Conference Room Lighting

Room Layout

The walls of this small room are a light cream color with a reflectance of 65 percent. The surface of the table in the center is a matte white solid polymer with a reflectance of about 80 percent. There is room for eight chairs around the table. There will also be small dark wood tables in two corners of the room, one with a television on top of it, the other with a personal computer monitor for use in video conferencing. The camera will be mounted on top of the monitor. Due to the orientation of the camera and table, not all of the seats will be occupied during video conferencing. A four foot by five foot projection screen hangs from one wall above a low dark wood bookcase. When in use, the projector will rest in the center of the table. There is also a white four foot square marker board on the wall opposite the projection screen. The ceiling is a 2'x2' suspended ceiling grid hung at 8'-6" above the floor. The ceiling tiles are white with an 80 percent reflectance.

Design Criteria

Though this is a relatively small space, visual tasks will vary widely for the conference room. This will require a versatile lighting system to accommodate these different activities. It can be used for meetings involving the reading from paper, it may include use of the marker board. Presentations may be projected on the screen. The television will also be used for video presentations.

For general meeting situations, the IES recommends a horizontal illuminance of 30 footcandles and a vertical illuminance of 5 footcandles. For video conferences, higher levels are required for quality video renderings by the camera. The recommended levels are 50 footcandles of horizontal illuminance and 30 footcandles of vertical illuminance. Other considerations are also important for video conferencing, such as a maximum luminance uniformity ratio on the face of three to one. The vertical illuminance is extremely important to prevent harsh shadows on peoples' faces. A target of 30 footcandles of vertical illuminance will also be applied to the white marker board. As with any meeting space, color and modeling of faces is an important design consideration, and is even more important for the video camera. Glare is also an issue, from direct and reflected components, most notably in the VDT screens and possible the marker board. In addition, luminance uniformity of the surfaces will also prevent veiling reflections in these surfaces and will improve the video renderings. With all of these different tasks that may take place in this space on a regular basis, it will be important to have a convenient control system that provides the proper light quality and quantity for each task. This will improve the functionality of the space and can help to conserve energy.

Being a very small space which may be occupied by several people at one time during meetings, it is important for the surfaces in the room to be bright to convey a feeling of spaciousness. This can be achieved through the application of indirect lighting to the space which will brighten the walls and ceiling while delivering the proper amount of illumination to tasks and faces.

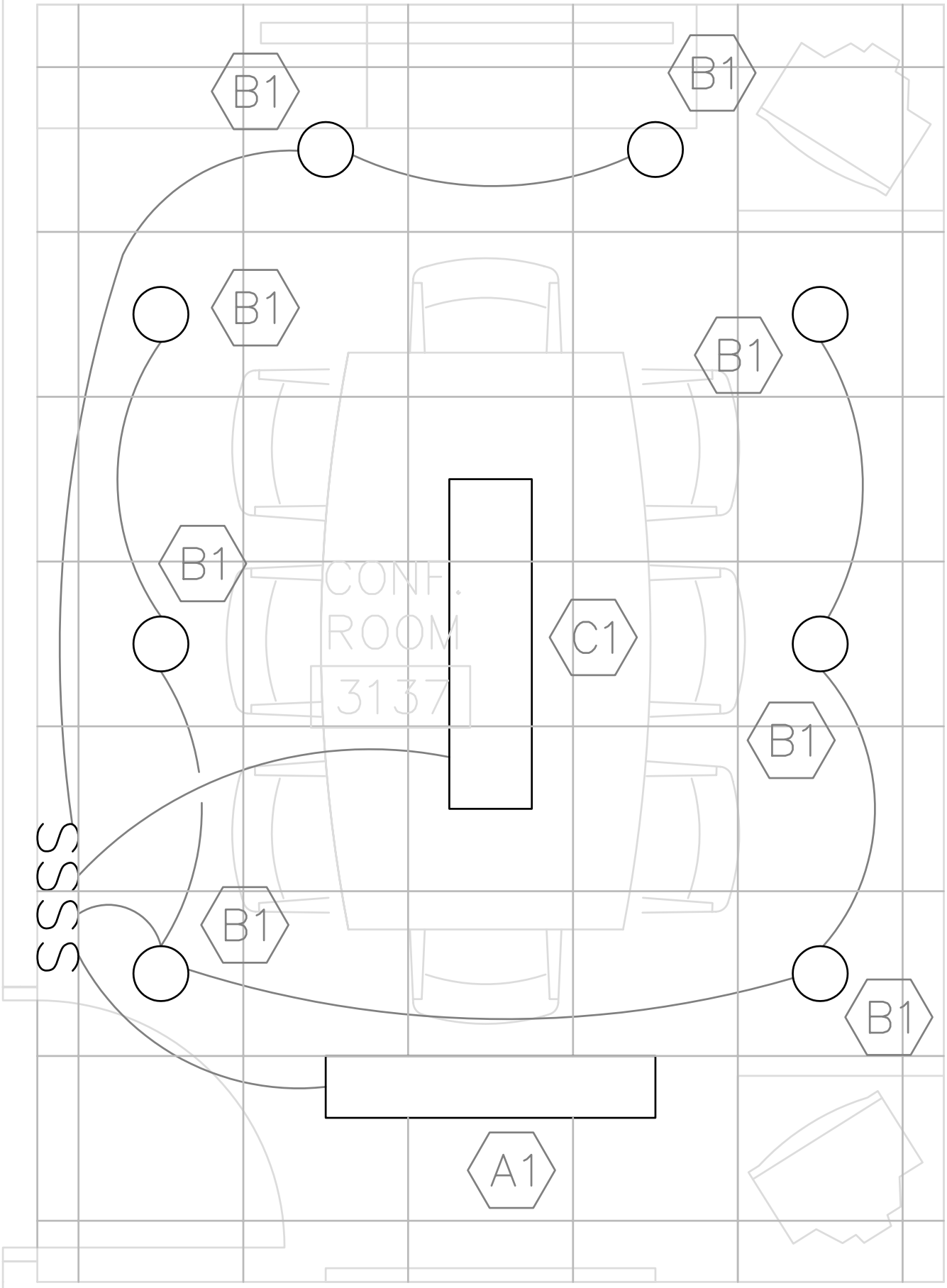
According to ASHRAE/IESNA Standard 90.1-1999, the maximum allowable power density for a typical conference room is 1.5 watts per square foot.

Design Solution

An indirect-direct pendant in the center of the room delivers light to the ceiling which provides relatively uniform direct light to the entire space. It creates a bright ceiling and walls and provides ample light to the table. Wallwash downlights illuminate the walls to create bright surrounding surfaces in the space for a more spacious appearance. Their light distribution also allows them to provide a direct light component towards the center of the room to help model faces. The surface of the table has a relatively high reflectance (60%) to help reflect light off table to provide light to the lower parts of the faces to increase uniformity. Finally a wall slot fixture above the white marker board provides the necessary illumination to the marker board. It also serves to provide indirect light to the space and brightens the wall, but can be turned off to conserve energy when the light is not needed.

Controls for this space are important to facilitate versatility. Though this is a very small room, to there will be four toggle wall switches. For meetings, the pendant will be switched on. The wallwashers will likely be left off, as their contribution is trivial for most situations. The light for the marker board can be switched on or off as necessary. For audiovisual presentations, the wallwash downlights away from the projector screen will be switched on to provide some direct light to the table, if necessary for jotting down notes, and the pendant will be turned off. Those downlights in front of the projector screen will be turned off so that they do not wash out the projected screen image. For videoconferencing, all of the lights will be switched on. An occupancy sensor will also be provided in the room to automatically shut off the lights when the room is not in use. For further clarification on the layout of the lighting system and the switching configuration, see the lighting plan on the next page. This versatility of the lighting system will enhance the various tasks performed here as well as conserve energy when possible. Dimming of some or all of these lights is another option, but was not implemented because there is plenty of switching control to be more than adequate, and dimming adds considerable construction expense.

The lighting power density is 1.7 watts per square foot. This is slightly above the 1.5 watts per square foot allowed by ASHRAE/IESNA Standard 90.1-1999. The high design levels recommended for video conferencing can account for this discrepancy. It will be rare that all lights in this space will be on at all times. The only time that this condition was designed is for video conferencing. For general meetings, the power consumption will fall into compliance. ASHRAE/IESNA Standard 90.1-1999 also allows the excess energy to be recovered in other spaces, which it is more than made up in the other two spaces designed in this report.


B1
B1
B1
B1
B1
CONF.
ROOM
3137
C1
B1
B1
B1
A1

LIGHTING FIXTURE SCHEDULE

FIXTURE	DESCRIPTION	LAMPS	VOLTAGE	BALLAST	WATTS
A1	LITECONTROL WALL/SLOT-2000 PR WALL SLOT FIXTURE WITH PARABOLIC REFLECTOR	(1) F54T5HO/4100K	277	ADVANCE ICN-2S54-90C@277	62
B1	LITHONIA AFVW WALLWASH DOWNLIGHT VERTICAL LAMP, OPEN REFLECTOR	(1) CF13DTT	277	ADVANCE ICF-2S13-H1-LD@277	16
C1	LITECONTROL CLASSICA ID (P-ID-5500) 4' INDIRECT-DIRECT PENDANT	(2) F32T8/4100K (1) F40BX/4100K	277	ADVANCE VCN-2S32-SC ADVANCE VCN-2TTP40-SC	32 44

LIGHTING POWER DENSITY

FIXTURE	WATTS PER FIXTURE	# OF FIXTURES	TOTAL
A1	62	1	62
B1	16	8	128
C1	108	1	108
		TOTAL	298
AREA: 170.5 SQUARE FEET		**DENSITY (W/SF)**	1.7

LIGHT LOSS FACTORS

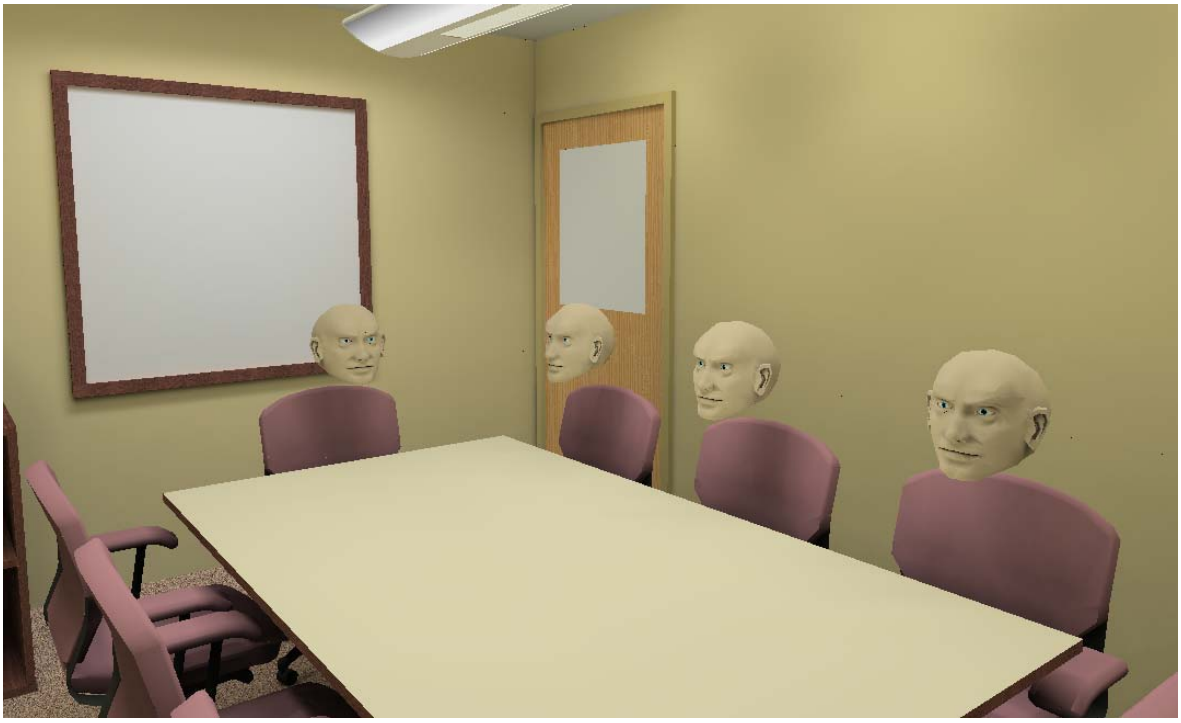
FIXTURE	TYPE	LDD	RSDD	LLD	BF	TOTAL LLF	INIT LUM	LUMENS
A1	IV	0.94	0.98	0.95	1.02	0.89	5000	4463
B1	IV	0.94	0.98	0.85	1	0.78	900	705
C1	II	0.97	0.94	0.9	0.92	0.75	8950	6757

DIRT CONDITIONS: VERY CLEAN
CLEANING CYLCLE: 12 MONTHS
RCR = 6.6

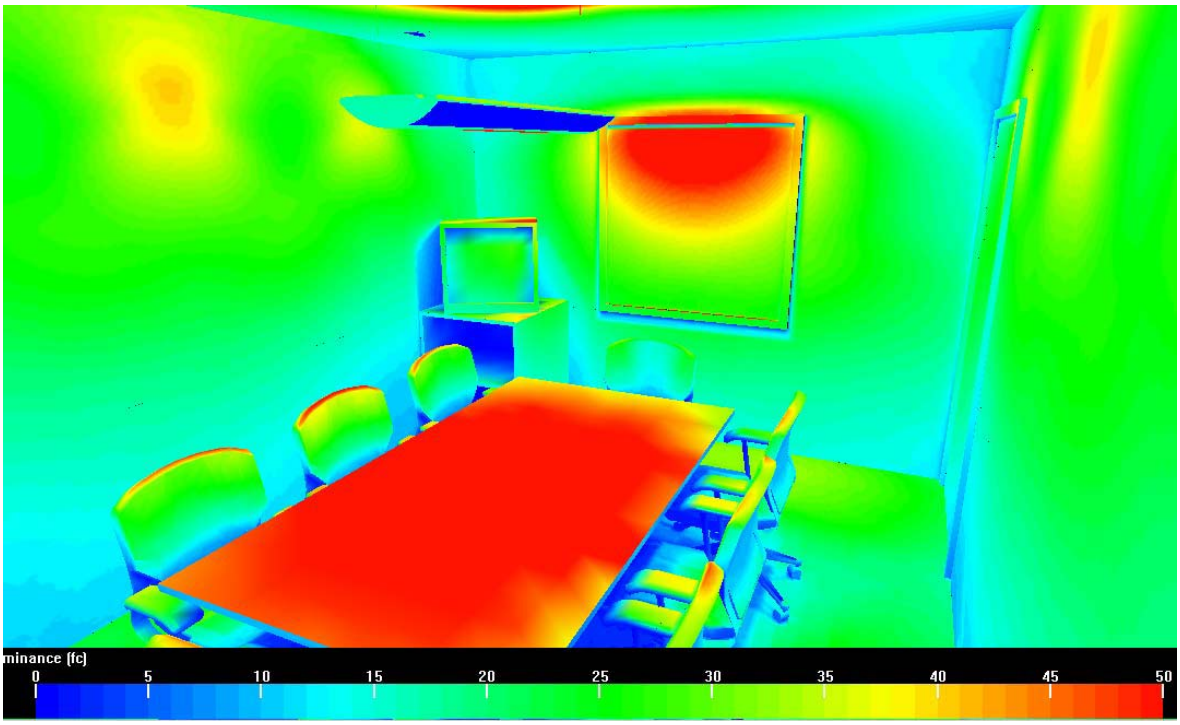
The following renderings show the appearance of the space, with it's bright surfaces to help the room feel larger. The lighting system provides a comfortable environment for face-to-face communication, reading, and audiovisual presentations.

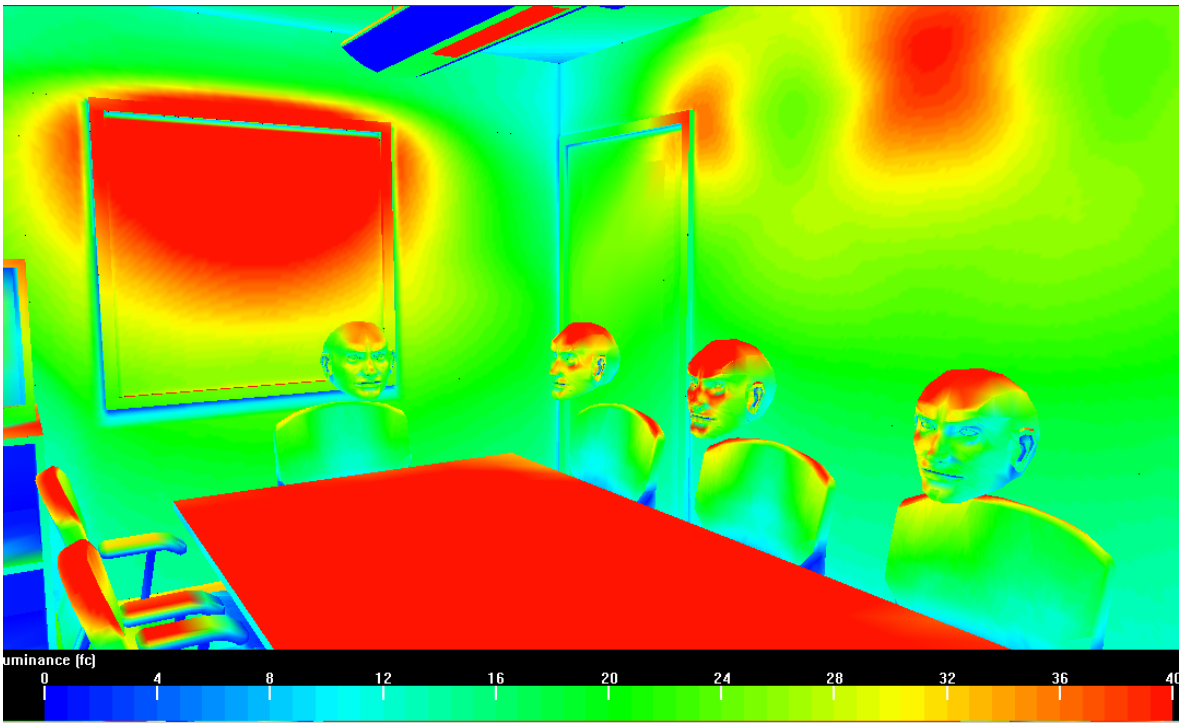
This rendering shows the view of the conference room looking towards the position of the camera and videoconferencing monitor as well as where the projector screen will be for audiovisual presentations.

This rendering shows the view of the conference room as seen from the camera. Faces were inserted into the room to examine the effectiveness of the lighting system for facial rendering. This view also shows how the slot fixture effectively illuminates the marker board.



As can be seen in the illuminance false color image, the necessary illumination levels have been achieved for the table (50 fc), marker board (50 fc), and faces (30 fc vertical). In addition, the surfaces throughout the room are very uniform, which is helpful for videoconferencing. Note that the first image has a maximum of 50 fc, while the second has a maximum of 40 fc to better depict the facial illuminances.





The luminance false color image below shows that faces are modeled well with some gradient, but falling within the 3:1 ratio. It is important that there is some variation within the allowable ratio so the faces have three dimensional character and do not appear flat under too severe uniformity. This image brings out facial feature by highlighting the top of the head, ears and nose, and slightly shadowing under the eyebrows, nose, lips, and chin.