1 Organizational Aspects

Project:	**Building Automation System**
Subproject:	**Floor32/4-Light-Control**
Documenttype:	**Problemdescription**
Documentname:	**team3-problemdescription**
Responsible:	**Team 3/Group Problemdescription**
User:	**Team 3**
Description:	Problem description for a system for controlling lighting to guaranty comfort and energy saving in all rooms of floor 4 of building 32.

Version#	Date	Creators	Remarks
v1	14.1.1998	Zimmermann	
v2	16.2.1998	Becker, Kronenburg, Zimmermann	
v3	18.2.1998	Becker, Kronenburg, Zimmermann	

2 Introduction

1 This document contains the needs for a new light control system for the fourth floor of building 32 of the University of Kaiserslautern.

2 The main motivation for the development of a new light control system are the disadvantages of the currently existing system. Since all lights are controlled manually, electrical energy is wasted by lighting rooms which are not occupied and by little possibilities to adjust light sources relative to need and daylight.

3 The architecture of the fourth floor of building 32 and the installation of the hallways and the rooms of this floor are described in the document *team3_inst_arch.v[n].fm* [Inst].

4 An explanation of terms can be found in the document *dictionary* [Dict].

3 Needs

5 In this section the needs for the new light control system are presented. In 3.1 functional needs are listed and in 3.2 non-functional needs.

3.1 Functional Needs

6 The functional needs are split in two groups, user needs and facility manager needs, depending on the person who has expressed them.

3.1.1 User Needs

7 The user needs are numbered by *U<number>*.

8 At first general user needs are listed which are demanded for each kind of room:

- U1 If a person occupies a room, the light has to be sufficient to move safely, if nothing else is desired by a chosen light scene.
- U2 As long as the room is occupied the actual chosen light scene has to be maintained.
- U3 If the room is reoccupied within T1 minutes after the last person has left the room, the last chosen light scene has to be reestablished.
- U4 If the room is reoccupied after more than T1 minutes since the last person has left the room, the standard light scene has to be established.
- U5 The wall switches for the window- and the wall-ceiling light group in a room should show the following behavior:
  - (i) if the corresponding ceiling light is completely on then the light will be switched off
  - (ii) otherwise the ceiling light will be switched on completely
- U6 The light scenes can be determined by using the control panel.
- U7 For each room the actual ambient light level can be set by the user using the control panel.
- U8 For each room a default light scene can be set (not by using the control panel).
- U9 For each room a default ambient light level can be set (not by using the control panel).
- U10 The value T1 can be set for each room separately (not by using the control panel).
- U11 If the outdoor light sensor or the motion detector of a room does not work correctly, the user has to be informed.

9 The user needs concerning the offices are:

U12 The ceiling lights and the task light should be maintained by the control system depending on different light scenes.
U13 The control panel should be installed movably like a telephone in the offices.
U14 The control panel should contain at least:
(i) a switch to set the task light (on/off)
(ii) a switch to set the ceiling lights (on/off/ambient)
(iii) a possiblity to set the actual ambient light level

10 The user needs for the remaining rooms are:

U15 In all other rooms the control panel should be installed near a door to the hallway.
U16 The control panel should contain at least:
(i) a switch to set the ceiling lights (on/off/ambient)
(ii) a possiblity to set the actual ambient light level

11 The user needs for the hallway sections are:

U17 When a hallway section is occupied by a person, the light in this hallway section has to be sufficient to move safely.
U18 Before a person enters a hallway section from another one, the light in the entered section has been turned on if necessary.
U19 The wall switches for lights in the hallway section have to show the following behavior:
(i) if the light is on then the light will be switched off
(ii) otherwise the light will be switched on

3.1.2 Facility Manager Needs

12 The facility manager needs are numbered by *FM<number>*.

FM1 Use daylight to achieve the desired light whenever possible.
FM2 Lights in a hallway section have to be switched off when the section has been unoccupied for T2 min.
FM3 If a room is unoccupied for more than T3 minutes, all lights must be switched off.
FM4 The value T2 can be set for each hallway section separately.
FM5 The value T3 can be set for each room separately.
FM6 The facility manager can turn off any light in a room or hallway section that is not occupied.
FM7 If a malfunction occurs the facility manager has to be informed.
FM8 If a malfunction occurs the control system supports the facility manager by finding the reason.
FM9 The system provides reports on current and past energy consumption.
FM10 All malfunctions and unusual conditions are stored and reported on request.
FM11 Malfunctions that the system cannot detect, can be entered manually.

3.2 Non-Functional Needs

13 The non-functional needs are split in several groups depending on the aspect they are dealing with. They are numbered by *NF<number>*.

3.2.1 Fault Tolerance

14 In any case of failure the system shall provide a stepwise degradation of functionality down to manual operability.

15 Needs in the case of a malfunction of the outdoor light sensor:

NF1 If the outdoor light sensor does not work correctly, for rooms the control system should behave as if the outdoor light sensor submits the last correct measurement of the outdoor light constantly.

NF2 If the outdoor light sensor does not work correctly the standard light scene for all rooms is that all ceiling lights are on.

NF3 If the outdoor light sensor does not work correctly and a hallway section is occupied the lights in this hallway section has to be on.

16 Needs in the case of a malfunction of the motion detector:

NF4 If the motion detector of a room or a hallway section does not work correctly, the control system should behave as if the room or the hallway section is occupied.

17 Needs in a worst case failure of the control system:

NF5 If the lights in a hallway section are neither controllable automatically nor manually the lights have to be on.

3.2.2 Safety and Legal Aspects

NF6 All hardware connections have to be made according to DIN standards.

NF7 No hazardous conditions for persons, inventory, or building is allowed.

3.2.3 User Interface

NF8 The control panel should be easy and intuitive to use.

NF9 The system warns about unreasonable inputs.

4 References

18 [Dict]

19 [Inst]