

# **Bathroom moments – light and water as intimate experiences**

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## **ABSTRACT**

This paper describes the potential of light to change the perceived atmosphere of bathrooms. It describes how to create light effects in a spatial setting. A test bathroom was designed and built for the purpose of conveying light expressions and exuding fascination for combined sensorial experience of light and water. In it, a wide range of luminous environments can be created by orchestrating various embedded lighting solutions. For this purpose light was integrated in furniture, bathroom elements such as the bathtub and architectural elements such as walls. The design process followed was characterized by a user-centered approach. Future consumers have therein a prominent role to play, especially during the analysis and evaluation phase. The relationship between visual ambience, key light qualities and perceived atmosphere was studied in the bathroom that was built.

## **INTRODUCTION**

Light and water are two media that play fundamental roles in human existence. They are also two media that are very basic in our daily lives and together can create fascinating expressions. The combination of water and light can strengthen the experience of both media beyond their individual potentials. The bathroom is the one place in our homes where we can take advantage of this combination. The bathroom at present belongs to a group of everyday spaces that are not recognized as being worthy of lighting design. One light point in the middle of the ceiling (where the electric supply is) and another near the mirror: this description probably fits a large number of bathrooms today. The presence of lighting is expected in the bathroom, but its effect on the environment's atmosphere is not recognized. The role of light in those spaces might be compared to the role of music in movies. It is there, but we do not realize how much it contributes to setting the atmosphere, unlocking emotions from their subliminal position. Our explorations focused on what is visually perceived and how luminous environments can be shaped to enhance atmospheres. If there is light present in a space or architectural environment, we can have a visual sensation of this scene with our eyes. Lighting thus affects how the physical scene with its objects and surfaces appears to us humans. The luminous environment is transformed into the retinal image which is the stimulus for the visual process that provides information to make possible the perceptual process of recognizing objects and surfaces

which form the visual basis for the perceived environment (Cuttle, 2003). Lighting is clearly a part of the physical environment and lighting conditions such as illuminance and the correlated color temperature of the lighting have been shown to change people's mood (McCloughan, Aspinall, Webb, 2000). Illuminance and correlated color temperature are terms used by lighting specialists. A user perceives them as follows: Different illuminances on a surface give different brightness impressions and a different correlated color temperature determines whether a perceived lit surface generates a cooler or warmer impression.

It is thought that lighting effects can be orchestrated to create luminous environments that are meaningful and relevant to people. They could help people to relax and withdraw into a world they have created themselves. They could help to transform a space so as to project a certain mood. They could provide a mode of self-expression. They could help to show off, e.g. by conveying luxury. It is believed that people are looking out for solutions that increasingly satisfy emotional needs on top of the primary functional ones.

With the aim of making light's role and potential in a bathroom setting tangible and of studying user perceptions in a realistic setting, a test bathroom was built.

## **DESIGN FRAMEWORK AND APPROACH**

For the design process light is thought of as a tangible building material for shaping space and establishing different luminous environments. Light does not have physical substance; nevertheless, it is able to modify the physical environment. What we visually perceive is influenced by the luminous environment that is present. Different lighting can alter impressions of surfaces, materials, shapes and forms. Lighting thus provides a possibility for instantly modifying the expression of a spatial setting. In the abstract model the physical room boundaries form a shell onto which certain meanings can be loaded. The design challenges derived from this are: to create a physical space with integrated lighting and in that physical space to create luminous environments that evoke emotions.

The design process followed 3 phases. These phases are laid down in a Philips Design Research paper: Understanding people in new ways (Bueno, Rameckers, 2003). The approach is an example of user-centered design:

- I. A research and analysis phase to understand user and space. This focuses on data gathering and understanding values and needs. Researchers and designers work together to collect information in the context of everyday life. Potential users are involved for gathering real-life data. This data is analyzed and the core values and needs, including the relationships between them, are identified.
- II. The translation and creation phase. Implicit qualities of light are transformed into explicit ones by formulating spatial and luminous concepts. Designers and researchers translate values and needs into solutions. At this stage they should not focus on product requirements or needs in isolation, but constantly keep in mind the context in which the values and needs are grounded. Only in this way is it possible

to understand the real meaning of values and hence the real meaning of solutions that will improve the quality of people's lives.

- III. The testing phase to evaluate the hypotheses constructed. Researchers and designers test the solution on a selected group of participants and observe their response.

## **PHASE I: UNDERSTANDING USER AND SPACE**

Today's expectations about lighting in the bathroom are focused on functional aspects. The purpose of light is so that users can perform typical bathroom activities easily and move safely through the room. As an example of such functional requirements, let us consider a user in front of the mirror putting on her make-up. What is needed for such an activity is obviously good illumination of the face. To provide a clear visual impression, light should cause almost no shadows and be free from irritating glare. That light could also have a pleasing character is seen as a bonus. Also, the lighting installation has to meet stringent practical bathroom requirements. It has to be hygienic and easy to maintain. The bathroom is often damp and therefore requires more attention to safety (e.g. with respect to being slippery, electricity) than other rooms. Water and damp in the environment actually greatly limit the possibilities for decoration. With the combination of light with water and damp the opposite is the case. It can create many fascinating visual effects. Lighting is seen as an opportunity to improve the atmosphere under these and other conditions.

By atmosphere we mean the experience of our surroundings in relation to ourselves. We experience our surroundings through the perception of external elements and through our internal sensations and moods. Furniture, music, lighting, color, fragrance and temperature are examples of the external elements that people can perceive as making up an atmosphere. People's (internal) perception and appreciation of atmospheres are influenced by their cultural background, the specific activity domain (e.g. home, workplace, etc.) and their individual needs and desires related to their activities, physical and emotional state, and mindset.

To deepen our understanding of needs in the bathroom, 24 consumers, all Dutch and between 20 and 60, were asked about their ideal bathroom. Consumer response pictured the ideal bathroom as:

- Relaxation room – creates a safe and tranquil haven in which one can withdraw from the hectic world.
- Wellness room – a room where one can spend quality time and balance body and mind.
- Fun room – a place where one can enjoy bathing and grooming oneself in a spontaneous and pleasant way.
- Unique room – its personality is refined, sophisticated, exclusive, unique, and/or exotic.

Individuals have their own preferences about the ideal bathroom, which might change from time to time. What consumers mentioned is that seasons and weather affect their wishes and desires. Ideally all individuals that share one bathroom e.g. a family, can be satisfied by personalized settings. These depend on the person and his or her needs, wishes and dreams and on the activity involved. The solution worked out and created as a test bathroom gives consumers the benefit of changing the atmosphere instantly for various moments in the bathroom.

## PHASE II: DESIGNING THE TEST BATHROOM'S INTERIOR, LIGHTING AND LIGHT EXPRESSIONS

### DESIGNING THE INTERIOR AND LIGHTING OF THE TEST BATHROOM

One condition given for the design of the test bathroom is that users must be able to connect the spatial setting to their home environment. To ensure that this is the case and maximize lighting opportunities, lighting is designed embedded in walls and furniture. Having lighting objects hanging in the space or extending into it is avoided, as this can focus too much attention on the object rather than on the light expression. By light expression we mean articulations in light that support, manifest and embody the thought concept. The behavioral reactions can be attributed to the intentionally arranged lighting we refer to as light effects.

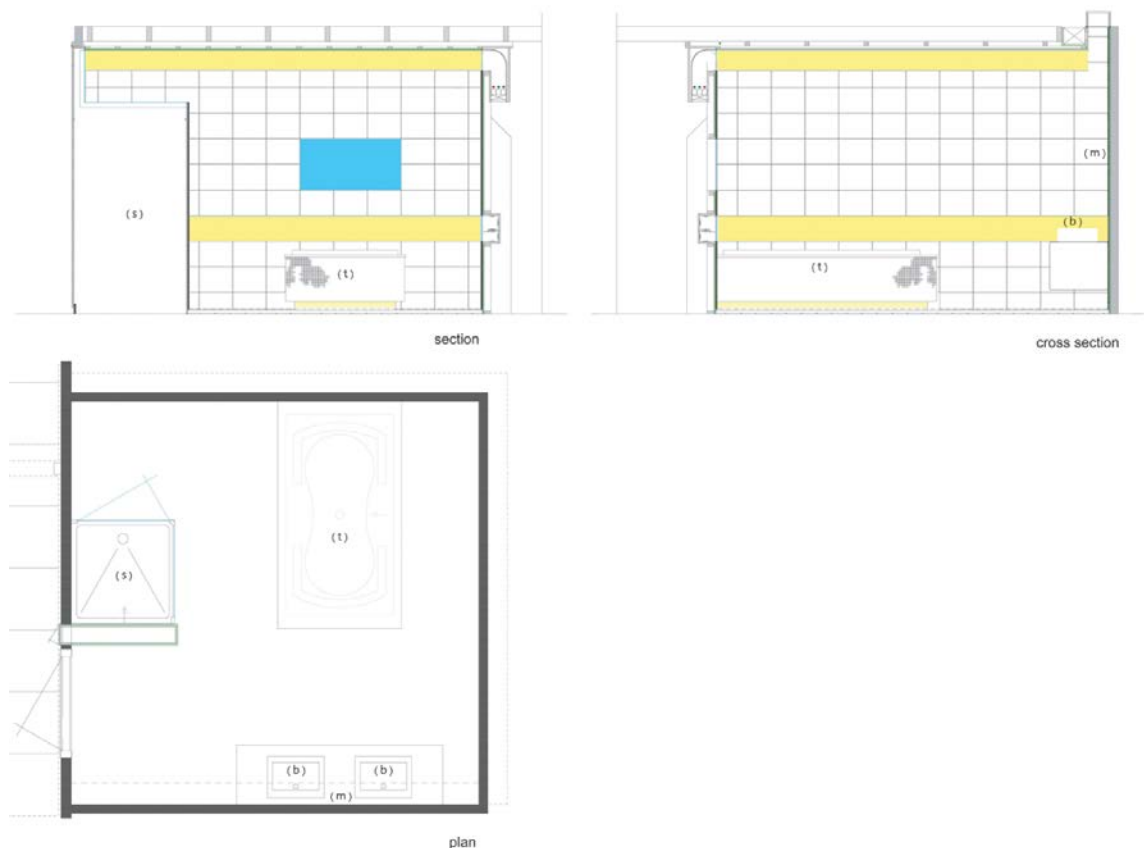
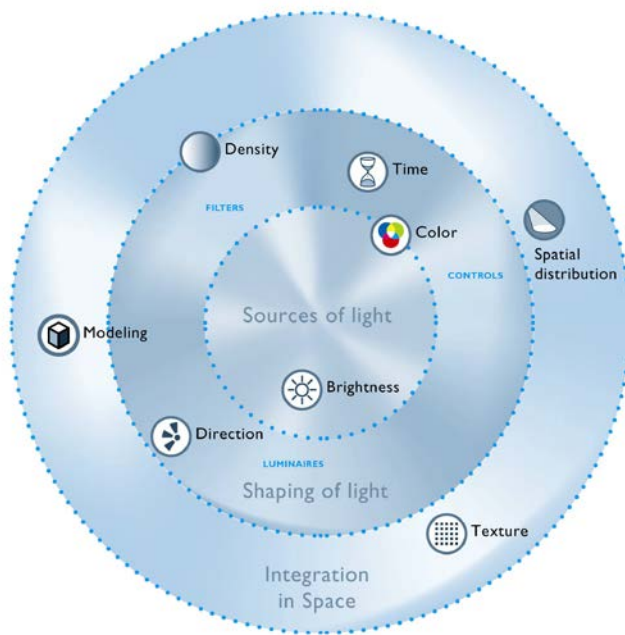


Figure 1: Plan and section of the test bathroom

The bathroom created is a square room of approx. 15.4 m<sup>2</sup> with a room height of 2.5 m. It is fully functional with 2 basins (b), a mirror (m), a shower (s) and a hydrotherapy bathtub (t) (Figure 1). Consumers evaluated the interior of the bathroom in daylight as being modern. To explore how to change the perceived atmospheres by means of light, lighting was embedded in such elements as walls, items of furniture, the bathtub and the shower doors. These are the ingredients for composing and creating a variety of luminous environments. When designing the lighting a whole set of parameters were considered, such as spectral composition, intensity and direction.



*Figure 2: Light expressions model*

For the sake of discussion a layered model of how light expressions are created was used (Figure 2 from Talk Atmosphere, a Philips internal publication). The diagram consists of three layers and can be read from the inside out or vice versa. This depends on whether you wish to start with the light expression or the light source. The 3 layers are: source of light, shaping of light and integration in space. Light qualities such as brightness, color, direction, spatial distribution, texture, density and their variation over time are mapped on the layers. The location within the layers tells us about the dominant influence.

In the following section two examples from the bathroom are given that illustrate the creation of light expressions. Example 1, the horizon element, is a horizontal band of light that spans two walls. Example 2 shows light points with color-changing functionality integrated in the bathtub. Table 1 contains a picture for visualizing the lighting expression and detailed descriptions based on the layered model, for both the horizon element and the light integrated in the bathtub. The examples demonstrate how to create a desired light

expression and which perceived light qualities they will correspond to. All qualities that can be influenced instantly to personalize the luminous environment are mentioned.



	Horizon element	Light integrated in bathtub
Light impression	 <p>Figure 3: Horizon lighting</p>	 <p>Figure 4: Bathtub lighting</p>
Light description	<p>Horizon composed of 3 areas: an upper and a lower one, with a horizon line between. The upper and lower areas can independently be in a variety of colors from saturated to shades of white, including enhanced shades of yellowish tones. A small overlap of light from the upper and lower chambers creates the horizon line.</p> <p>By lighting one chamber or both with the same or different color combinations, various light patterns (texture) can be generated.</p>	<p>Illuminating the water and tub in shades of white or colors. Water depth impressions and water reflection patterns can be created.</p> <p>The effects comprise: on the lowest installed level, background lighting via the tub and on mid level, efficient coloring of the water volume and density (spatial distribution). The upper level excels in creating reflections of the water surface (dynamic texture).</p>
Integration in space:	<p>Horizontal backlit strip of frosted glass at a height of 66 cm to 91 cm. The strip is placed along two walls. The light is distributed diffusely from the backlit surface towards the room.</p>	<p>Lighting is embedded in the bathtub. Light points are arranged on three different levels of height within the tub. The role of the bathtub and water is to shape the light.</p>
Shaping light:	<p>Light is mixed in 2 separate chambers, then diffused and emitted to the room.</p>	<p>Water shapes light, diffuses it; ripples on the surface create reflections in the tub and on the ceiling and walls. Water movement transforms static light into dynamic impressions. (Reversible light fades can create moving water impressions).</p>
Sources of light:	<p>Light Emitting Diodes (LEDs) in red, green, blue and amber.</p>	<p>12 light points, each equipped with red, green and blue Light Emitting Diode (LED) sources.</p>
Light qualities that can be instantly influenced for personalization	<ul style="list-style-type: none"> <li>- Brightness</li> <li>- Color or color temperature (for white light)</li> <li>- Texture</li> </ul>	<ul style="list-style-type: none"> <li>- Brightness</li> <li>- Color or color temperature (for white light)</li> <li>- Density (impression that light has substance)</li> <li>- Spatial distribution</li> </ul>

Table 1: Light expressions of the horizon element and the bathtub

## DESIGNING MEANINGFUL LUMINOUS ENVIRONMENTS FOR THE TEST BATHROOM

Spending time in the bathroom is typically connected to activities related to the body. It is the room where one grooms the body and, indirectly, the mind. This makes it an intimate place with a high need for privacy. Being the only place in the house which is often locked, besides the toilet, the bathroom is an isolated place where one can literally withdraw from the world, alone or with close family. The bathroom is privileged as a private space where people can express their moods and emotions. There is no social control to inhibit this.

The design challenge concerning luminous environments is to encapsulate meaning or find articulation for certain meanings. The different uses of water as a clear stream at the basin, as falling “rain” in the shower and as a surrounding element in the bath were taken as basic sources of inspiration. Light complements and enriches these expressions. Light could also provide alternatives for some of the existing expressions, e.g. through changes in light the water could virtually move, avoiding the noise that water-jet engines produce. The composed luminous environments form hypotheses that can be demonstrated and communicated to customers. These are extended and refined in iterative loops.

This series of photographs (Figure 5) from the bathroom that was created illustrates (as well as photography can represent a spatial setting) the potential to change the atmosphere in the bath by the use of light.



*Figure 5: Three light situations from the test bathroom that was constructed*

The left-hand picture in Figure 5 shows a situation corresponding to general expectations today. Some diffused daylight from a window and if required some supplementary illumination in the space. No light in the bathtub. In the middle and right-hand pictures in Figure 5 we see situations with a lit horizon element and light integrated in the bathtub. Experiencing the impact of light during consumer sessions indicated that there is a learning effect in discovering the impact of light and what it can do for both atmosphere and mood. Switching back to the normal light mode evoked reactions among all consumers such as: dull, boring, functional, practical.

The ultimate aim is that people will be able to instantly adjust the atmosphere in the bathroom. To guide customers through the many possibilities that would result from influencing single parameters (e.g. dimming one source), sets of understandable and



relevant choices were prepared. On the basis of these sets, customers can easily create light expressions that reflect their actual physical and emotional states and project the states desired. Light becomes an expression, a reflection of identity and personality. Bathing as an activity and the bathroom as a space form conditions where feelings can be shown without restriction.

### PHASE III: EVALUATION OF TEST BATHROOM LIGHTING CONCEPT

The evaluation of the influence of light on the perception of the test bathroom was performed during individual interviews in the test bathroom. Interviews lasted 2 hours and during them participants stood in the shower cabin and filled the bathtub with water, but took neither a shower nor a bath. 8 women and 4 men, all Dutch and aged between 30 and 60, participated in the study. For the evaluation the different areas were demonstrated in a variety of light settings. From the evaluation sessions it was evident that when taking a bath people feel that creating an ambience is very important. By ambience is meant the surrounding conditions that contribute to the perceived atmosphere of a specific place. Of the activities that are performed in the bathroom, taking a bath is recognized as the one during which people are most open to mood influences.

For the bathing activity 3 moments were sketched that link specific human need states with bathing expressions, the atmosphere and lighting qualities that are present in space. This was done by means of a photograph taken in the test bathroom, quotes from consumers and descriptions of key light qualities, perceived atmosphere and associated bathing expressions. Bathing expressions and atmosphere descriptions were derived from consumer evaluation; light qualities are characterizations carried out by a pool of expert lighting designers summarizing the lighting conditions that demonstrated the atmospheres mentioned.



Moments to withdraw from the outside world. Me-time

"I put everything in a place where I can easily reach it: tea, cookies, magazines. I lock the door, and then it's time to rest and relax."

"After work I literally wash off the stress and the chaos of my job. I want to leave it all behind and connect to myself again."

*Figure 6: Me-time*

- Light qualities: Low to moderate brightness; centered light that surrounds you and blends out whatever else is there (spatial distribution); often warm tones preferred.
- Atmosphere: Introvert, introspective; calm, quiet; relaxed.
- Bathing expressions: Taking a hot bath by yourself; just staring while taking a bath; locking the door; turning off the phone; reflecting on the day while in the bath.





Moments to share sensations with people close to you  
 “My husband and I often take a bath together. It’s wonderful, we take magazines, but we also talk a lot. Finally we have time for each other, without the children or anyone.”  
 “I often take a bath with my child. It’s a moment of being very close to your children.”

*Figure 7: Sensation*

- Light qualities: Favorite colors and color combinations; harmonic, balanced spatial arrangement; good modeling to ensure natural facial expressions; some sparkle can make it glamorous.
- Atmosphere: Intimate, harmonious; playful, happy; romantic, oriented towards the other; calm.
- Bathing expressions: Taking a bath with partner; discussing with partner while in the bathroom/bath; bathing with children;



Moments of pleasure and well-being  
 “I only take a bath once every 2 months or so. Then it feels like a special occasion and I really indulge myself. I shave my legs, use my favorite lotions, I feel reborn afterwards.”

*Figure 8: Pleasure*

- Light qualities: Directional light that reflects on the water surface, creating highlights; rather bright and sunny impression; active color tones preferred.
- Atmosphere: Open to the world, harmonious; sunny, warm; pleasurable, playful.
- Bathing expressions: Fussing with masks/shaving/oils in bath; drinking a glass of wine, reading a book, listening to music.

The following conclusions are drawn from consumer evaluations:

- 1) Lighting is able to add a completely new dimension to the bathroom experience. Light makes it possible to transform space: the originally functional bathroom becomes a totally different space.
- 2) Light has a very strong and positive impact on creating atmosphere in the bathroom and is also able to influence one's mood/state of mind. It helps to create a certain mood.

- 3) The actual experience of what light can do to the atmosphere and your mood is extremely important. This is especially true because (on a conscious level) the bathroom is still perceived as relatively practical and functional, and also because light (as it is currently perceived) is still primarily functional.
- 4) There is a playful aspect in preparing your own settings and experimenting with light. Dynamic settings (sequences) arouse curiosity and were very well received.

## **DISCUSSION**

People like to create an atmosphere that suits them and what they are doing or feeling. There has always been a need for appropriate atmospheres. People have always created suitable environments or 'décors' to support distinct activities. Theatre and stage experts, architects, interior designers, and light designers have developed expertise and knowledge in the creation of ambiances.

Many different components combine to constitute what is perceived as atmosphere. Light influences visual appearance. Lighting has to be considered in conjunction with aspects of other senses in a holistic, integrated manner. The bathroom is an example of sensorial play. The bathroom is a place for cleaning and grooming. Water is not only used for cleaning but also for pleasure. Light just reaches out for that transposition. Combined effects of light and water have in the past managed to create consciousness among consumers. An aesthetic experience can influence the level of consciousness of what we see. What humans know about an environment is both more than external reality, in that they perceive with prior knowledge and expectations, and less than external reality, in that they record only a portion of the entire visual frame yet recall it as complete and continuous (De Young, 1999). The creation of luminous environments that convey happiness, joy, tranquility and so on is partly artistic creation. In visual art the artist can be portrayed as a kind of experimental psychologist who probes the visual system with pictures (Latto, 1995). On the palette of a painter you find various pigments. The palette of the designer, artist and amateur enthusiast working with light is made up of the generic qualities of light: brightness, color and direction.

The empirical studies described in this paper considered only visual effects. Since we know that IR and UV radiation also have an impact on our bodies and we are rapidly learning about our body's biological response to light, these could be areas that might push research into new territories to further our understanding of human factors.

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