

Property Management for Schools in Macao

摘要

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本文提出有關澳門學校一些機電(E&M)問題，如材料及工序收貨等事項。並希望政府成立專業學會，以監督承包公司，保證質量，防翻工和未來損害。

Abstract :



This paper points out that there is a lack of local code of practice in E&M works⁽¹⁾. There are no guidelines for the selection of materials as well as governing the workmanship, thus, incurring re-do or latent defects.

Introduction:



Standardization of E&M hardwares does not imply unifi-

cation as the engineering codes of practice in Macao do follow those of the U K ' s as well as China, particularly in water and power supply. We found out that due to the lacking of experts stationing in schools during the period of renovation, the sub-contractors may use their left over materials from the previous projects in order to bid the tender at a lower price. For instance, they can use 1 1/4" pipes instead of 1 1/2" pipes since both pipes can hardly be differentiated from appearance.

They can also install electrical sockets of one type in room A but another type of sockets in room B. Both meet the standard but not a unified type as we mentioned in the first sentence of this paragraph.

This paper gives a guideline to the school staffs in the selection of materials and workmanship principles.

school day. Such a practice can reduce the redundancy of power consumption.

1. Electric plugs & sockets

Fig.1 shows 3 types of socket /plug available in Macao, whereas in Hong Kong only the third type is accepted by both the Hong Kong Electric and China Lights & Power Companies. This third type of plug is fitted with a 5 AMP fuse, which is safe for the school teachers/staffs. In fact, stock keeping of one type is easier than 3. For the sake of uniformity, all fluorescent tubes are 4' long, and 2' long for the battery type. Energy saving light bulbs to be either all screw or all nail headed type.



Fig.1

4. Fire services

Only fire hydrant system and detection system are needed for schools. Sprinkler system is not necessary. Addressable smoke detectors are installed in all rooms except the kitchen or pantry where heat detectors are employed. Although annual fire inspection by authorized person is compulsory, frequent checking of the fire pump room and water tank is required to monitor whether if any water leakage or overflow occurs. Such frequent inspections can be the duty of the school's janitor. Fire extinguishers of CO₂ type are placed in labs, computer rooms, library, pump room, electrical room, hall, office, guardroom, function rooms and teacher rest rooms.

2. Wiring

Wiring conduits can either be disclosed or concealed. Fig.2 shows a vertical disclosed conduit connected to a concealed switch box, i.e. pvc conduit on the wall while the box in the concrete. Hence, the portion where a change from disclosed to concealed conduit results to a reduction of diameter, which may not be accessible for future wiring passage. We suggest that disclosed conduits and boxes are suitable for schools in renovation.



Fig.2

5. Water supply

Water cost in Macao is comparatively higher than in Hong Kong. The main reason is that in Hong Kong, potable water and flushing water are two separate systems. Only the former is fitted with a meter; flushing water for the toilet is free of charge. On the contrary, both potable and flushing water in Macao are of one main supply with a meter. For the sake of water saving, auto-stop press type faucets are preferred for the students. Compression joint copper piping can't be used in the concealed system. Brass soldering or silver welding piping is acceptable for concealed piping. All concealed piping need to be pressure tested prior to back-fill.

3. Air-conditioning

Air-conditioning consumes 20%-30% of the school's power expenditure. Normally, two sets of split-typed air-conditioner each 2 h.p. are sufficient for a standard classroom of 30 students⁽²⁾. Note that 2x2h.p. is better than 1x4h.p. The remote control should be kept by the class teachers who will turn off the air-conditioners at the end of the class prior to lunch and the end of the

6. Classroom door locks

The door lock handle of a 30-student classroom is being turned and twisted for about 200 times a day by

the students. A hydraulic drum is installed on the door top so that the frequency of touching the door handle can be minimized, at the same time, its life time can be maximized. Furthermore, the hydraulic drum provides an automatic door close so as to maintain the classroom temperature. If possible, request the door lock dealer to set all door locks be opened by one main key. These locks will be installed eventually in all classrooms, thus, relieving the janitor's burden from keeping so many keys.

7. Material Selection

Most of the electrical items marked with BSXXX are of quality assurance. However, no China G.I. pipes and UPVC pipes can officially be used in Hong Kong eventhough they are of Chinese GB approval. We make no comments for such a declination, but via hearsay, China pipes are of lower quality. Enclosed herewith are of the important E&M items which comply with the British specifications ⁽³⁾ ⁽⁴⁾:

- Electric plug & socket (13 AMP) – comply with BS1363 fitted with 5 AMP fuse
- White UPVC conduits for Wiring – comply with BS 6099
- UPVC coated copper water pipes – comply with BS1057 type X
- White UPVC drainage pipes – comply with BS6255
- Grey UPVC drainage pipes – comply with BS3500
- Both white and grey are suitable for drainage
- GI steel water pipes – comply with BS1387 class B
- Wires for conduit. (red and dark) – comply with BS6004

8. Workmanship

Below are 10 precautions to ensure the contractors' workmanship :

- ▶▶ One switch controls one light fixture. Should there be additional light fixture(s), power supply shall be obtained from the first fixture instead of from the switch.
- ▶▶ Never allow your contractor to run their disclosed electric conduits but connection to a concealed box.
- ▶▶ Never allow your contractor, for his own conveniences, to have both high and low voltage wiring sharing the same conduit. Low voltage refers to those detectors,

computers, telephone, doorbell and etc.

- ▶▶ No wires can be seen unless the fixtures are portable. Air-conditioners and exhaust fans at high level are exceptions.
- ▶▶ Never allow one electric socket simultaneously to serve two or more air-conditioners.
- ▶▶ Electric pvc conduit shall not be bent to right angle by hand ;make sure the workers use a bending device or install an elbow. Winkle after bending is not acceptable.
- ▶▶ The drain pipe after leaving the base plate of an air-conditioner shall immediately run down vertically. Should this is a lateral run, make sure the pipe has sufficient fall for the flow of the condensed water and the lateral span length to be kept to a minimum. Failing to perform the above may cause the condensed water accumulating in the base plate and entering into the premises.
- ▶▶ All pipes passing through floor slabs must be sleeved. To be more clear; plant a short pipe with diameter slightly larger than the working pipe; fill up the gap between the sleeve pipe and the working pipe with caulking cement. Make sure the top face of this sleeve is at least 50 mm above ground to prevent floor water penetrating into the floor below.
- ▶▶ All pipes must be verified without leakage prior to backfill with cement. Hydraulic test at 150 PSI for one working day is recommended.
- ▶▶ Never full pay to the contractors right after the working completion with full satisfaction unless the amount is trivial. An agreement with the contractors shall be made that certain percentage out of the contract payment needs to be kept as a performance bond for a period of, say, one month.

9. Property management by law:

Attentions need to be paid on the following works:

- ▶▶ testing of water leakage for piping inside slabs.
- ▶▶ electrical wiring.
- ▶▶ application of sealants and water proofing materials. In general, acidic cure sealants are not recommended in all glazing works. Neutral cure sealants are normally applied sheet membranes instead of burning tar are

used in water proofing works.

- ▶▶ Facades works such as wall tiles, marble/granite and curtain wall where compatibility between the sealant and substrates is required.
- ▶▶ others that may endanger the students.

All the abovementioned works require experts to look after the contractors. Up to present, there are no mechanisms to govern the quality of these contractors who may even sub-contract the work to some others. It is important to achieve the budget since monies are from the government, or in other words, from the citizens of Macao. Schools cannot afford to set up their own engineering department other than one or two handy persons. We advise the government to register all relevant contractors and disclose the name list to the public ^[5]. Setting up of professional bodies is an urgent need in Macao. Not only for school projects, but also for other sectors. Members of these professional bodies are authorized persons who can monitor the work of contractors. Without prejudice, Hong Kong engineers do play an important role in Macao's building industry. We shall take these Hong Kong and UK's professional institutions (institutes) as references in the formation of a local one. Here are the names of some typical ones:

- ▶▶ The Institution for Electrical Engineers, UK,
- ▶▶ The Chartered Institution for Building Services Engineers, UK,
- ▶▶ The Institute of Maintenance & Building Management, UK,
- ▶▶ Building Services scheme, The Hong Kong Institution for Engineers,
- ▶▶ Electrical scheme, The Hong Kong Institution for Engineers,
- ▶▶ Other equivalent Engineers.

Members of this professional body, for example, the existing Macao Institution of Engineers (established in 1988), should have their names appear in the government gazettes and can claim themselves as authorized persons by law. Their scope of work includes air-conditioning, fire services, plumbing, drainage, gas and electrical works. Should there be litigations between clients and contractors, these authorized people can testify in front of the court.

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- 3) 電力(線路)規例手冊, 香港機電工程署, 2003年, 頁293-297
- 4) 聶華明, 水電實習上冊, 中國台灣弘揚出版, 2005年, 頁107-114
- 5) Registered Licensed Plumbers; Registered Licensed Electricians; Registered Contractors. Issued by the City District Office (current year), Hong Kong Government.

