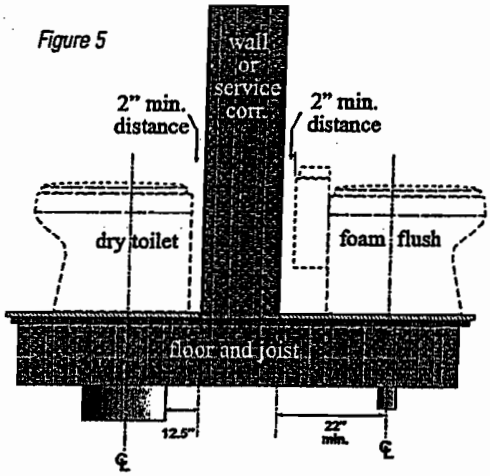


Figure 7

Toilet Model	Inches above floor
AF208 (standard dry)	3
AF209 (HC height dry)	7

Figure 4

Figure 6

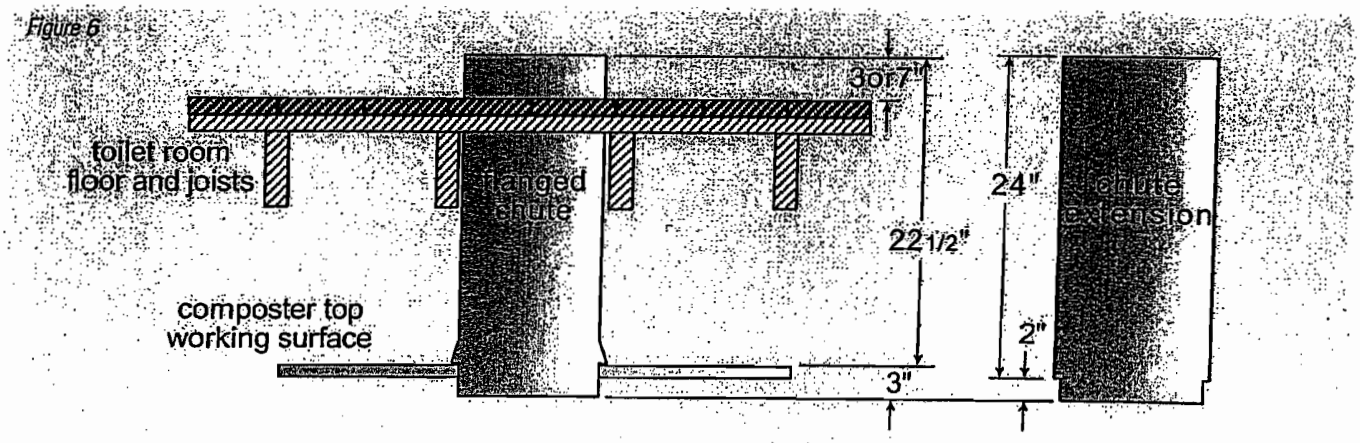


Figure 7

Composter Model	Minimum distance from chute centerline to rear edge of tank	Minimum distance from chute centerline to side edge of tank	Maximum distance between chute centerlines across width of tank	Maximum distance between chute centerlines across length of tank	Minimum distance from chute centerline to finished toilet room wall for toilet placement
M1	15.5"	14.25"	N/A	N/A	12.5"
M2	15.5"	14.25"	N/A	N/A	12.5"
M3	12.25"	12"	N/A	41.75"	12.5"
M10	19"	15.5"	15"	33"	12.5"
M12	16"	14"	33"	42.5"	12.5"

Ventilation System

The ventilation system is designed to oxygenate the compost pile and to keep the toilet room odor free. Air is drawn down the toilet chute, carrying away odor, carbon dioxide and water vapor. The composter fan will carry out the function of a conventional bathroom exhaust fan; there must be no other bathroom exhaust fan or other competing air flow. Consult an HVAC engineer for more detailed assistance.

A separate vent run and roof exit is assumed for each tank, utilizing 4" rigid ducting. The vent should be as straight as possible to eliminate condensation collection points and should extend at least 2 feet above the roof peak. The vent should attach to the composter top as far to the front of the tank and as far from the toilet chutes as possible.

Each system comes with its own AC or DC fan. This fan will be adequate to ventilate the compost chamber in most situations. The fan is mounted in-line and should be kept easily accessible.

Plumbing

Fresh Water

A small amount of fresh water is needed in the composter to create the optimal environment for the proliferation of the organisms responsible for decomposition. In most circumstances, this amount of water is no more than one to three gallons per day. The water is delivered through a misting manifold installed across the inside of the tank top near the front.

Where a pressurized water supply is available, bring a 3/4" line to the composter area for connection to the moistening components. A timer and solenoid valve control the flow of water. In non-pressurized situations, a storage tank can hold the necessary fresh water for moistening and a timer and pump will control the flow. See Appendix for storage tank sizes and volumes.

Liquid End-Product

The liquid fertilizer that results from the composting process is stable, odorless and can be stored indefinitely by the time it reaches the collection area. It has a useful nutrient content and should, where allowed, be used on ornamental plantings, trees, shrubs and lawns. Consult local codes for allowable disposition of this material.

A liquid removal system is standard with Clivus composters and is contained within the device itself. It can be an electric (AC or DC) pump, manual pump or simple gravity drain that directs the liquid fertilizer to a secondary storage tank using standard plumbing hardware. The storage tank will hold the liquid fertilizer until it is to be used according to local codes and should be sized according to toilet use, emptying interval and floor space available. See Appendix for tank descriptions.

The electric liquid removal systems for the M10 and M12 are made up of a Pump Isolation Chamber inside the compost tank, a submersible pump and liquid-level activated float switch inside the PIC, and a check valve to prevent backflow into the pump. The AC pump uses a 1" rigid drain line (supplied by purchaser), the DC pump uses 3/4" vinyl tubing (10' supplied). The M1, M2 and M3 do not require the PIC.

Electricity

Requirements

Electricity is required for the fan, moistening system and liquid removal pump and should be brought to the vicinity of the compost tank. The source of the electricity and the components requiring it can be either AC or DC; Clivus can supply solar or other power-producing equipment. Consult model specification sheets for electrical component power requirements.

Maintenance

Regular

Regular maintenance consists of the addition of bulking material, compost pile raking and, in the absence of automatic devices, compost pile moistening and the removal of liquid end-product. Space must be allocated to store bulking material. Wherever possible, a sink should be installed for cleaning tools and floors.

Periodic

Periodic maintenance includes cleaning the fan and ventilation ductwork and the occasional removal of solid compost. A clear, wide, direct path from the compost tank to the outdoors is preferable.

Appendix

Auxillary Polyethylene Liquid Storage Tanks

CAPACITY (gallons)	SIZE (dia. X ht. in inches)	ACCESS PORT (diameter in inches)	PART NUMBER
110	35 X 35	8	TC3535IC
130	23 X 76	8	TC2376IC
165	31 X 58	8	TC3158IC
220	35 X 63	8	TC3563IC
300	35 X 78	16	TN3678IC
300	35 X 81	16	TC3581IC
300	42 X 59	8	TC4259IC
300	45 X 60	16	TC4560IC
305	46 X 48	16	TN4648IC
500	46 X 76	16	TC4676IC
500	48 X 71	16	TN4871IC
500	52 X 66	16	TC5266IC
500	64 X 42	16	TC6442IC
550	45 X 94	16	TC4594IC
550	67 X 42	16	TN6742IC

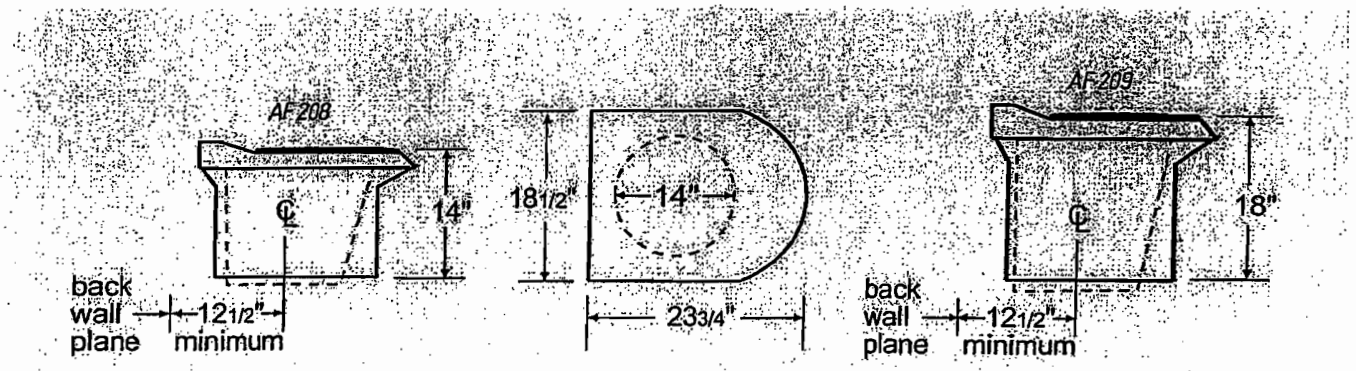
Waterless Toilets

All waterless toilets include: fiberglass stool with sanitary white gel finish for ease of cleaning, white plastic seat and cover, toilet liner.

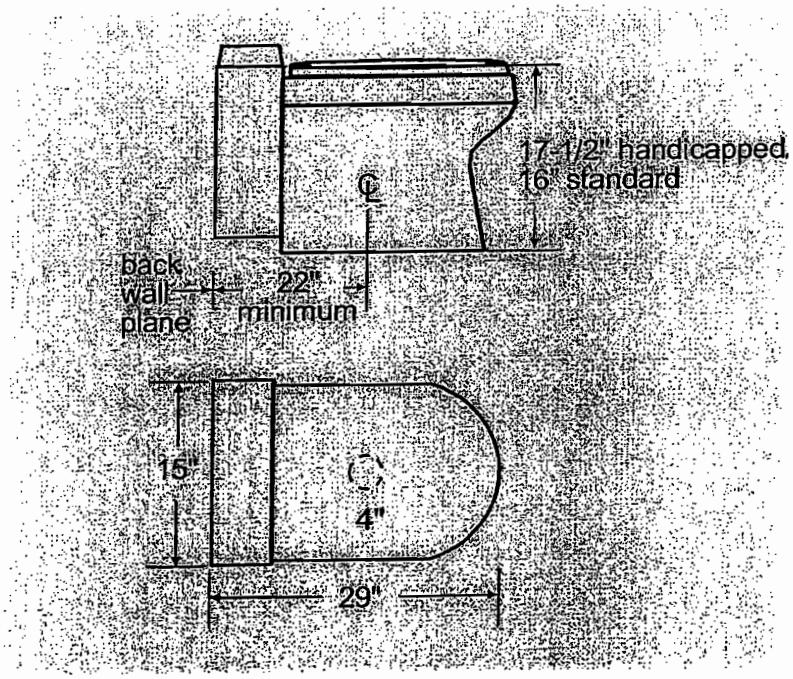
Specifications and materials

STANDARD MODEL
AF208
Liner: polyethylene
Chute opening: 14"
ont to back: 23 3/4"
Vidth: 18 1/2"
Height of seat: 14"
Weight: 23 pounds

HANDICAP MODEL
AF209
Liner: polyethylene
Chute opening: 14"
Front to back: 23 3/4"
Width: 18 1/2"
Height of seat: 18"
Weight: 26 pounds



Foam-flush Toilet



Specifications and Materials

Toilet body material: vitreous ceramic
Water tank material: vitreous ceramic
Water tank capacity: 9.5 quarts
Toilet seat/lid material: ABS
Front to back: 29"
Width: 15"
Height of seat: 16"; 17-1/2" handicapped
Drain: 4" PVC only
Center line to rear wall: 12 with tank mounted in service corridor, or 22" minimum wtih tank mounted on fixture
Center line to side wall: 15" minimum
Weight: 88 pounds

Power: 120V AC
Consupmption: Continuous--4 watts; flushing--8 watts for 45 seconds
Water consumption: approx. 3oz./flush

DRAWING NO LP-R-16

FERN SPECIES (DICRANOPTERIS PEDATA)
TO BE PLANTED BENEATH STRUCTURE
TO PROVIDE SLOPE STABILZATION

WOODLAND MIX.
(A)+(B)+(C)

WOODLAND MIX.(A)

NGONG PING
CABLE CAR ALIGNMENT

ANGLE STATION AT LEI NAK SHAN

TOWER 5

TUNG CHUNG
CABLE CAR ALIGNMENT

FICUS PUMILA TO BE PLANTED
@150mm C/C IN A ROW
SURROUNDING SUPPORTING
COLUMNS

FERN SPECIES (DICRANOPTERIS PEDATA)
TO BE PLANTED BENEATH STRUCTURE
TO PROVIDE SLOPE STABILZATION

FICUS PUMILA TO BE PLANTED
@150mm C/C IN A ROW
SURROUNDING SUPPORTING
COLUMNS

HYDROSEEDING TO BE
CARRIED OUT PRIOR
TO PLANTING.

LEGENDS:

- WORKS SITE
- NEW TREE PLANTING
- RETAINED TREE
- TRANSPLANTED TREE
- PLANTING AREA
- RETAINED WOODLAND

NOTES:

ALL AREAS TO BE HYDROSEEDED PRIOR TO PLANTING WORKS TO ASSIST EROSION CONTROL. HYDROSEED MIX TO CONSIST OF CYNODON DACTYLON + PASPALUM NOTATUM. (THERE IS TO BE NO GREEN DYE OR TERRAM COVER TO BE USED WITHIN COUNTRY PARK TO AVOID ANY POLLUTANTS TO PARK)

PLANT SCHEDULE:

Woodland mix 'A'

Shrubs	Botanical Name	Size(mm)Ht.
Ga	Gordonia axillaris	1000mm
Scs	Schima Superba	1000mm
Rt	Rhodomyrtus tomentosa	1000mm
Ms	Melastoma sanguineum	1000mm
Bf	Baeckea frutescens	1000mm
Dp	Dicranopteris pedata	1000mm

Woodland mix 'B'

Sd	Sapium discolor	1000mm
Rc	Rhus chinensis	1000mm
Ls	Litsea rotundifolia	1000mm
Mch	Machilus chinensis	1000mm

Woodland mix 'C'

Mc	Melastoma candidum	1000mm
Mpan	Microcos paniculata	1000mm
Ri	Rhaphiolepis indica	1000mm
Ss	Sapium sebiferum	1000mm
Sh	Schefflera heptaphylla	1000mm
Mp	Mallotus paniculatus	1000mm

REVISION	DESCRIPTION	BY	DATE	APPROVED

前田建設工業株式會社 Maeda Corporation
1601-5 NEW EAST OCEAN CENTRE 9 SCIENCE MUSEUM ROAD T.S.T. EAST, KOWLOON, HONG KONG TEL : 2369 9267 FAX : 2724 4084

地鐵公司 MTR Corporation
MTR TOWER TELFORD PLAZA – KOWLOON BAY HONG KONG TEL : 2993 2111 FAX : 2798 8822

PROJECT 東涌吊車 TUNG CHUNG CABLE CAR

ORIGINATOR 凱達柏濤有限公司 Aedas Limited

TITLE

ANGLE STATION AT LEI LAK SHAN

LANDSCAPE PLANTING PLAN

SCALE	1 : 250 @ A1	CAD REF			AS BUILT APPROVED
DATE	APR. 2005	AS BUILT DWG NO			
DRAWN	WL	DESIGNED	JW	DRAWING NO LP-R-16	REV B
CHECKED	JW	APPROVED	SF		