



## **Installation of lighting plants in the theatres**

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**Topic:** Educational Lighting Site

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One of the fundamental points in the planning of a new theatre, or in the restructuring of an existing one, is, obviously, the electrical system. A designer who, after having examined the specific law regulations, approaches a theatre for the first time, starts to feel uncomfortable when he has to deal, together with the client and the theatre technicians, with the needs presented by the technicians themselves. In practice, although generally speaking all theatrical plants can be the same, the use of lights in a theatre is an artistic instrument and, thus, a detailed design and, as a consequence, the use of it, must reconcile the technical and economic rules of an electric system with the need of an artistic direction which requires different solutions for each theatrical show. In order to obtain a positive result in the design of a system to be installed in a theatre, it is thus often necessary for the designer to be assisted and advised by an expert in theatrical lights.

### Types of lighting plants

Electric systems in theatres can be divided in plants for the power supply of technical uses (conditioning system, motors, stage machinery, safety lights, etc.) and lighting plants. The latter can be further distinguished in generic lighting plants and lighting plants for a show. The generic lighting plant is substantially an industrial-type system for the power supply of the various lighting points scattered around the theatre, according to the rules of lighting engineering and architecture, which are controlled by area boards and switches according to the technical characteristics of a generic lighting plant that presents no specific theatrical requirements, apart from the logistic ones imposed by the conditions of use of the premises pursuant to the specific technical normative laws. A lighting plant for entertainment can be distinguished from a generic lighting system, in that the former is aimed at the use of lighting devices. It must be possible to control lights for entertainment not only for lighting engineering needs, but also because it is a fundamental artistic instrument for theatrical shows. Both adjusted and direct lights can provide the above-mentioned functions. By adjusted lights we mean those lights that can be placed only when they are either switched on or switched off.

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### Reference law regulations

The plant related to "show lights" originates from the general low tension control board and supplies the specific uses of theatrical shows. On the stage area it is installed alongside the safety lights service system and the stage and service plant for white and blue lights.

Obviously, all the concerned premises, excluding the technical service rooms, must be classified as "premises for public entertainment" and, accordingly, be subject to the regulation CEI64-8/7 chapter 752, beside, naturally, the more general ones. In particular, in the whole area defined as the stage the plant must guarantee a minimum degree of protection equal to IP44. Other technical reference regulations that must be implemented are law 186 of 01/03/1962 (duly), circular no.16 of 15/02/1951 (regulations related to premises for public entertainment), CEI regulations related to electrical systems utilizers, IEC regulations (International Electrotechnical Commission), I.S.P.E.L.S. recommendations and VV.FF prescriptions and recommendations. The calculation of the electrical loads weighing on the plant must be carried out on the real needs of individual theatres using, as an indicative norm, a medium-sized theatre with an orchestra pit in which the power used by the stage lights can amount to 25% of the total, emergency lights to 1%, stage services to 3%, the dressing rooms to 2%, the director's board to 1%, the orchestra-pit board to 2%. It is advisable to install a power that exceeds by about 60% the absorbed one calculated in the project.

### Selection of the plant

The main distribution board for stage lights, which receives its power supply directly from the low tension main distribution board of the theatre, distributes energy to the various boards of the area such as the stage lights regulators boards, direct and service stage lights boards, the power supply board for the appliances of an eventual touring company and other boards required by the services needed by the theatre. The stage lights regulators board supplies the regulating dimmers of the lights and, for this reason, is the point that makes the stage lights system differ from a "traditional" plant. The dimmer groups, enclosed in triphase power supply cup-boards and usually placed in a room next to the stage, receive their power supply from the regulators board and supply the services such as lighting devices and power inlets. Each dimmer normally supplies a 2.5Kw or 5Kw circuit, in rare cases also 10Kw ones. It is evident that with an equal installed power, the more are the circuits, the more flexible will be the running of the lighting system. Dimmers must be controlled from a distant position, generally located in the director's room, but with the possibility of moving them in other places of the theatre, thanks to a specific console used for this purpose. This control, which once was carried out by means of a bundle of cables that transported a control voltage between 0 and 10V to each individual channel, is obtained according to the DMX512 protocol by means of a small dual pair cable as well as a monitor.

The connection of the services to the dimmers is traditionally done through an inlets board comprising a set of panel inlets (one per each panel) and a set of sockets (one per each dimmer channel) and a bundle of inlet/socket lashes that connect a specific service to a dimmer channel. At present, theatres are increasingly adjusting to technological innovations and are removing the inlets board, with substantial savings in terms of costs, space and possible faults, in favour of "software" inlets, the so called patch function, inserted among the functions of the director's board which allows, by means of a keyboard, to direct any circuit of the console to any dimmer. Nonetheless, it is important during the design stage to take into consideration the stage inlets board of the appliances of travelling companies, a function that must be always guaranteed with an appropriate system of commutators. All the lines destined to the lighting services of a show are commonly terminated on fixed inlets that are normally grouped together, no more than 5 per board (CEI64-8, par. 752.55.1) and which end up in an automatic circuit breaker placed in the sector board. These groups of inlets must be distributed so as to cover all the needs of the show and of the services connected to it. Therefore, they are placed on the stage, on the various control platforms and on the trellis. Apart from the stage area, it is indispensable, in any case, to anticipate the need to position illuminating bodies even in the hall, on the side walls beside the

proscenium, on the ceiling and on the rear wall or on the gallery or on the boxes. All these groups of inlets must also be placed together with inlets not adjusted to the power supply of the appliances that do not require adjusting or that do not accept it, such as discharge projectors.

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### Conclusions

Although it is not possible to go into the details of the subject of the present article it is important to remember that beside the fundamental parts here dealt with, there are other secondary signal, control and service plants that are indispensable for running the lighting of a show. They are based on the new technologies of signal transmission through Ethernet networks that allow to optimize the plants without the very strict limitations so far imposed by the protocol DMX512.

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