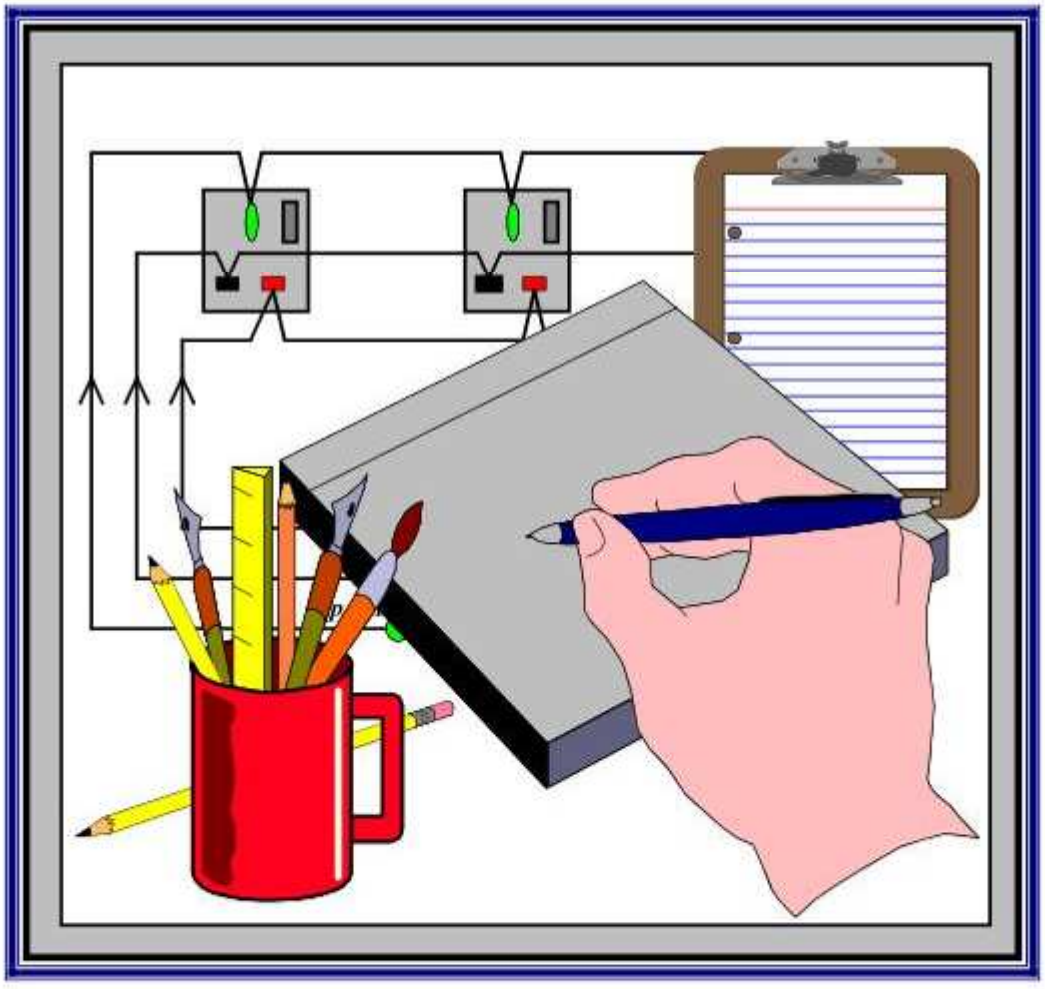
THE INSPECTION AND TESTING OF ELECTRICAL INSTALLATIONS BS7671 CHAPTER 62 - PERIODIC INSPECTION AND TESTING

ELECTRICAL INSTALLATION CONDITION REPORT



TECHNICAL SUPPORT AND TRAINING

BS7671 CHAPTER 62 - PERIODIC INSPECTION AND TESTING

ELECTRICAL INSTALLATION CONDITION REPORT

BS7671 Regulation 621.1 requires that **"...periodic inspection and testing of every electrical installation shall be carried out in accordance with Regulations 621.2 to 5 in order to determine, so far as is reasonably practicable, whether the installation is in a satisfactory condition for continued service."**

After taking into account the availability of records and the use, condition and nature of the installation he must decide upon the scope of the periodic inspection and test and upon completion advise the client on any remedial work required.

The test engineer must be competent, **(BS7671 Regulation 621.5)** in addition to the previous requirements for new installations, he must have the ability to compare and interpret the test results with any previous results provided and satisfy himself that they are within the requirements of BS 7671.

The requirements for a periodic inspection and test of an electrical installation are that the inspection comprising close scrutiny shall be carried without dismantling or with partial dismantling as required together with the appropriate tests as specified in BS 7671.

With the **Electricity at Work Regulations** requiring that all electrical installations be maintained in such a manner that danger will not arise then periodic inspection and testing is essential.

Reasons for Periodic Inspection and Testing.

i) To satisfy the Electricity at Work Regulations.

ii) To satisfy the requirements of licensing authorities.
Petrol stations and cinema's etc.

iii) Change of ownership.

iv) Building Society mortgage applications.

v) Where there is a suspicion that the installation may be damaged.

vi) Where there has been a change of use and/ or a significant increase in the electrical loading of the installation.

Records of maintenance must be kept.

To satisfy the requirements of the **Electricity at Work Regulations**, all places of work should have documentation confirming that the installation has been maintained to a level so as to prevent danger (so far as is reasonable practicable).

A current Periodic Inspection and Test Report usually satisfies these requirements.

BS7671 CHAPTER 62 - PERIODIC INSPECTION AND TESTING

ELECTRICAL INSTALLATION CONDITION REPORT

BS7671 Regulation 621.1 requires that the inspection shall be carried out in such a manner that will ensure as far as is reasonably practicable that

"....(i) safety of persons and livestock against the effects of electric shock and burns

(ii) protection against damage to property by fire and heat arising from an installation defect

(iii) confirmation that the installation is not damaged or deteriorated so as to impair safety

(iv) the identification of installation defects and departures from the requirements of these Regulations that may give rise to danger."

Whilst carrying out the inspection and test it is the engineer's responsibility to ensure that no danger arises and that equipment and property are not damaged irrespective of the condition of the installation.

BS7671 Regulation 621.2 With regards to the frequency of the periodic inspection and testing four factors must be taken into account.

1) the type of installation, its
2) use and operation, the
3) frequency and quality of maintenance, and the
4) external influences to which it has been subjected.

Periodic inspection and testing need not be carried out provided that it can be ensured that the installation has been under effective supervision and that continuous monitoring and maintenance of the installation has been carried out.

BS7671 Regulation 631.2 Upon completion an **Electrical Installation Condition Report**, with an inspection schedule plus and a test result schedule must be given to the person ordering the work.

It must be ensured that any damage, deterioration, defects, dangerous conditions and non-compliances which may give rise to danger are identified and recorded.

BS7671 CHAPTER 62 - PERIODIC INSPECTION AND TESTING

ELECTRICAL INSTALLATION CONDITION REPORT

The Wear and Tear List

With the passing of time the general condition of an electrical installation usually deteriorates. This could be due to a number of factors:-

i) **wear and tear** - The general condition of equipment such as motor starters, switches, contactors etc. which are in continuous use could deteriorate due to wear and tear. Replacement might be required.

ii) **damage** - Where damage is likely to occur or equipment is likely to be abused then additional mechanical protection should be provided. If this is not carried out then damage to the installed equipment can occur. Replacement with suitable equipment or additional mechanical protection must be provided.

iii) **Corrosion**

iv) **excessive overloading**

v) **ageing, and**

vi) **suitability to the environmental conditions to which it is subjected.** Checks on any external influences that may have been introduced since the previous inspection and test was carried out. Introduction of acid baths giving of toxic and corrosive fumes will affect the installed equipment.

vii) **suitability of the installed equipment for the use to which it is intended.** The working environment of the installation may have changed over the years. Equipment which may have been previously suitable for the environment and working conditions may now not be.

The form which is general use and available from the IET as a PDF file entitled 'FORMS for 2008 inc Amd No 3:2015' must not be used for fire alarm, emergency lighting and petrol station installations.
These installations have their own inspection and testing certificates.

ELECTRICAL INSTALLATION CONDITION REPORT

Client Name Address Post Code	**SECTION A. DETAILS OF THE CLIENT / PERSON ORDERING THE REPORT**

SECTION B. REASON FOR PRODUCING THIS REPORT

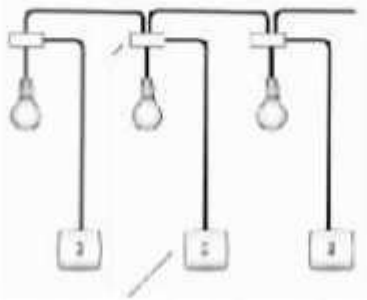
Information with regards to the purpose of the inspection must recorded in the appropriate section of the report form. Reasons for the inspection could include:

i) insurance purposes,
ii) licensing for the local authority,
iii) a building society mortgage application, and
iv) a routine maintenance inspection for compliance with the EAWR 1989 Regulations.
v) clients request

Occupier Address Telephone	**SECTION C. DETAILS OF THE INSTALLATION WHICH IS THE SUBJECT OF THIS REPORT**			
Type of Premises	**Domestic**	**Commercial**	**Industrial**	
	Other			
Estimated age of the original installation		**Years**		
Evidence of alterations or additions		**Yes**		
		No		
If 'yes' estimated age of alterations		**Years**		
Alterations or additions not apparent				

It is sometimes difficult to determine the age of the installation if no records have been kept or made available to the test engineer. If this is the case then the engineer must estimate the approximate age by using information obtained during the inspection.
This can be calculated from the wiring system used on installations - not including any apparent additions / alterations - an approximate age can be estimated.

- the use of twin PVC cables without CPC e.g., 47+ years



As cables for lighting circuits installed prior to 1966 do not include circuit protective conductor's, any new or replacemen switches or ceiling roses must be of the all insulated type.

ELECTRICAL INSTALLATION CONDITION REPORT

- the use of lead sheathed cables -65 years +

Lead sheathed cables were used in installations prior 1948.
They have rubber insulated tinned copper conductors and an outer sheath of lead.
As the conductor insulation is rubber and therefore prone to deterioration it can be assumed they will have exceeded there anticipated working life.

- the use of **Tough rubber sheathed (TRS), vulcanised rubber insulation (VRI) cables** - 65 years +

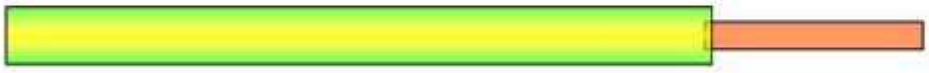
With the introduction of pvc insulated cables in the early 60's rubber insulated, tough-rubber sheathed (TRS) type became obsolete. As rubber is prone to deterioration they should be left undisturbed until replaced.

- the use of imperial pvc cable size - 40 years +

1/ .044 current carrying capacity =
3/ .029 current carrying capacity =
3/ .036 current carrying capacity =
7/ .029 current carrying capacity =
7/ .044 current carrying capacity =

Cables used up to the very early 1970's were of the imperial type.
Their conductors may be single-stranded or may have three, seven or more strands
The copper conductor's were usually tinned.

Green coloured protective conductors or sleeving instead of green-yellow - 36years+



Since 1977 identification of the circuit protective conductor was changed from green to green-yellow.

The test engineer should be capable of being able to estimate the age of the electrical installation from the information obtained during the visual inspection in years.

ELECTRICAL INSTALLATION CONDITION REPORT

SECTION C. DETAILS OF THE INSTALLATION WHICH IS THE SUBJECT OF THIS REPORT

Date of last Inspection		Installation records available?	Yes / No
		Records held by	

Prior to the commencement of the inspection, the engineer should be in possession of the installations Electrical Installation Certificate or previous Periodic Report Forms plus Minor Works certificates for work that has been carried out since the last inspection, diagrams and charts

The information required with regards to the supply characteristics for an ELECTRICAL INSTALLATION CONDITION REPORT is the same as the requirements for an initial inspection.

SECTION D. EXTENT AND LIMITATIONS OF INSPECTION AND TESTING

Extent of Electrical Installation covered by this report	
Agreed Limitations Agreed with Operational limitations	

The inspection and testing detailed in this report and accompanying schedules have been carried out in accordance with BS 7671:2008 (IET Wiring Regulations) as amended to.....

Prior to commencement, it must be ensured that the client has agreed to the extent of the installation that is to be inspected and tested.

Exclusions could also be included within the extent box e.g., no inspection and testing carried out at outlet points at a height greater than 3.5m above finished floor level.

It must be remembered that the client is likely to presume that the whole of the installation has been inspected and tested, as this is not the case it must be ensured that the client is fully aware of what has actually been carried out.

ELECTRICAL INSTALLATION CONDITION REPORT

SECTION E. SUMMARY OF THE CONDITION OF THE INSTALLATION

The assessment of the electrical installations **general electrical condition** is usually contained in the centre of the report. To avoid any misunderstanding with th e client, the comments with regard to the overall assessment is placed in a more prominent position. i.e. the front page.

Overall assessment Satisfactory Unsatisfactory **DELETE AS APPROPRIATE**

NOTE. An unsatisfactory assessment indicates that dangerous (code C1) and/or potentially dangerous (code C2) conditions have been identified.

Make a note of when remedial work is completed to a satisfactory standard Date / /

SECTION F. RECOMMENDATIONS

NEXT INSPECTION Subject to the necessary remedial action being taken, I / we recommend that the installation is further inspected and tested by .....(date).

The test engineer will have to determine the interval to the next inspection and test. The interval could be different to that originally anticipated by the designer.

SECTION G. DECLARATION - FILL IN DETAILS AS REQUIRED

SECTION H - SCHEDULE(S)

The Inspection and Test Result Schedules are part of this report, it is only valid when they are attached to it.

SCHEDULE OF ITEMS INSPECTED

Information, access and labels/ notices etc.

✓	*Presence of diagrams, instructions, charts and other necessary information.*	N/ A	*Access to switchgear and equipment*
✓	*Labelling of protective devices, switches etc.*		*Presence of danger notices etc.*

SCHEDULE OF ITEMS TESTED

APPLICABLE TESTS

	Continuity of Protective Conductors *(including main and supplementary bonding)*
N/ A	**Continuity of Ring Final Circuit Conductors**

It can be seen that the schedules of items inspected and tested are the same as those used in the Electrical Installation Certificate

ELECTRICAL INSTALLATION CONDITION REPORT

SECTION F. RECOMMENDATIONS REFERD TO THE SCHEDULE (S) OF INSPECTIONS RECOMMENDATIONS

The recommendations are based upon the results of the inspection and tests carried out within the *limitations* specified.

One of the following codes, as appropriate, has been allocated to each of the observations made above to indicate to the person(s) responsible for the installation the degree of urgency for remedial action.

C1 – Danger present. Risk of injury. Immediate remedial action required

C2 – Potentially dangerous - urgent remedial action required

C3 – Improvement recommended

It is possible that some deficiencies could warrant entry into more than one category section.

No remedial action is required	

SECTION E. SUMMARY OF THE CONDITION OF THE INSTALLATION IS A SUMMARY OF THE SCHEDULE (S) OF INSPECTIONS

General condition of the installation (in terms of electrical safety)

This section on **this** certificate requires a brief description of the installation.
With regards to the condition terms like good, o.k., average are not acceptable.

THE ABOVE COULD INCLUDE ITEMS / CIRCUITS NOT TESTED

The client, unless informed will assume that the whole of the electrical installation has been inspected and tested, any items or circuits such as emergency lights, fire alarms, heating systems, intruder alarm systems and appliances which have not been inspected must be identified.

ELECTRICAL INSTALLATION CONDITION REPORT

INSTALLATION SCHEDULE

The installation schedule should be brought up to date take into account any new additional circuits

SCHEDULE OF TEST RESULTS

Although the recommended schedule of test results is the same as the Electrical Installation Certificate, the requirements with regards to the amount and level of testing is different on a periodic test.

For example, measurements of (R_1 + R_2) are difficult to obtain without dismantling equipment, insulation resistance tests cannot be carried out with the supply energized.

Other factors that could restrict the amount of testing could include access problems and safety

To ensure no misunderstanding with the client occurs with regards to the methods used and what is actually being inspected and tested , it should be considered essential to provide the client (prior to commencement) with a specification detailing the results of the discussions held previously.

PERIODS BETWEEN INSPECTION AND TESTING

With BS 7671 providing minimal guidance regarding the frequency of the periodic inspection and testing of an installation, the designer having taken into account the type of installation, its use and operation, the frequency of maintenance and any external influences to which it is likely to be subjected, has to determine the interval of time before the installation is further inspection and tested.

The standard *Electrical Installation Certificate* will contain the designer's recommendations.

After the first periodic inspection and test, the engineer having taken into account the condition of the installation has the option to increase or decrease the interval before the installation is again further inspected and tested.

This recommendation along with reasons will be contained in the periodic report.

The installation should have displayed in a prominent position at the origin of the installation a notice with an indication when the next date for inspection and testing is due.

A comprehensive guide to the *initial frequency* of inspection and testing of electrical installations is given in the form of a table in Guidance Note 3 Table 3.2on Page 65.

ELECTRICAL INSTALLATION CONDITION REPORT

The types of installations described in Guidance Note 3 are listed under four general headings. i.e.

1) General installation - which includes domestic, commercial and industrial
2) Hospitals and medical clinics
3) Buildings open to the public - which includes churchs, cinemas and theatres.
4) Special and specific installations – which includes Agricultural and Horticultural, Caravans, Construction sites and petrol filling stations.

It would be irresponsible of any engineer in charge of an electrical installation to assume that his responsibilities are at an end by carrying out any periodic inspection and testing at the maximum recommended intervals.

He must ensure that a system is in operation whereby routine checks are carried out by responsible persons at intervals less than the maximum periods specified for the inspection and testing. In effect the routine tests are used to supplement the periodic inspection and test.

Any breakages must be made good as and when they are discovered.
On a routine inspection the responsible person would be looking for :-

- signs of breakages
- signs of wear and tear
- signs of overheating
- presence of labels and warning notices
- accessibility and operation of switchgear

Routine inspections are therefore an essential part of any inspection and test programme.

Recommended frequencies for the routine inspections of electrical installations

Type of Installation	Routine Check
Commercial	1 year
Hospitals (General)	1 year
Cinemas	1 year
Caravan parks	6 months

Recommended Initial frequencies for inspecting and testing electrical installations

Type of Installation	Maximum period between inspection and testing
Commercial	5 years
Hospitals (General)	5 years
Cinemas	1-3 years
Caravan parks	1 year

Although the "time intervals" shown are only recommended, there is a **legal requirement** under the **EAW Regulations** to ensure the installation is maintained to a level that prevents danger. To satisfy these requirements, testing at regular intervals must be carried out and records of each inspection and test must be kept. In the event of an accident failure to have this proof of compliance, could result in prosecution in the criminal courts.

Form 6 Form No: ...../6

ELECTRICAL INSTALLATION CONDITION REPORT

SECTION A. DETAILS OF THE CLIENT / PERSON ORDERING THE REPORT

Name .....

Address .....

..... Post Code: .....

SECTION B. REASON FOR PRODUCING THIS REPORT .....

.....

Date(s) on which inspection and testing was carried out .....

SECTION C. DETAILS OF THE INSTALLATION WHICH IS THE SUBJECT OF THIS REPORT

Occupier .....

Address .....

..... Post Code: .....

Description of premises (tick as appropriate)

Domestic ☐ Commercial ☐ Industrial ☐ Other (include brief description) ☐ .....

Estimated age of wiring system .....years

Evidence of additions / alterations Yes ☐ No ☐ Not apparent ☐ If yes, estimate age .....years

Installation records available? (Regulation 621.1) Yes ☐ No ☐ Date of last inspection .....(date)

SECTION D. EXTENT AND LIMITATIONS OF INSPECTION AND TESTING

Extent of the electrical installation covered by this report

.....

.....

Agreed limitations including the reasons (see Regulation 634.2) .....

.....

Agreed with: .....

Operational limitations including the reasons (see page no.....) .....

.....

The inspection and testing detailed in this report and accompanying schedules have been carried out in accordance with BS 7671: 2008 (IET Wiring Regulations) as amended to .....

It should be noted that cables concealed within trunking and conduits, under floors, in roof spaces, and generally within the fabric of the building or underground, have **not** been inspected unless specifically agreed between the client and inspector prior to the inspection.

SECTION E. SUMMARY OF THE CONDITION OF THE INSTALLATION

General condition of the installation (in terms of electrical safety) .....

.....

.....

Overall assessment of the installation in terms of its suitability for continued use

SATISFACTORY / UNSATISFACTORY* (Delete as appropriate)

*An unsatisfactory assessment indicates that dangerous (code C1) and/or potentially dangerous (code C2) conditions have been identified.

SECTION F. RECOMMENDATIONS

Where the overall assessment of the suitability of the installation for continued use above is stated as UNSATISFACTORY, I / we recommend that any observations classified as *'Danger present'* (code C1) or *'Potentially dangerous'* (code C2) are acted upon as a matter of urgency.
Investigation without delay is recommended for observations identified as *'further investigation required'*.
Observations classified as *'Improvement recommended'* (code C3) should be given due consideration.

Subject to the necessary remedial action being taken, I / we recommend that the installation is further inspected and tested by .....(date)

SECTION G. DECLARATION

I/We, being the person(s) responsible for the inspection and testing of the electrical installation (as indicated by my/our signatures below), particulars of which are described above, having exercised reasonable skill and care when carrying out the inspection and testing, hereby declare that the information in this report, including the observations and the attached schedules, provides an accurate assessment of the condition of the electrical installation taking into account the stated extent and limitations in section D of this report.

Inspected and tested by:	**Report authorised for issue by:**
Name (Capitals)	Name (Capitals) .....
Signature	Signature .....
For/on behalf of	For/on behalf of .....
Position	Position .....
Address	Address .....
Post code ..... Date	Post code ..... Date .....

SECTION H. SCHEDULE(S)

.....schedule(s) of inspection and .....schedule(s) of test results are attached.

The attached schedule(s) are part of this document and this report is valid only when they are attached to it.

ELECTRICAL INSTALLATION CONDITION REPORT

Form 6 Form No: ...../6

SECTION I. SUPPLY CHARACTERISTICS AND EARTHING ARRANGEMENTS

Earthing arrangements	Number and Type of Live Conductors		Nature of Supply Parameters	Supply Protective Device
TN-C ☐ TN-S ☐ TN-C-S ☐ TT ☐ IT ☐	a.c. ☐ 1-phase, 2-wire ☐ 1-phase, 3-wire ☐ 2 phase, 3-wire ☐ 3 phase, 3-wire ☐ 3 phase, 4-wire ☐	d.c. ☐ 2-wire ☐ 3-wire ☐ Other ☐	Nominal voltage, U / U_0(1) ..... V Nominal frequency, f(1) ..... Hz Prospective fault current, I_{pf}(2) ..... kA External loop impedance, Ze(2) ..... Ω Note: (1) by enquiry (2) by enquiry or by measurement	BS (EN) ..... Type ..... Rated current .....A
	Confirmation of supply polarity ☐			

Other sources of supply (as detailed on attached schedule) ☐

SECTION J. PARTICULARS OF INSTALLATION REFERRED TO IN THE REPORT

Means of Earthing	Details of Installation Earth Electrode *(where applicable)*
Distributor's facility ☐ Installation earth electrode ☐	Type ..... Location ..... Resistance to Earth ..... Ω

Main Protective Conductors

Earthing conductor	Material	csa .....mm²	Connection / continuity verified ☐
Main protective bonding conductors	Material	csa .....mm²	Connection / continuity verified ☐
To incoming water service ☐	To incoming gas service ☐	To incoming oil service ☐	To structural steel ☐
To lightning protection ☐	To other incoming service(s) ☐ Specify		

Main Switch / Switch-Fuse / Circuit-Breaker / RCD

Location .... BS(EN) ..... No of poles	Current rating ..... A Fuse / device rating or setting ..... A Voltage rating V	**If RCD main switch** Rated residual operating current ($I_{\Delta n}$) .....mA Rated time delay .....ms Measured operating time(at $I_{\Delta n}$) .....ms

SECTION K. OBSERVATIONS

Referring to the attached schedules of inspection and test results, and subject to the limitations specified at the *Extent and limitations of inspection and testing* section

No remedial action is required ☐ The following observations are made ☐ (see below):

OBSERVATION(S)	CLASSIFICATION CODE	FURTHER INVESTIGATION REQUIRED (YES / NO)
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One of the following codes, as appropriate, has been allocated to each of the observations made above to indicate to the person(s) responsible for the installation the degree of urgency for remedial action.

C1 – Danger present. Risk of injury. Immediate remedial action required

C2 – Potentially dangerous - urgent remedial action required

C3 – Improvement recommended

ELECTRICAL INSTALLATION CONDITION REPORT

INSPECTION

BS7671 Regulation 610.2 - Prior to the commencement of the inspection, the resultsof the **Assessment of General Characteristic's** required by
Section 311 (MAXIMUM DEMAND AND DIVERSITY),
Section 312 (CONDUCTOR ARRANGEMENT AND SYSTEM EARTHING) and
Section 313 (SUPPLIES) these include

a) The maximum demand

b) the nominal voltage and number of phases

c) the nature of the current and frequency

d) the P_{efc} and/ or the P_{scc} at the origin of the supply

e) the type and rating of the main protective device

f) the earth fault loop impedance at the origin,

g) the earthing arrangement, and

h) the rating, number of poles and the type (BS) of the main switch or circuit breaker, together with diagrams, charts and tables with reference to **BS7671 Regulation 514.9.1** which requires that information regarding
- the type and composition of circuits, (cable type and size, points served, circuit information and **circuits that could be vulnerable to tests**),
- the method of protection against indirect contact, the maximum design and test earth loop impedance values,
- the information necessary for the identification of each device performing the functions of protection, isolation and switching and its location,

This should be made available to the person or persons carrying out the inspection and testing.
It is essential that all steps are taken to minimise the danger to persons or damage to property when carrying out the inspection and testing.

To this end **inspection must always precede testing**, preferably with the section or part of the installation being inspected isolated from the supply.

The purpose of the inspection is to ensure that installed electrical equipment has been:

1) correctly selected and erected,

2) suitable for the environment to which it is installed, and

3) not visibly damaged.

Regulation 611.3 and **Guidance Note 3** provides a list of approximately **180** items that need to be visibly inspected.

It is recommended that engineers produce their own inspection list as it is virtually impossible to produce a complete check list to satisfy all installation types.