

Isolators

- ▣ Infeed Isolators
- ▣ By-pass Isolators
- ▣ Section Isolators (Motorized Type)
- ▣ Motorized Isolators



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69

Infeed Isolators

- ▣ Infeed isolators are provided at each traction substation for disconnection of the overhead line equipment from D.C. output of the substation



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By-pass Isolators

- ▣ By-pass Isolators are associated with infeed isolators to provide connection between two adjacent section which are separated by section insulators. The isolators are normally opened and may be closed remotely via MCS or locally in emergency.



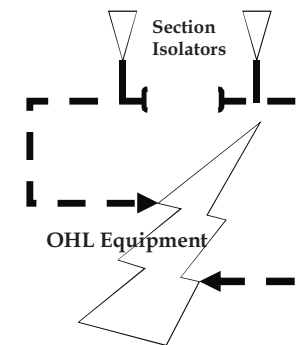
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Section Isolators (Motorized Type)

- ▣ Section isolators are provided to enable sections to be subdivided or isolated, and in certain locations are used to provide an alternative feed from another section.



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72

Motorized Isolators

- Motorized Isolators are provided in depots and on the main running line for easy and expedient isolation/connection of traction current by Power System Controller at OCC

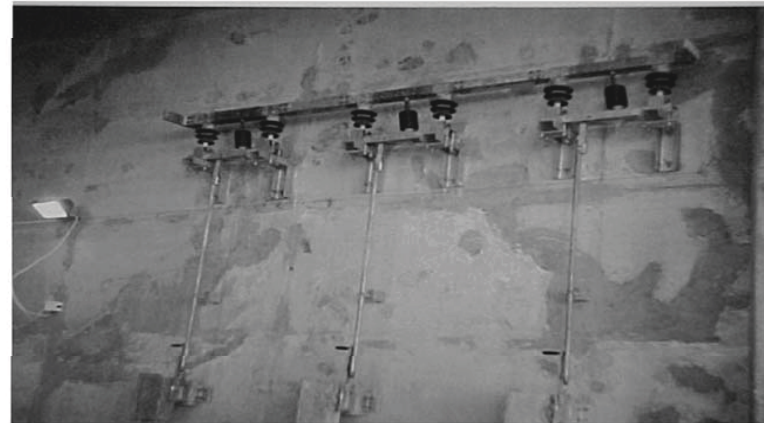


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73

OHL ISOLATOR

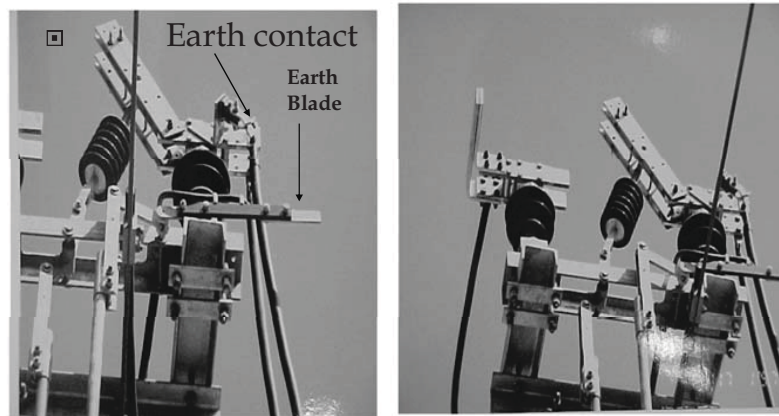


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OHL ISOLATOR



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75

Isolator Switching

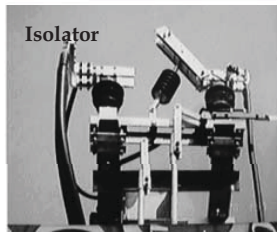
- Off-load Switching :
 - Preferably trip off traction current before during switching.
- No-load Switching :
 - Switching when all train pantograph down even though traction current is live. Still preferable.
- On-load Switching :
 - Switching when all train pantograph still contacting with live OHL. **NOT** preferable.

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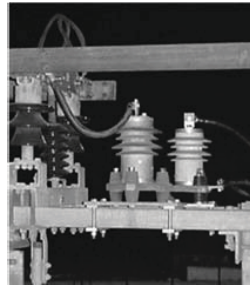
Overhead Line Equipment



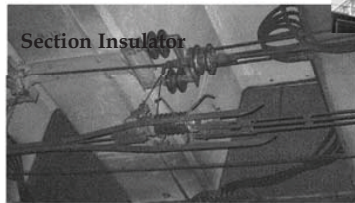
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Balanced Weight Anchor



Lightning Arrestors



Section Insulator

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APM Traction & Power System (TPS)

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79

Qty of High Voltage Equipment (Not in Update)

	URL	LAR
33kV Circuit Breaker	147	102
11kV Circuit Breaker & RMU	204	149
1500V DC Circuit Breaker	146	105
33kV & 11kV Power Cable	~370 km	~490 km
Rectifier Transformer & 1500V Rectifier	36	26
Distribution Transformer	18	8
11/.43kV Station Transformer	160	116
Protection Relay	~3400	~9400

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78

Traction & Power System Introduction

- The new TPS supply the APM operation for T1 Line Extension and RR Line of APM system. It covers new alignment area between WH and MFC.
- Traction transformers convert power supply from 11kV utilities system to 600V 3 phase a.c. traction voltage for APM system usage. 600V switchgear distributes traction power supply to APM via power rails. Harmonic filters eliminate harmonics generated from APM system during operation to achieve required power quality.
- The two new TPSs for T1 Line Extension and RR Line consist of 11kV incoming supply sources, 11/0.6kV traction transformers, 600V switchgear, power factor correction equipment, harmonics filters, batteries and chargers, UPS and associated control system and equipment.

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80

Traction & Power System Introduction

The new installed TPS equipment list:

- a) 11/0.6kV traction transformers;
- b) 600V switchboards and accessories protective devices, current and voltage transformers, interlocking and auto-changeover, control and indication elements for TPS of APM systems;
- c) Power factor correction equipment and harmonics filters;
- d) 30V d.c. batteries and changers and distribution systems;
- e) 220V single phase UPS and distribution system;
- f) LV power cables and control cables including cable accessories and cable containments interconnection between traction transformers and switchboards, and among switchboards and equipment within the plant-room;

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81

Traction & Power System Introduction

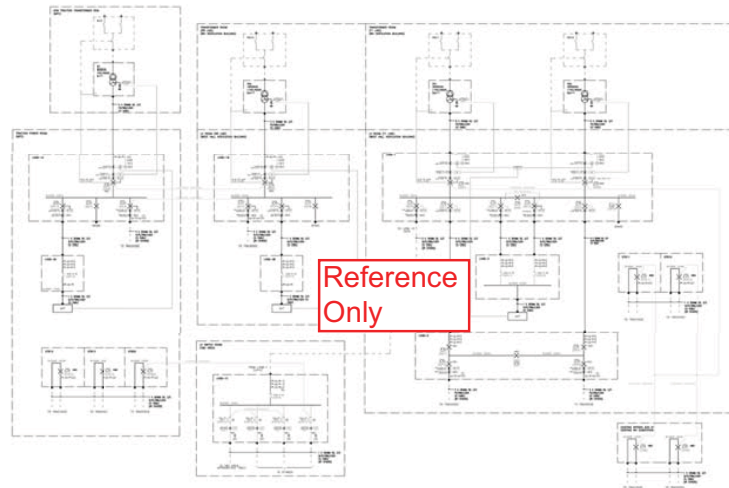
- g) Control cables running through trackside for interlocking among LVSB at different plantrooms, and hardwire tripping circuits between ETD panel;
- h) Multicore cables connecting between TPS equipment and SCADA interface panels;
- i) ETD panel at DCR and TDMO for tripping the relevant circuit breakers of LVSB;
- j) 380V 3 phase a.c. power distribution systems for TPS of APM;
- k) Earthing and bonding of the TPS equipment;
- l) Cable containments within the plantrooms and marshalling boxes.

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82

SLD for T1 Line extension & RR Line

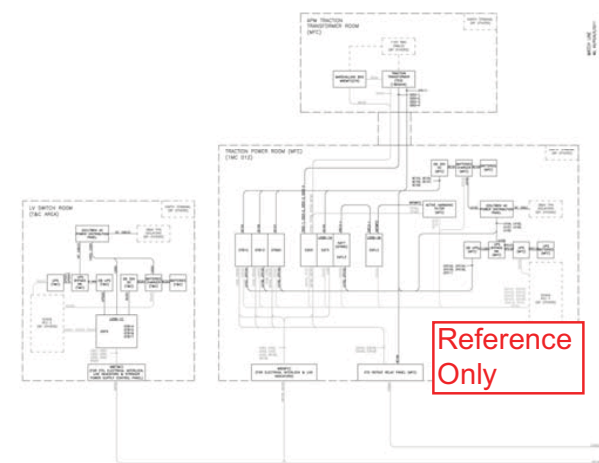


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83

Interface Diagram for T1 Line extension & RR Line

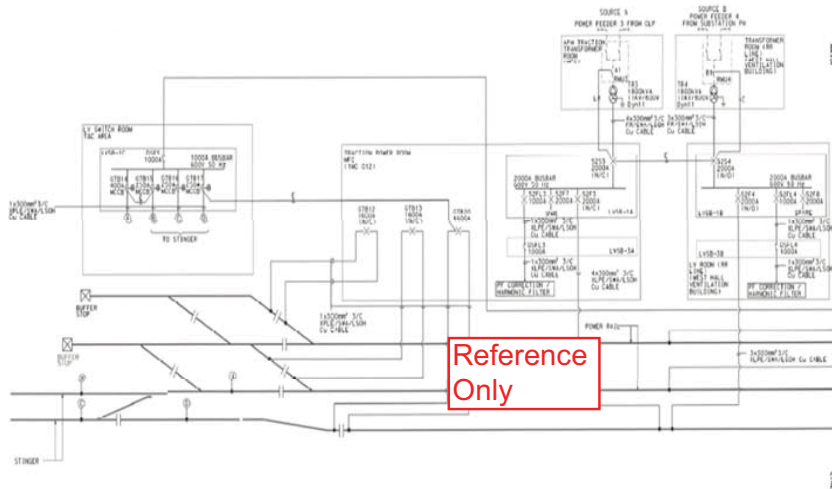


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84

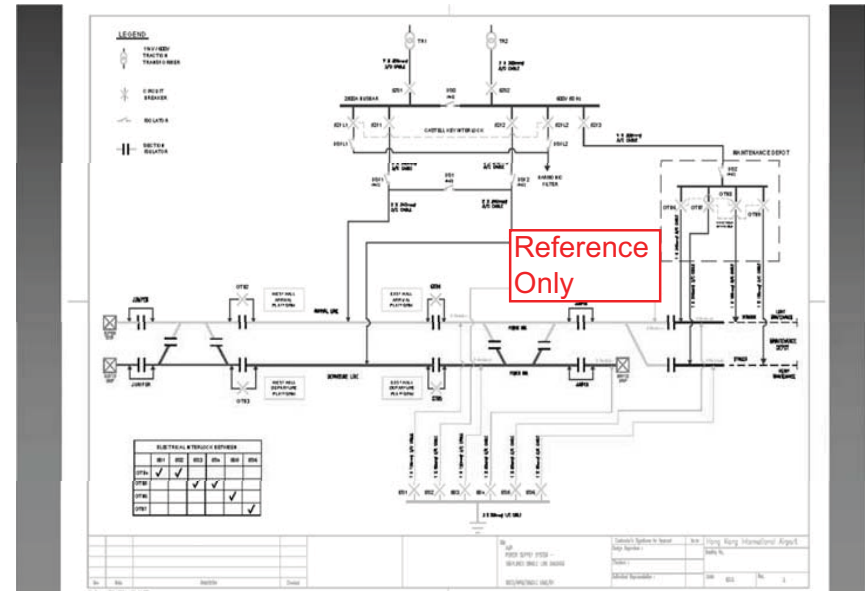
Schematic Diagram of New TPS



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86

11kV Ring Feeder with 2-Isolator 630A



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87

11kV RMU A6/R2

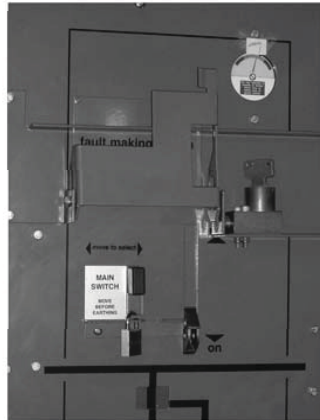


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11kV RMU C320 Front Plane



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89

11kV RMU C320 Gas Gauge

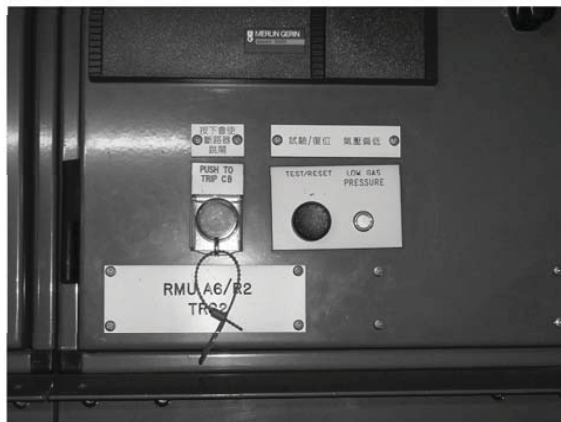


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11kV RMU C320 Trip Button



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11kV RMU C320 Low Gas Pressure Alarm

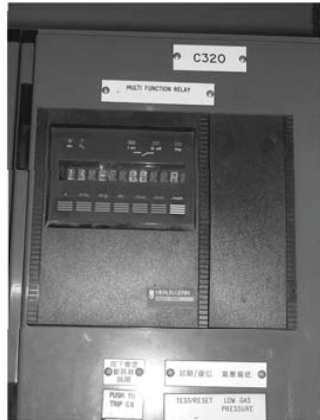


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11kV RMU C320 Multi-Function Relay



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Back view of the 11kV RMU C320

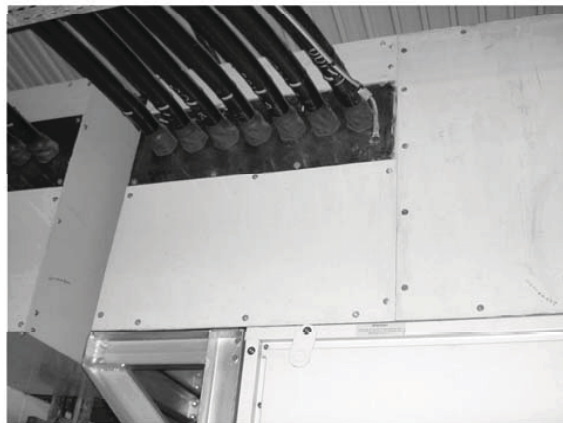


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Cable form RMU to Transformer

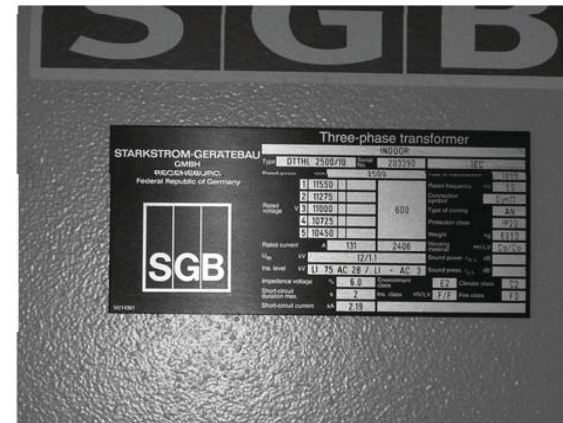


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Name plate of the 11/0.66kV Transformer

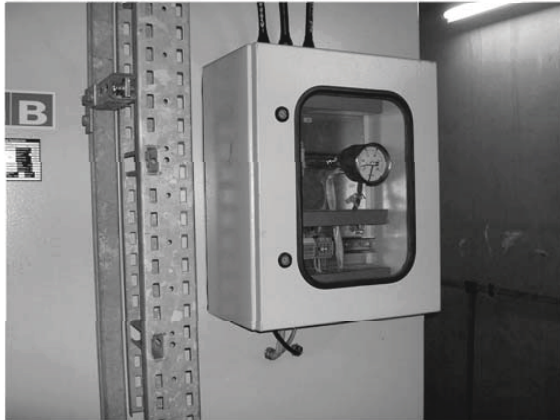


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Temperature meter of the Transformer

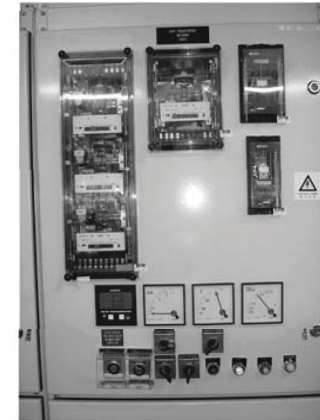


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ACB 52S1 600V 2500A 50KA NC (Relay side)

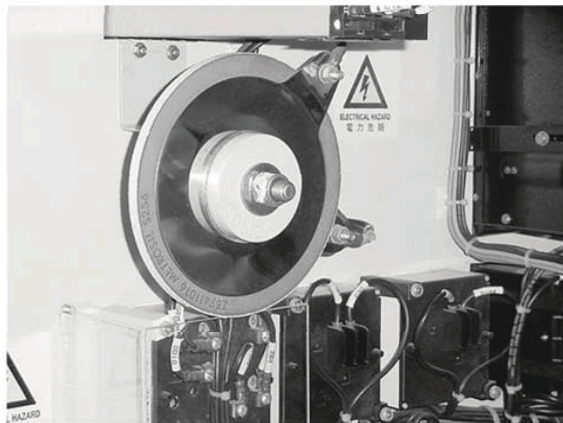


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Metrosil what function?

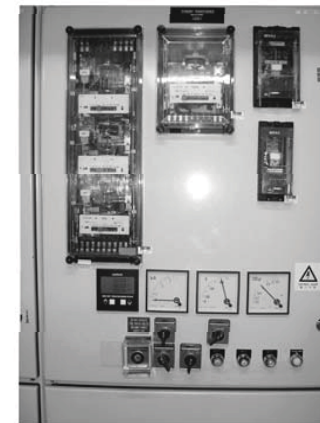


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ACB 52S2 600V 2500A 50KA NO (Relay Side)



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100

52F3 600V 2500A (Circuit Breaker)

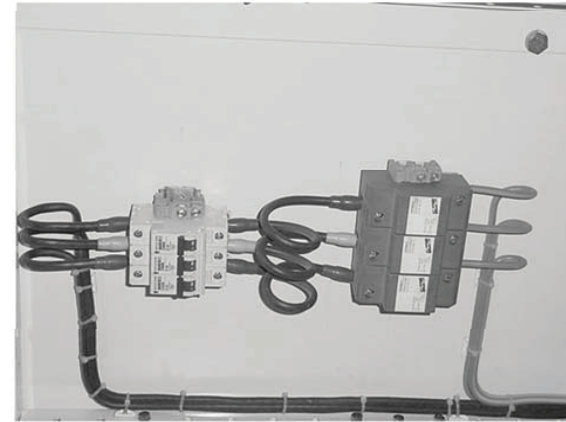


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Lighting Arrester



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102

East Hall LV SWGR Rm Harmonic filter and Capacitor Bank Panel

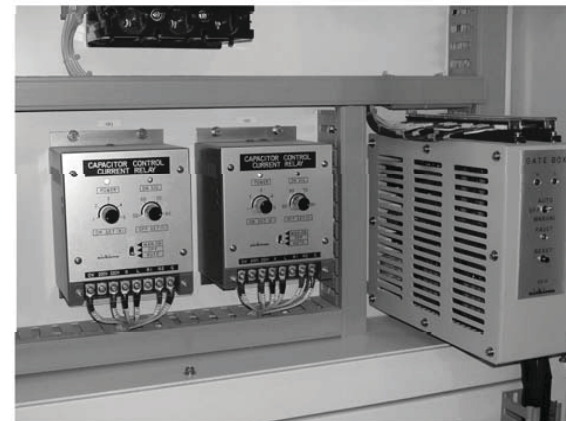


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103

East Hall LV SWGR Rm Harmonic filter and Capacitor Bank Panel



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104

GTB6 MCCB 600V 400AF



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105

Step down voltage 380/220V



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106

Battery Charger & Battery

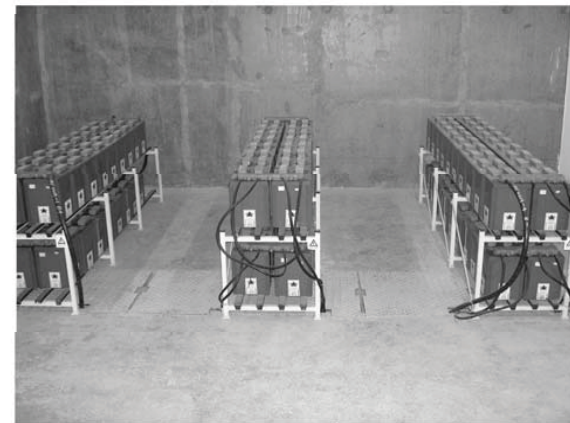


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Battery Charger & Battery



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108

Remote Earthing Control Board

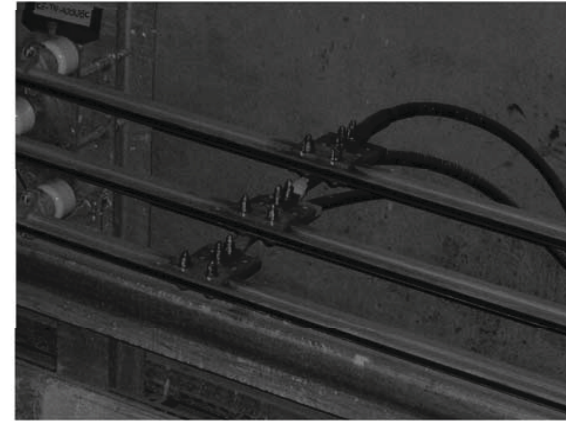


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Feeder Cable & Live Indicator



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Feeder Cable & Live Indicator



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111

Prove Death Equipment



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112

Prove Death Equipment



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113

Prove Death

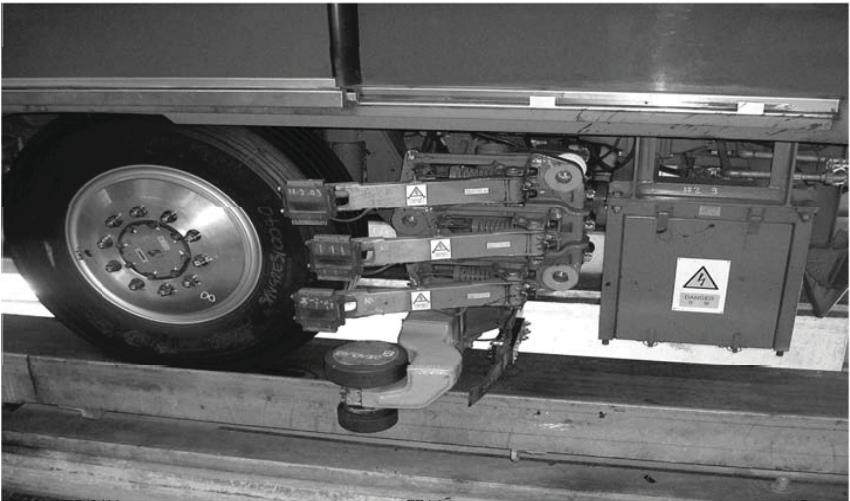


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Connection Power to the APM train at Mainline



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Connection Power to the APM train at Mainline

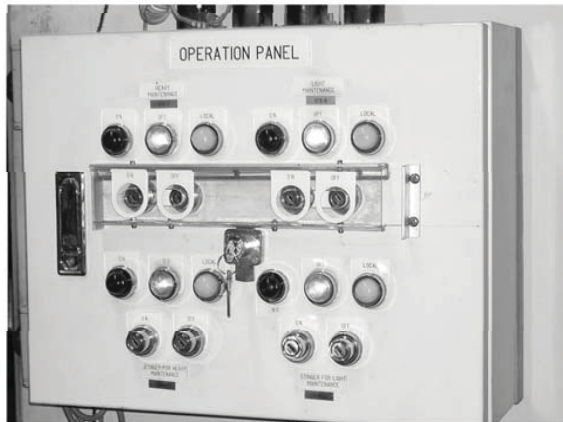


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116

Heavy & Maintenance Track Operational Panel

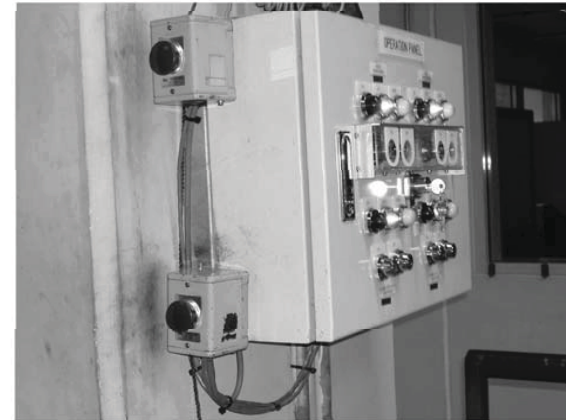


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EPB for Heavy & Maintenance Track Operational Panel

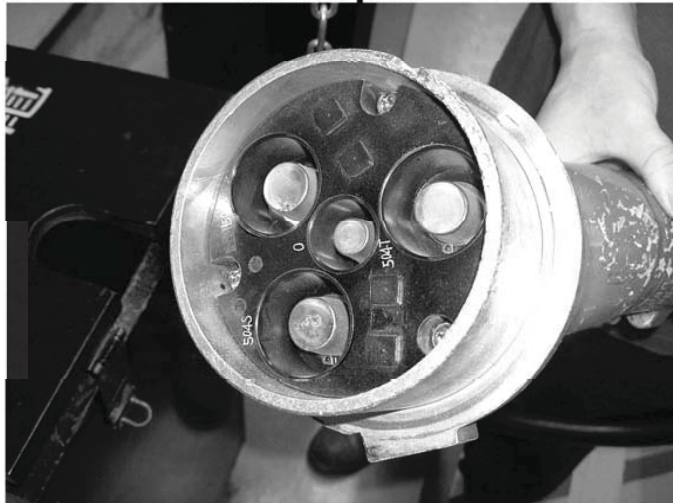


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Connection Power to the APM train at Depot

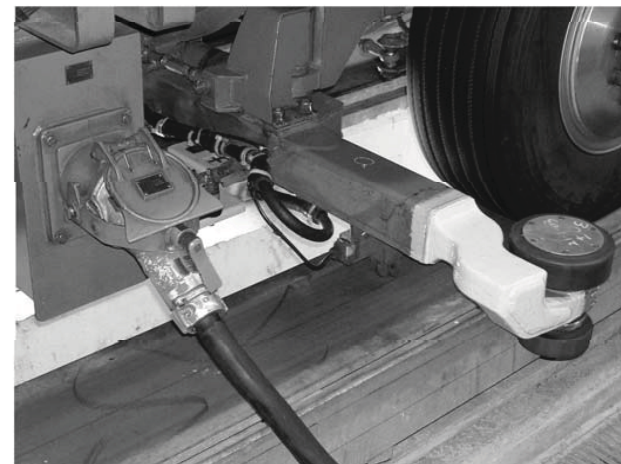


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Connection Power to the APM train at Depot



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120

Connection Power to the APM train at Depot

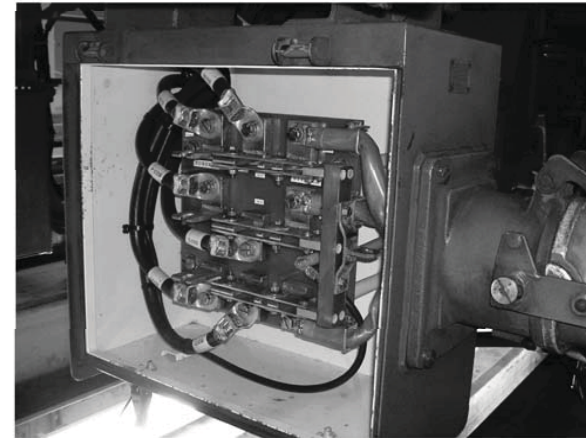


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Connection Power to the APM train at Depot



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122

Light Rail Power System

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123

Light Rail System Introduction

- In 1984, the Hong Kong Government invited KCRC to design, build and operate the Light Rail System (LRT), as a HK\$1billion turnkey project to serve the population of the Northwest New Territories of Hong Kong.
- The initial LRT network comprised 23.35 km, 6 routes and 41 stops. The first batch of 70 air conditioned light rail vehicles (LRV) arrived in Hong Kong October 1987.
- Following a series of extensive commissioning and trial runs, passenger services commenced on 18 September 1998.
- Three additional links in Tuen Mun have been built at a cost of about HK\$300 million, with an additional five kilometres of route and 10 stops. These were commissioned between November 1991 and February 1992.

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124

Light Rail System Introduction

- The Tin Shui Wai Extension which was constructed at a cost of HK\$150 million, was commissioned in early 1993. In March 1995, Section III of the Tin Shui Wai Extension was also put into passenger service. The whole Light Rail network now comprises 31.75 km of double track and 57 stops. The average daily patronage in 1998 was 350,000, including 37,000 on LR feeder bus.
- In mid 1993, 30 LRVs, at cost of HK\$400 million, were put into service.
- To cope with the rapid patronage growth, another 20 new LRVs amounting in value to over HK\$300 million were purchased and commissioned in September 1997.

Light Rail Power System

- **3 x 11kV infeed points from power company with automatic changeover to minimise interruption.**
- **11kV stepped down and rectified to 750V DC for train service.**
- **OHL sections are dual fed with secure traction supply.**
- **11kV stepped down to 380V low voltage for equipment on LR Stop platforms, such as lighting, S&C equipment, AFC equipment, etc.**

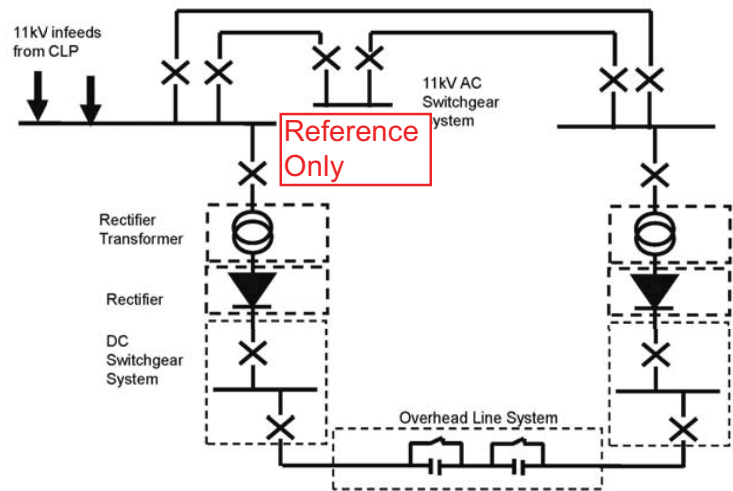
Major System Assets for LRT

- ▣ Route Length (km): 36.15 km
- ▣ System voltage: 750V DC
- ▣ Stations: 16 Rectifier Stations
- ▣ OHL environment: at grade / viaduct / rail/cross-over road
- ▣ Circuit Breaker: 98 no. high speed DC circuit breakers
- ▣ Overhead line isolator: 150 no.
- ▣ Messenger Wire: 120 mm² hard-drawn copper wire
- ▣ OHL contact wire: 120 mm² silver copper wire

Basic Design for Light Rail

- 3 x 11kV supply from the power company, dedicated 11kV network with automatic changeover.
- Stepped down and rectified to 750V DC feeding to OHL via 750V panels and OHL isolators.
- OHL sections are dual-fed.
- Dual-fed 380V AC low voltage for LR Stop platforms equipment.

Basic Design for Light Rail

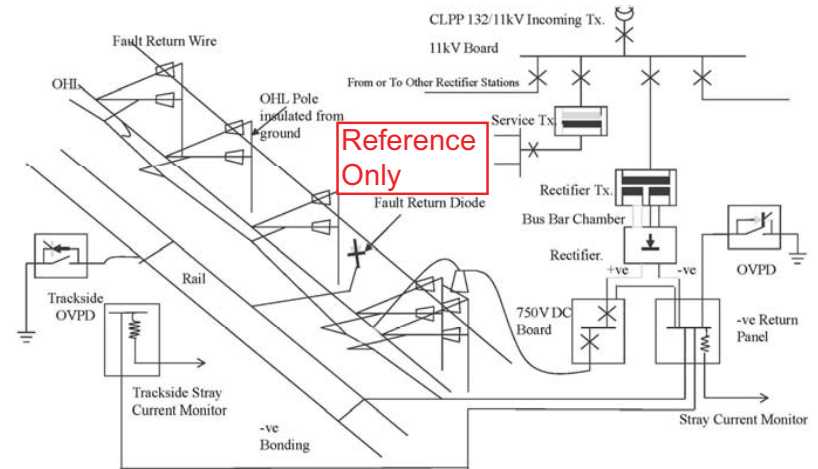


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129

Basic Design for Light Rail

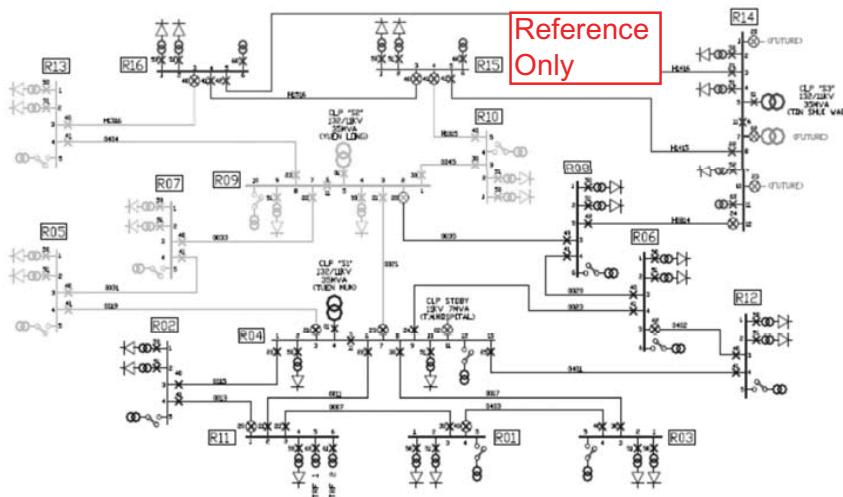


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Light Rail AC 11kV & DC 750V Network



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131

List of Light Rail Equipment

- 11kV VCB Panel
- Rectifier Transformer
- Auxiliary Transformer
- Rectifier
- 750V DC Panel
- Negative Return Panel
- Stray Current Control Device
- Auto-changeover Panel
- Charger & Battery
- Overvoltage Protection Device
- Annunciator
- Pilot Marshalling Box
- Fault Return Diode

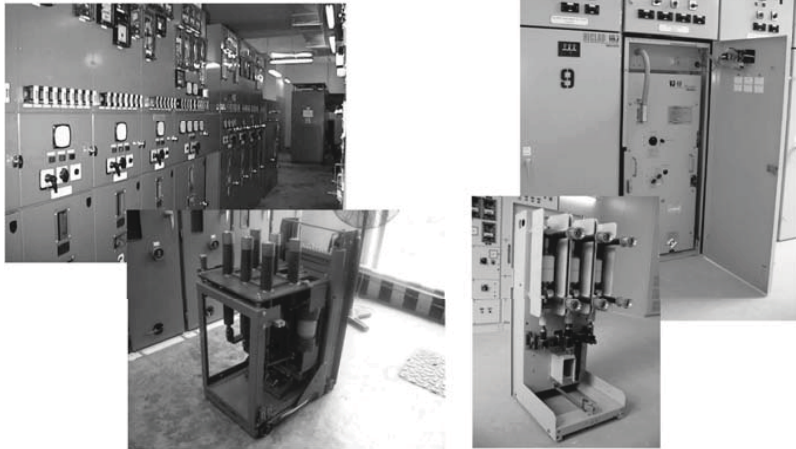
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132

List of Light Rail Equipment

LR 11kV Switchgear



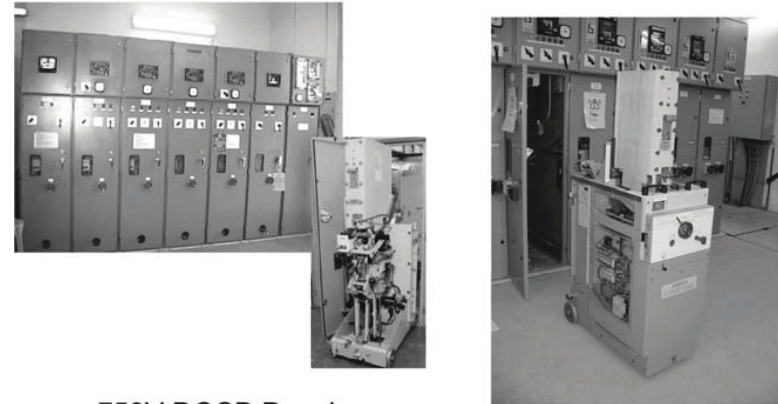
11kV VCB Truck
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133

List of Light Rail Equipment

LR 750V DCCB



750V DCCB Panel

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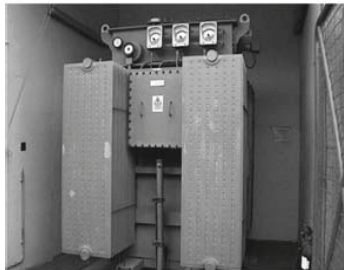
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750V DCCB Truck

134

List of Light Rail Equipment

LR Rectifier Transformers



Rectifier Transformer

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Input – 11kV
Output – Two secondary windings,
2 x 3-phase 582 Volt
Rating – 1600kVA
Insulation Fluid – Silicon or Midel
oil

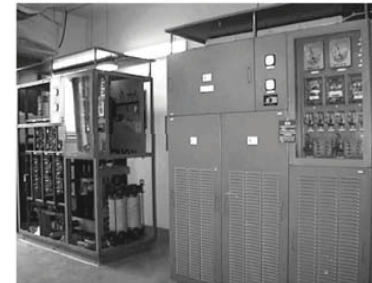
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135



List of Light Rail Equipment

LR Rectifier



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Input – 582V AC
Output – 750V DC
Rating – 1500kW
Frame Insulated from Ground

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136

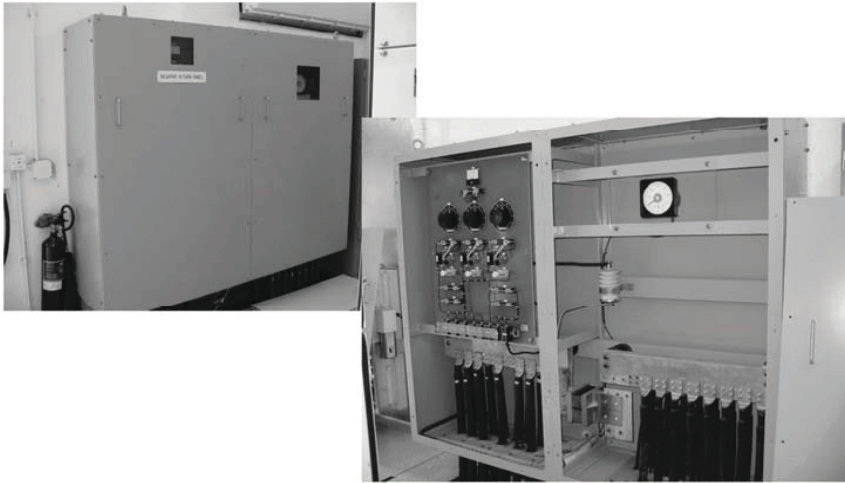


Internal View



List of Light Rail Equipment

LR Negative Return Cubicle



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137

List of Light Rail Equipment

110V Charger

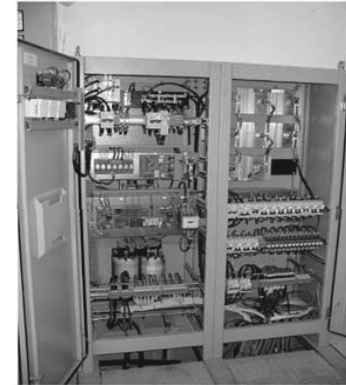
Charger External View



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Charger Internal View



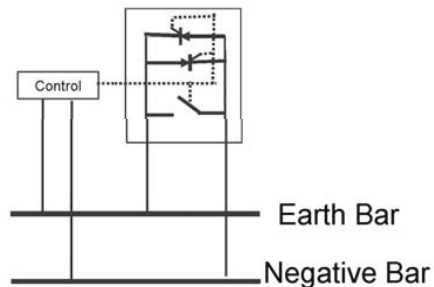
138

List of Light Rail Equipment

Overtoltage Protection Device

Safety Device for Protecting Electric Shock Hazard to Personnel

- Short Circuit negative to earth if voltage higher than 50Volt



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139



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140