WORKPLACE PLANNING AND DESIGN STANDARDS IN SOUTH AFRICA

Office Planning and Evaluation Standards for South Africa

A developmental study on recommended minimum standards for office environments
to maximize productivity and create a healthy workspace environment for the employee

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Abstract

The importance of workplace environmental conditions in improving and sustaining the productivity of end-users in offices was recognised. Developments in offices to support diversity in work style and work processes in offices have become a field of study in more advanced countries in Europe and Japan. This lead to the investigation of the standards of offices in South Africa, a fast developing country. The workspace influenced the level of success brought by the individual to the company. Facility managers realised the importance of end-user optimum productivity and the influence of end-user satisfaction in a competitive marked worldwide.

What are the standards of South African offices, and what are the guidelines used to plan the ideal workspace?

A study of the methods of the developed countries like Japan's New Office Promotion Association (NOPA), and the Netherlands' Centre for People and Buildings (CfPB) was used as a case study to provide guidelines as to what is important when planning a workspace, to end in the optimal physical resource. A comparison of these standards with the National Building Regulations (NBR) and its companion, the South African National Standards (SANS 10400), lead to the conclusion that the regulations set to plan offices was underdeveloped and therefore opened a field of research to develop a set of proposed guidelines. The standards of NOPA and CfPB were compared with the available standards from SANS 10400 and NBR to create a document with recommended minimum standards for workplace environments in South Africa.

By using these recommended minimum standards as an evaluation instrument, a nationwide company, Telkom, was approached for participation on the bases of case study research to determine the quality of office environments in South Africa compared to the set standards concluded from other countries. The company was evaluated by using the Post Occupation Evaluation (POE) method introduced by Wolfgang Preiser (Preiser,1988:4). Performance evaluative research in workplace environments is a form of evidence-based

research which aims to assess the functionality and serviceability levels of a specific facility on the basis of its ability to support and facilitate diverse work styles, as well as the user-needs and -requirements associated with it. The evaluation process was conducted according to the principles of an investigative-level Post-Occupancy Evaluation (POE) study, and aimed to assess the impact of stimuli from the workplace environment on the ability of users to optimally perform and accomplish work-related tasks.

Conclusions drawn from this study indicated that users realise the impact that the overall work environment has on their ability to work productively. In this regard problems related to limited or inconvenient access to office resources, and problems related to poor thermal comfort (specifically with regards to the penetration of direct sunlight and lack of control over air-conditioning) occurred with a similar frequency.

The results from this study were compared to the current regulatory standards in an attempt to create updated minimum standards.

Since workplace environmental performance evaluation is still a new approach to the study of the built environment in South Africa, it is expected that data obtained through this study will contribute towards the founding of a database on workplace office environment standards in South Africa. By building up a database of this nature, it would be possible to enable comparative evaluations with international examples from researchers participating in cross-cultural evaluations of workplace environments as part of research initiatives. Most importantly, data and results generated by this study will enable valuable feedback to participants in the study in terms of facility performance, employee satisfaction, and factors that inhibit/enhance productivity.

Keywords: Building Performance Evaluation (BPE), Post-Occupancy Evaluation (POE), Facility Management (FM), recommended minimum standards, functionality, serviceability, productivity, workspaces.

Abstrak

Sedert die belangrikheid van werksplek-omgewingstoestande in die verbetering en volhoubaarheid van produktiwiteit van eindgebruikers in kantore opgemerk is, het beplanning ter ondersteuning van diverse werkstyle en werksprosesse, as ‘n studieveld, in meer ontwikkelde lande soos Europa en Japan uitgebrei. Hierdie gewaarwording het tot die ondersoek na beskikbare standaarde vir kantore in Suid Afrika, ‘n land wat vinnig ontwikkel, gelei. Die werksplek-omgewing beïnvloed die mate van sukses wat deur die individu na die maatskappy gebring word. Fasiliteitsbestuurders het ook bewus geraak van die belangrikheid van die eindgebruiker se optimale produktiwiteit,en die invloed wat die eindgebruker se tevredenheid in die kompeterende mark wêreldwyd het.

Wat is die standaarde vir Suid-Afrikaanse kantore, en wat is die riglyne vir die beplanning van die ideale werksplek?

‘n Studie van die metodes van ontwikkelde lande soos Japan (Japan’s New Office Promotion Association, NOPA), en die Nederlandse “Centre for People and Buildings” (CfPB) is gebruik as presedente om die riglyne te bepaal van wat belangrik is in die beplanning van ‘n werksplek sodat dit as ‘n optimale fisiese hulpbron kan dien. ‘n Vergelyking hiervan met die Nasionale Bouregulasies (NBR) en die Suid-Afrikaanse Nasionale Standaarde (SANS 10400) het uitgewys dat die bestaande regulasies vir die beplanning van kantore onvoldoende is en dat die veld dus braak lê vir navorsing om ‘n stel riglyne te ontwikkel. Die standaarde van NOPA en CfPB is vergelyk en daarna vervleg met die beskikbare standaarde vanaf die SANS 10400 en die NBR om ‘n document met voorgestelde minimum standaarde vir werksplek-omgewings in Suid-Afrika op te stel.

Deur hierdie voorgestelde minimum standaarde as ‘n evaluasie-instrument te gebruik, is ‘n nasionale maatskappy, Telkom, genader om te deel in die basis van presedentstudies om die kwaliteit van kantooromgewings in Suid-Afrika te bepaal, in vergelyking met die daargestelde standaarde van die ander lande. Die maatskapy is geëvalueer deur middel van die Post-Okkupasie Evaluasiemetode soos bekendgestel

deur Wolfgang Preiser. “Performance evaluative research” in die werksplek-omgewing is ‘n vorm van bewysgebaseerde navorsing wat poog om die funksionaliteit en diensbaarheidsvlakke van ‘n spesifieke fasiliteit te assesseer, gegrond op sy vermoë om diverse werkstyle en die meedaande gebruikersbenodighede en vereistes te ondersteun.

Die evaluasieproses is uitgevoer volgens die riglyne van ‘n ondersoekende vlak Post-Okkupasie Evaluasie (POE) studie, en is daarop gemik om die invloed van die stumili vanaf die werksplek-omgewing op die vermoëns van die verbruikers om optimal te presteer en take te voltooi, te ondersoek.

Gevolgtrekkings na aanleidng van die studie dui daarop dat eindgebruikers bewus is van die impak wat die werksomgewing op hul vermoë om produktief te funksioneer het. In die verband is probleme as gevolg van beperkte of ongemaklike toegang tot kantoor hulpbronne, en probleme as gevolg van swak gebouklimaat (spesifiek penetrasie van direkte sonlig en min tot geen beheer oor lugversorging) geïdentifiseer.

Die uitslae van die studie is vergelyk met die huidige regulerende standaarde in ‘n poging om ‘n stel opgegradeerde minimum staandaarde te skep.

Omdat werksplek-omgewingsprestasie-evaluasie steeds ‘n nuwe benadering tot die bestudering van die bou-omgewing in Suid-Afrika is, word daar verwag dat die data van hierdie die studie sal bydra tot ‘n databasis vir werksplek-omgewingstandaarde in Suid-Afrika. Deur so ‘n databasis op te bou, word dit moontlik om vergelykende studies vanaf internasionale voorbeelde van navorsers wat deelneem aan kruis-kulturele evaluasies, uit te voer. Meer belangrik nog sal die data en uitslae van hierdie studie waardevolle terugvoer aan die deelnemers van die studie verskaf in terme van fasiliteitsprestasie, werknemertevredenheid, en faktore wat produktiwiteit inhibeer/bevorder.

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List of terminology

Building Performance Evaluation (BPE):	Research and understanding the interrelationships between people and the built environment with which they interact (Le Roux et al, 2005).
Center for People and Buildings (CfPB):	The Center for People and Buildings works on the growth of knowledge about people, work and work environment. They focus on the promotion of research, product development and the transfer of knowledge in this field (http://www.cfpb.nl).
Cell:	Cell offices accommodate individual concentrated work with little interaction. Highly autonomous people occupy them in an intermittent, irregular pattern with extended working days – and often work elsewhere some of the time (possibly at home, at a client's office or on the road). These offices recall the monks' cloister or the venerable, highly cellular offices of the Inns of Court of London. (Duffy, 1997:62)
Club:	Club organisations are for knowledge work, i.e. for office work that transcends data-handling because it can only be done through exercising considerable judgement and intelligence. Typically work in such organisations is both highly autonomous and highly interactive. The term club, because one of the

	nearest models to the new transactional office, despite it's unfortunate and outmoded overtones, is the old-fashioned gentleman's club (Duffy, 1997:65)
Den:	Den offices are associated with group work, typically highly interactive but not necessarily autonomous. Den spaces are designed for group working and often provide a range with several simple settings, usually arranged in open-plan office or in group rooms. The term den is used because these are busy and interactive places where it is easy to work informally in groups (Duffy, 1997:64).
Hive:	Hives are characterised by individual, routine-process work with low levels of interaction and low autonomy. Such offices can be compared to beehives occupied by busy worker bees (Duffy, 1997:62).
New Office Promotion Association (NOPA):	Established in June 1987 as a core organisation for the promotion of new offices in Japan. The business objectives of NOPA focus on conducting studies and research on issues related to the comfort and functioning of the office as a place that support activities for the intellectual production, gathering, and provision of relevant information and support (Le Roux, 2002:77).

Office:	A particular physical entity housing the organisation and its core activities (Duffy, 1997).
OHS Act:	Occupational Health and Safety Act
Post-Occupancy Evaluation (POE):	Phase in the building process that follows the sequence of planning, programming, design, construction, and occupancy of a building (Preiser et al., 1998).
Telkom NBSC:	Telkom National Business Solution Centre.
Telkom RHO:	Telkom Regional Head Office
Workplace:	Any location that is being appropriate for work. A generalised view of overall office planning and design methodologies and appropriation of location (Le roux, 2002:7).
Workspace:	Individual settings, desks, or work surfaces within the workplace (Le Roux, 2002:7).

Chapter 1

Introduction

Fig. 1.1: Conventional office space: corridor feeds rooms on the side.

Organisations spend millions of rands on the upgrading of physical facilities, and even more on their employees – but what is the guideline to ensure the success of the upgrade? How is this money to be spent? (Kraemer, et al, 1977:70)

With the development of offices as quality environments that result in end-user satisfaction to enhance productivity as well as assist organisations in attaining their objectives, research on improving the office environment has become an important part of facility management. Although they initiate the process and inform the planners of their needs, the planner needs to be made aware of the relationship between people and buildings. End-users spend many hours in this environment, and that the work environment has a direct influence on the productivity level of the organisation.

Countries such as Japan and the Netherlands have developed this field with great success and provide an example of how the relationship between people and their built environments – in this case the workplace environment – can be managed.

In Japan, the New Office Promotion Association (NOPA) and Japan Facility Management Association (JFMA) recognised the advantages of proper facility management. The standards and procedures subsequently developed for the creation of new office environments resulted in productivity-enhancing, and more user friendly workplace environments. Above mentioned associations realise their objectives by:

- study and research activities training and education, liaison with overseas organisations; and
- public relations activities.

A similar organisation, Centre for People and Buildings (CfPB) situated in the Netherlands was established in 2001 as a result of collaboration between:

- The Dutch Government Buildings Agency;
- Delft University of Technology; and
- Dutch Inland Revenue.

The main objective is to address the need for evidence-based reasoning in Facility Management (FM). They specifically focus on the creation and sharing of knowledge about the relationship between people, work, and the workplace environment. They contribute to the industry through:

- Creating objective datasets, instead of opinions;
- Creating platforms for discussion, design and management based on facts;
- Benchmarking for comparison;
- Cross case analysis for understanding patterns; and
- People in the organisations contribute and learn

The CfPB focuses on the problem by understanding the issue and improving end user involvement through action research. The Centre's methods include observations, questionnaires, plan analysis, etc.

Although the collection of data and its contribution to workplace environmental conditions in the South African context remain the primary goal of this study, this initial exposure to concepts of Building Performance Evaluation (BPE) is indicative of how studies related to the reciprocal relationships between people and the built environment – generally referred to as person-environment studies – can be adopted into the teaching curricula of architectural design and other related subjects.

The conclusions and reflections arising from this study serve as a starting point regarding workplace standards and performance of offices in South Africa, and are not the final word on the procedures for assuring optimal user wellbeing, satisfaction and (most importantly) the accelerated achievement of business objectives. Success in this regard can only be attained through the continued studying and development of information to improve facilities with a view to creating an optimal workplace environment for users.

The need for evidence-based decision making for optimising the use of existing physical resources and the prioritising on proposed new development in office facilities in South Africa was recognised. Due to the functional and spatial requirements of these facilities, and the costs associated therewith, the need for informed decision-making is emphasized. However, the lack of sufficient research in this field in South Africa makes this study an important first step towards the formulation of a database on work performance characteristics in South Africa.

In South Africa the creation of workplace environments that focuses on the employee is a new field of study. Due to the fast-growing need for expertise in this field, this study will aim to provide a set of minimum guidelines that will support the facility manager in making informed decisions when planning and upgrading offices, especially open-plan offices. The ideal will be to have the optimum level of productivity, but due to the generic outline of this study, the purpose is to set recommended minimum standards that will be attainable for facility managers and other people involved in the management of successful workplace environments.

"The chronology and the geography of newer kinds of office work are being redrawn as IT allows more and more people to control, and indeed redesign, the ways in which they manage their energy and intelligence, shape their working days and reconfigure the connections between home, work and leisure" (Clements-Croome, 2000: 323).

As the business industry developed, offices needed to evolve from a conventional corridor with rooms on the

Fig. 1.2: Supportive workplace environment

Fig.1.3. Johannesburg skyline. Retrieved 11 December 2007 from the World Wide Web: http://gis.tshwane.gov.za/website/Tshwane internet/viewer.htm

side (fig. 1.1), divided into hierarchal spaces to a supportive workplace environment (fig.1.2). Such offices should support individuality in work method end work style, encourage communication and improve productivity, while also supporting the organization's needs by being economically efficient.

What does the term *supportive workplace environment* imply? Total building performance should include both the human performer's needs, as well as the organisation's needs. This could be discussed as follows:

- human performer's needs: - psychological
  - sociological
  - physiological
- organisation's needs: -economic

It is thus an environment that supports individuality, encourages communication and improves productivity, while also supporting the organisational needs by being economically efficient.

1.1 Human Performance Needs

"The qualities of the environment affect human performance inside a building and these should always be given high priority" (Clements-Croome, 2000: 34).

- Psychological influences
  - Career achievement – the ambition of a person and the career opportunities within the organisation all work together as motivation which in return affects the productivity of an employee.
  - Home/work interface – the place to which a person retires after work, and the circumstances of his/her personal life have a direct influence on the quality of the person's work, and therefore productivity.
  - Intrinsic to job – the value a person attaches to the job he/she is in, induces or

reduces productivity by the level of effort that that person is prepared to invest.

- Sociological influences
  - Relationship with others
  - Cultural integration
- Physiological influences:
  - Indoor climate – determined by the temperature, humidity and rate of air movement inside the building.
  - Workplace environment – the total office building, including context, parking, entrance, security, atmosphere and layout.
  - Workspace – the space that is available for each employee to achieve his/her daily goals and perform tasks on a daily basis.
  - Indoor Air Quality (IAQ) – determined by the O_2 / CO_2 ratio, dust levels, ventilation of air, and circulation of air within the building.

"Buildings filter the passage of light, air and sounds between the inside and outdoor environments" (Clements-Croome, 2000: 34). Of all the above, the building, or workplace environment allows the most control, therefore it is valuable for the organisation to invest in the specialising and idealising thereof.

"Use the physical environment to attract, retain, stimulate and inform the increasingly valuable people who work for them" (Clements-Croome, 2000: 329).

1.2 Organizational needs

- Economic
  - Floor space – less floor space for more income. The in detailed consideration in the planning of the use of rented office space, results in effective use of all rented area. With less unused space, the money spent on

	Physiological needs	Psychological needs	Sociological needs
1. Spatial	Ergonomic comfort, disabled access, functional servicing	Habitability, beauty, calm, excitement, view	Way-finding, functional adjacencies
2. Thermal	No numbness, frostbite; no drowsiness, heat stroke	Healthy plants, sense of warmth, individual control	Flexibilities to dress with the custom
3. Air quality	Air purity; no lung problems, rashes, cancers	Healthy plants, not closed in, not stuffy; no synthetics	No irritation from neighbours, smoke, smells
4. Acoustics	No hearing damage, music enjoyment, speech clarity	Quiet, soothing; activity, excitement, 'alive'	Privacy, communication
5. Visual	No glare. Good task illumination, way-finding, no fatigue	Orientation, cheerfulness, calm intimate, spacious	Status of window, daylight office, 'sense of territory'
6. Building integrity	Fire safety, structure strength & stability; weather – tightness, no out gassing	Durability, sense of stability, image	Status/appearance, quality of construction, 'craftsmanship'
Performance criteria general to all human senses, in the integrated system			
	Physical comfort, health, safety, functional	Psychological comfort, mental health, psychological safety, aesthetics	Privacy, security, community, image/status

Fig. 1.4: Human performance needs and the supportive building (Clements-Croome, 2000:273)

workplace environments can be reduced. Therefore the floor area can be reduced to be used more effectively.

"*Managers who genuinely wish to change their organisation's culture have an immensely powerful tool available to them in the re-design of their office environment. The values that are essential in the development of new ways of doing business – egalitarianism, transparency, stimulus, creativity, lateral thinking, and accelerated responsiveness – all have very concrete equivalents in the powerful language of design"* (Clements-Croome, 2000: 325).

By designing and planning the workplace according to the needs of its users, the workplace becomes the environment within which to work smarter, not harder.

Time spend in the office is not equivalent to work done. Technology has changed work methods, that require interchangability and flexibility. By not adapting the workspace one can understand the effects it would have on productivity.

1.3 Research Question

The corporate world expanded and became readable as the top of hierarchy of buildings in the skylines of 20th century cities (fig.1.3). The office developed into a specialised space, influenced by technology, changes in work methods and the need for economic power and success. Technology and changes in work style, greater flexibility with regard to time, work method and workplace, and the competitive market made - the world a smaller place, and had a great influence on the conventional work culture.

"*The task of architecture is to make visible how the world touches us*". (Clements-Croome, 2000: 33)
The need to investigate the way in which offices are planned and designed, and thereby contribute to better and more supportive workplace environments, gaining increasing prominence and acceptance.

Except for general standards as per the South African National Building Regulations (NBR), no reference work currently exists on minimum workplace planning and design standards for the evaluation of the quality and standard of facilities in South Africa. Thus the question:

What are the minimum standards for office planning and evaluation in South Africa? To what information are these specialised spaces planned, and evaluated?

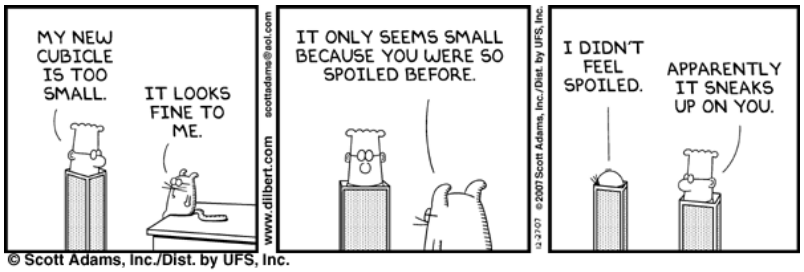


Fig. 1.5: Dilbert. Retrieved January 22, 2008 from the World Wide Web: http://www.dilbert.com

1.4 Research Philosophy

The conservative office (the general office with a linear layout, typically with two rows of enclosed offices on the sides and a main circulation corridor in the middle), with tight settings in the layout and office culture, has changed into a flexible space where the whole office environment – the conventional office as we know it – has been changed, as explained by Francis Duffy (1997:56).

The conventional office was designed to:

- Accommodate one person per workstation;
- Express divisions between hierarchical level, workspace and activities through physical boundaries to separate people and functions;
- Reinforce the hierarchy emphasising the difference in importance of staff members; and

- Accommodate no teamwork.

The new office represents:

- The economic importance of the effective use of time: office work is seen as a series of parallel processes where all levels of staff work together towards the same goal, which leads to an intensification in the use of space;
- A disregard for hierarchical and physical boundaries in order to expand communication between departments and enable specialists to solve complex problems more quickly;
- No hierarchies – what you can do is more important than who you are;
- Stripping the organisation back to the core activities by 'outsourcing' activities that are non-central;
- The importance of group activity, by encouraging interactive teamwork and making use of open-plan, only partially cellular, office layouts;
- Confidence in the creative use of information technology; and
- An increase in flexibility, which leads to an improvement in terms of the employee's autonomous decision-making ability regarding the time (in/out of office), place (in/out of the office, as well as different locations while in the office), and structure (work processes) of work performance and accomplishment.

This new work culture created the need for a change in the conventional office layout, which lead to open-plan offices that encourage the two main focuses of the new office: interaction (a quantifiable element, which leads to objective implementation and results) and autonomy (a non-quantifiable element, thus subjective reflection on implementation and results). The focus on interaction between workers has developed extensively since the value of communication between experts in different fields was noticed. Technology made interaction easy. It is now possible to communicate worldwide within seconds. Also in the office, space needs to be created for informal and formal meetings where different groups of people can have brainstorming sessions, and interact. *"The glue that holds the team together is constant communication,*

some of it planned and some spontaneous and unplanned" (Becker, 1990:70).

Autonomy, the degree of control, responsibility and discretion each office worker has over the content, method, location, and tools of the work process (Duffy, 1997:60), has also changed. According to literature sources the basic understanding is that, the more autonomy workers have, the more work satisfaction is gained, which leads to a better outcome. The increased autonomy, however also leads to a desire to exercise more control over each person's work environment, such as climate control and control of lighting. The key to successful office design is to understand the functioning of the specific office, and to create the different spaces to accommodate these conflicting needs. Based on almost two decades of consultation work in offices in the UK, Francis Duffy proposed the solution in the form of four office types: hives, cells, dens and clubs, with different functions for each (see fig.1.6).

"A contemporary organisation that wishes to change its culture – to abandon hierarchy, to encourage interaction, to stimulate creativity, to accelerate innovation, to break through previously impenetrable organisational silos – would be foolish to attempt such changes while persisting with an office environment that expresses, through inertia, exactly the opposite values" (Clements-Croome, 2000: 324).

The office functions as a reflection of the work style of the organisation and should therefore be planned accordingly. By using different spaces for the different functions, such as group activities and individual processes, the communication/interaction and autonomy of the individual is used to maximise productivity. *"…offices now identified as being for 'group processes' and 'concentrated study' will tend to converge into what has been called a 'transactional' office where, through the management of time and space, both interaction and autonomy will be maximised"* (Duffy, 1997:60). The office landscape can then be specifically planned according to this data. They are divided into four types (fig 1. 5):

- Hive: Individual processes - open individual workspaces, semi-enclosed individual workspaces
- Cell: Concentrated study - silent workspaces, enclosed workspaces

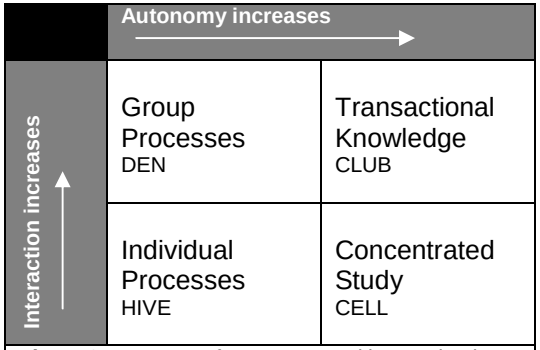


Fig. 1. 6: Increase of autonomy and interaction by office typologies (Duffy, 1997:61)

- Den: Group processes - team spaces, brainstorming spaces
- Club: Transactional knowledge - meeting spaces

Most offices use all of these office types, but in order to determine the ratio in which they are needed, to obtain maximum use of this work process and to determine the use of these offices, a performance evaluative research (PER) study must be conducted. Because every employee gets to work according to his/her own method, such a study will also be an objective reflection on work performance.

Aspects of workspace utilisation were also addressed by Becker (1990: 74), with specific reference to the provision of territorial (fixed-address) and non-territorial (free-address) workspace settings and staffing typologies. Accordingly, fixed-address workspace is classified as workspace that is occupied for more than 60% of the day, while free-address workspace is classified as workspace that is occupied for less than 60% of the day, making it available to more than one user. In this way, the same amount of office space can accommodate more users. The advantage of these offices is that the focus on performance and quality of work is shifted to the worker, who can now work according to his/her own method. The emphasis is on the work being done, not where or how it is done.

	Hive	Cell	Den	Club
Pattern of work	Work broken down into smallest components to be carried out by staff who are given precise instructions and little authority.	High-level work carried out by talented, independent individuals with more authority (isolated knowledge work).	Project or other group work of a straightforward kind, requiring different types of independent skills.	High-level work carried out by talented, independent individuals with more authority, who need to work both collaboratively and individually; work process constantly being redesigned.
Occupancy of space over time, capacity of sharing space over time	Conventional 9-5, tending towards shift work. Routine timetable, little or no interaction, and full-time occupancy of workspace offer little scope to share space, except for 24-hour shift work.	Increasingly looser and variable, more flexible, extended working days, depending on individual arrangements. Low occupancy of space creates opportunities for shared individual settings (enclosed or open).	Conventional 9-5, but becoming more varied by subgroup activities. Interactive staff, likely to spend time away from desks, creates an increasing opportunity for sharing space over time.	Complex and independent regarding what needs to be done and regarding individual arrangements, but high occupancy of use is expected over extended periods of time. Highly intermittent pattern of occupancy (teamwork) supports shared use of task settings.
Type of space layout	Open, ganged (4-6 pack), minimal partitions, maximal filing. Imposed basic space standards.	Cellular enclosed offices or individually used open workstations with high screening or partitions.	Group space or group rooms, medium filing, complex and continuous spaces incorporating meeting spaces and workspaces.	Diverse, complex and manipulable range of settings based on wide variety of tasks.
Use of IT	Simple/basic terminals or network computers.	Variety of individual computers on networks and popular use of laptops.	Computers and some shared specialised group equipment.	Variety of individual computers on networks and general use of laptops.

Fig 1. 7: Summarised chart for organisational types (Duffy, 1997:60)

1.5 Research instruments

Performance evaluative research (PER) studies can be conducted in different ways, and what matters is not how much information is retrieved, but the value of the information that is retrieved. Therefore each survey is structured according to the type and amount of information that needs to be gained for that specific study. This ranges from a very in-depth study where the full range of post occupation evaluation (POE) techniques are used, to where only a selection is grouped together to collect specific information.

Research focusing on open-plan office environments includes various techniques of data collection in the open-plan office. Studies known as Post Occupation Evaluation (POE), a type of PER, use specific techniques such as mapping in order to gather data pertaining to patterns of workspace (desk) utilisation, actual time spent in the office, and the nature of work-related communication and movement. Data obtained through these mappings enable facility managers, and other organisational management members, to better understand differences in the work styles of employees, as well as the specific spatial requirements associated with each work style. The different levels of POE surveys are as follows:

1.5.1 Indicative level:

- An informal walkthrough by the members involved in the research to briefly identify problems that would need attention during the investigative level survey and check accuracy of given plans and other information prior received.
- Formally select a group of people from the organisation to base the survey and observations on. This is a time- and cost-saving method to obtain an overall insight into the environment and usage.

1.5.2 Investigative level:

- A systematic, very accurate observation of the workspace while people are using it. The level of the research is determined by the time available and the level of information needed. The information gained from this is a sense of how people use the space – e.g. where people meet informally (at photocopiers or in corridors), when and for how long.
- Looking for traces of behaviour, such as how people communicate, by looking at how furniture is moved (how chairs face each other, etc.); writing and trash such as coffee cups show whether or not a space is being used.
- Temperature and humidity measures, access card readings to determine the in/out time of employees, motion sensors that indicate occupation of rooms, and the number and location of telephone calls.
- Human resources and accounting departments keep information on employees and salaries. This information can be used to determine employees' environmental satisfaction and turnover, which can be used to complete formal surveys and interviews.
- Information gained through the lodging of complaints in order to determine the time that elapsed from the lodging of the actual complaint to its resolution, the cost of resolving the problem, the cost of creating office space and the occupation of offices.
- Detailed analysis to determine the layout of offices, the distance between different departments and the access paths to the different areas.
- Informal or formal interviews, with a set of predetermined questions to obtain information directly from the user.
- Questionnaires, divided into categories with questions related to the information required from each category.

1.5.3 Diagnostic level:

- Analysing of gathered information
- Advising and recommendations regarding the conclusions made from the study

Performance-evaluative research in workplace environments in South Africa is new in terms of the study of the built environment. Although various studies have been undertaken on a wide range of topics related to the workplace environment, studies investigating the actual relationship between organisational culture and ways in which workplace environmental resources are made available and subsequently utilised by employees, have received very little – if any – attention. This is especially true in terms of research from a facility management perspective.

An investigation of offices in South Africa needs to be undertaken in order to determine a general standard before any recommendations can be made. Due to the fast-growing need for expertise in this field, this study will aim to provide a set of guidelines for the planning and upgrading of offices, especially open-plan administrative offices. After investigating and evaluating selected existing offices in the country, the purpose will be to determine the general standard and to set recommended minimum standards that will be accessible for facility managers and other people involved in the management of successful workplace environments. This information can be used as a tool for benchmarking and cross-cultural comparisons of workplace environmental performance. Examples of such recommended minimum planning and design standards already exist in most advanced countries in Europe, the U.S.A, Canada, and Japan (Le Roux et al, 2005:42).

Indications from the application of these recommended minimum standards are that real benefits are to be gained in terms of creating and managing healthy workplace environments. Due to the demand for optimum facility performance and staff productivity, it is deemed necessary to investigate and evaluate existing workplace standards in South Africa and, through a comparative approach, to develop similar guidelines for the improvement of the planning, design, evaluation, and management of workplace environments.

In order to test the validity and applicability of this body of international research in terms of the reciprocity, *the People-Environment Research Group* in the Department of Architecture, University of the Free State, has undertaken PER projects. The objective is to conduct similar studies in new and/or innovative office developments in South Africa. The current research directive thus forms part of the overall research interests and objectives of this group.

The advantages of this approach are twofold. Firstly, it allows for a more quantifiable means of providing adequate workspace that supports and enhances the productive accomplishment of work, and secondly, it creates an altogether more balanced work-life experience. The most recent development in this field of research is based on current and anticipated workstyle changes, which aim to formulate a predictive workplace Facility Management tool through which adequate office space can be procured in anticipation of future workspace needs (Le Roux et al, 2005: 42).

1.6 Research Aim

The aim of this study is to provide guidelines in the form of recommended minimum standards to assist facility managers and other users in informed decision making and planning process to provide optimum workspaces that support productivity. Most importantly, data and results generated by this study will enable valuable feedback to participants in the study in terms of facility performance, employee satisfaction, and factors that inhibit/enhance productivity.

Chapter 2

Research Objectives:

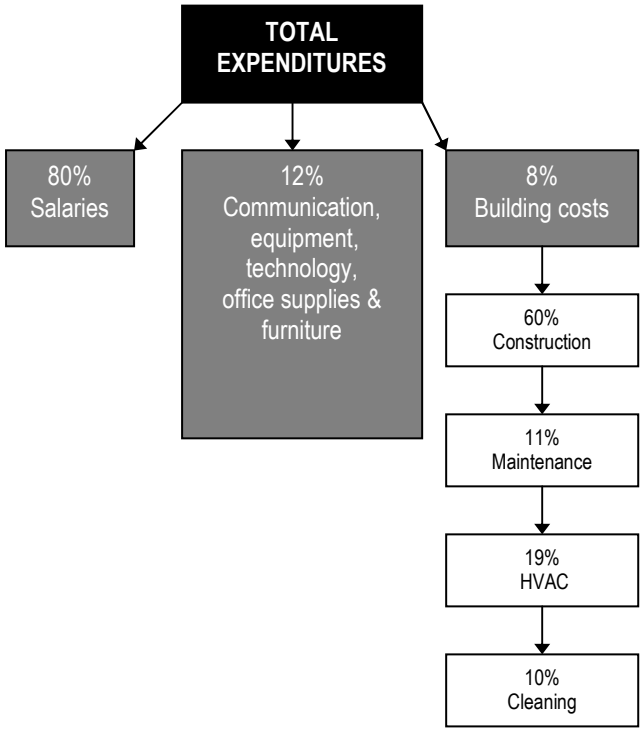


Fig. 2.1: Spreading of organisational expenditures

According to Rotraut Walden (Preiser & Vischer, 2005:118), research into the psychological well-being of employees has shown that the workplace environment has a direct influence on employee productivity. Staff salaries usually make out about 80% of a company's expenditure, while 12% is spent on communication, technology, equipment, office supplies and furniture. Only 8 % is spent on the building. On breakdown of the cost of the building it is calculated that 60 per cent thereof is spent on construction, 11% on maintenance, 19% on air-conditioning and heating systems, and 10% on cleaning (Preiser & Vischer, 2005:119). Although the construction cost is seen as the largest, if spread over the lifespan of the building, it takes up only 5% of the building costs. This is a very important expenditure, since the way this is spent determines the effectiveness of the other 95%.

The general organisation see their employees as their biggest potential growth factor, but a minimal investment in the workplace environment can result in productivity improvement of between 10-50 per cent. (Preiser & Vischer, 2005:119)

General standards as per the South African National Building Regulations (NBR) and the updated SANS currently exist as the only reference works on minimum workplace planning and design standards for the evaluation of the quality and standard of such facilities in South Africa. Due to the general viewpoint and application of these standards, and given the increasingly global level at which organisations operate, the need for the development of a recommended minimum standard that could be used as a tool for benchmarking and cross-cultural comparisons of workplace environmental performance has been

identified. Research into how to plan and improve the workplace environment became a need in the field of facility management.

Examples of such recommended minimum planning and design standards already exist in most economically advanced countries in Europe and Japan. Indications from the application of these recommended minimum standards are that these countries have benefited in terms of creating and managing healthy office environments. Due to the development of offices and the demand for optimal facility performance and staff productivity, and even more importantly, to ensure the workplace environment support the actual work processes, it is deemed necessary to investigate and evaluate existing workplace standards in South Africa and, through a comparative approach, suggest similar guidelines for office planning, design, evaluation and management.

To establish the standard of an office it is necessary to investigate what it is that determines the success of a workplace. According to Clements-Croome (2000:10) the success of a building can be measured in the productivity and satisfaction of its users. Productivity can be defined as “increased functional and organisational output, including quality” (Clements-Croome, 2000:13). Productivity is hard to measure and therefore needs to be investigated from all sides. According to Franklin Becker and Fritz Steele (1995) useful criteria to consider when measuring productivity are the following:

1. *Quality* – improvement in quality can not only be measured by the adjustments in individual managers, a team with talent or nature of tasks, but the impact of all these things together;
2. *Mission and goals* - must be integrated with the company to be assessable;
3. *Rewards and incentives* – by changing to the open workplace design, the more transparent team space make each team member’s performance more visible; and
4. *Employee involvement* – the more control the individual has over his/her workspace and work

method the more job satisfaction is gained which in return leads to higher productivity.

People change, as well as organizational objectives and goal setting in response to the business context, and the manner in which it is implemented. This determine the direction the company will take. A building that supports this direction can influence the level of success. An intelligent building can improve productivity by 10% annually (Clements-Croome, 2000:46). Intelligent buildings should not be seen as new and expensive buildings, but as buildings that improve user satisfaction and support the organisational structure and goal. Other factors that also impact on employee satisfaction (Le Roux & Esterhuysen, 2007:5) includes:

i) the specific organisational context
ii) job type and the characteristics of individual employees
iii) the nature of the workplace's environmental attributes
iv) the quality of the overall work environment as per the individual employee's qualitative assessment thereof.

The organisation, like an organism, needs multiple factors to be able to survive. These factors are based on the organisation, the building and its users. These factors control staff's performance and can be divided into four levels (Clements-Croome, 2000:11):

a) Personal:
- motivation and career achievements
- home/work interaction
- intrinsic to job
- job type and the characteristics of individual employees

b) Sociological
- relationship to others

c) Organisational
- the specific organisational context and structure
- managerial role

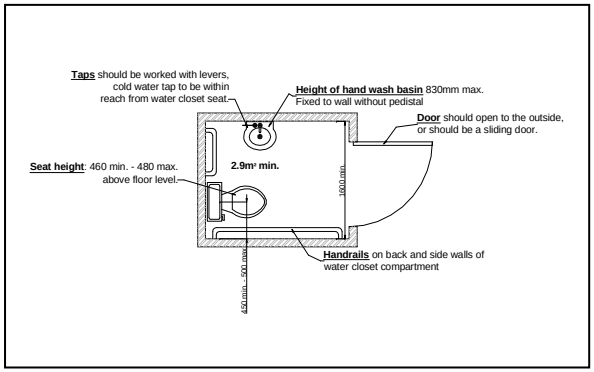


Fig.2.2: Basic regulations for a toilet for disabled users

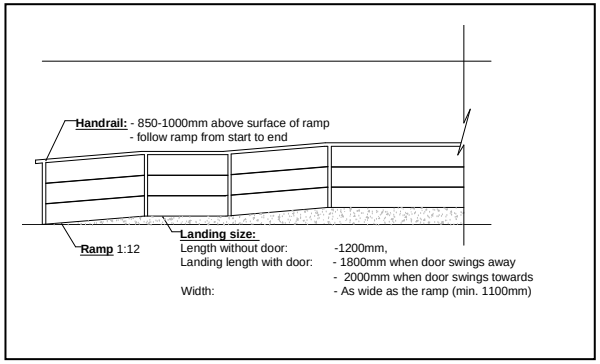


Fig.2.3: Basic regulations for ramps for disabled users

d) Environmental

- the nature of the workplace's environmental attributes
- the quality of the overall work environment as per the individual employee's qualitative assessment thereof.
- physically measurable values in workplace environment:
    - indoor climate
    - workplace orientation
    - workspace sizes and ergonomics
    - indoor Air Quality (IAQ)

An imbalance in any of these four levels affects the productivity of the user. Since the workplace environment is the most controllable factor, basic minimum standards is necessary to evaluated or plan it. Such a minimum requirement would not only assist in the improvement of employee satisfaction, but will also upgrade health, comfort, well-being and safety,

This research project focuses on the nature and quality of the relationship between people and the built environment. The purpose of this project is firstly to provide an opportunity for feedback regarding the refurbishment of office space, and secondly to determine a minimum standard to guide office planning and evaluation in the future. Thirdly, this research project will also determine the extent to which the working environment standard supports individual work performance behaviour in South Africa. The results of this survey will help to improve the workplace environment. A set of minimum standards can then be determined to be used in future office design.

"Since the cost of the people in an office is an order of magnitude higher than the cost of maintaining and operating the building, spending money on improving the work environment may be the most cost effective

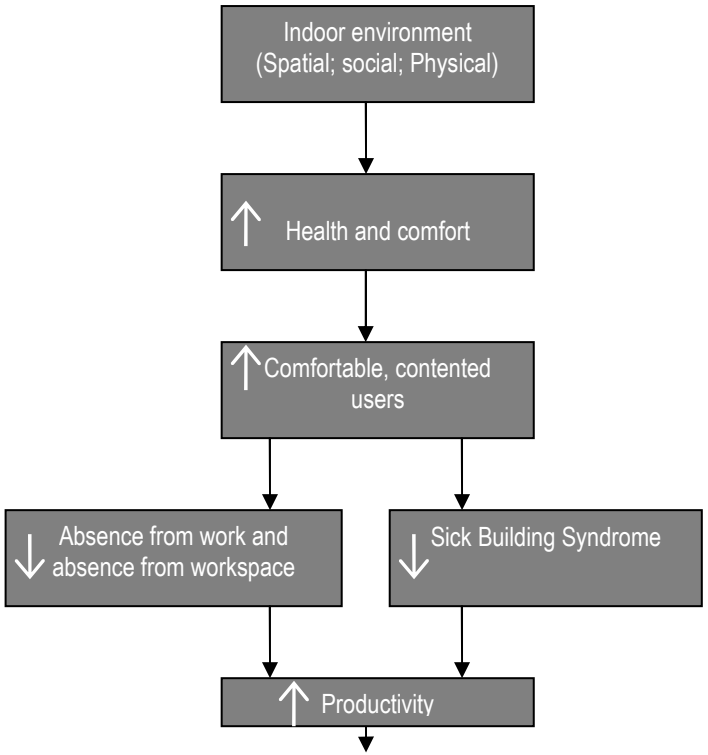


Fig.2.4: Dynamic interaction between environmental factors and productivity

way to improve worker productivity." (Clements-Croome, 2000:13).

The study aims to measure the following environmental factors:

2.1 Spatial and Environmental Comfort:

Indoor environment has direct and indirect effects on users and productivity. The dynamic interaction between spatial, social and physical factors of the indoor environment influences productivity by affecting health, comfort, wellbeing and overall satisfaction of end-users. The user is comfortable when the mind and body is in a state of content. The physical workplace should provide a comfortable environment for the user in which to perform daily tasks. Daily unnecessary absenteeism from the individual workspace for regular informal breaks is less when the workspace and workplace comply with the levels of comfort of the users of the building. The spatial and environmental comfort also has an influence on sick building syndrome (SBS), a noticeable and measurable negative outcome of buildings in which the physical environment is not acceptable for the workers in the office.

Spatial and environmental comfort can be investigated by measuring the physical influences of the following:

- *Spatial qualities:*
  - Physical relationships between people and equipment. Different pieces of equipment in a work area should be compatible in their design, specifically with regard to overall layout, functional distribution, allocation of space, etc.

- *Lighting environment:*

  The amount of light necessary for good task performance depends on the nature of the task, the

sharpness of the task performer's eyesight and the environment in which the task is carried out, i.e. general lighting level, natural lighting, artificial (general, ambient and task) lighting, aspects of glare, etc.

- *Thermal comfort:*
  - The indoor climate needs to be appropriate if work is to be carried out in comfort. It is determined by:
    - Air temperature is the experienced temperature, of which the aim should be to provide conditions in which the body temperature should be maintained.
    - Radiant temperature is heat that travels to and from the body via electromagnetic waves
    - Air humidity is the percentage of the moisture that would saturate the air at the existing temperature.
    - Rate of air movement

Of these, air temperature is the most important.

2.2 User Accommodation

According to the National Building Regulations, the Bill of Rights (SANS 10400, 2005: iv) states that: "everyone has the right to an environment that is not harmful to their health or well-being". The following aspects should be taken into account when investigating a work environment that is not harmful:

- *Safety:*
  - Interior safety:
    - Fire safety (SANS 10400 Part T)
    - Emergency and escape routes
    - Layout of the building

        - Circulation
        - Lighting
        - Floor finishes

    - Exterior safety:
        - Approach to the building
        - Entry into the building

- *Environmental satisfaction:*
  - Even when all the measurements are according to the set standards, user satisfaction of the environment is not guaranteed. For this purpose a study of the users' experience should be part of the planning and evaluation of the workplace.

- *Ergonomics (physical aspects of the user-machine/furniture interface):*
  - This concerns the size, shape, colour, texture, method of operation and other physical characteristics of furniture and other equipment in work space.

- *Storage:*
  - Storage for both private and work-related items should be provided for.

- *Facilities for universal access:*
  - All facilities should comply with the NBR minimum regulations for facilities for disabled persons. The SANS 10400 provides a minimum standard which is used to evaluate these facilities. See figs. 2.1 and 2.2 for a summary thereof.

All of the above-mentioned aspects will be assessed by means of actual measurement, as well as questionnaires. By attaining this information, it will be possible to determine the standard of the office in comparison to studies from other countries which specialises in workplace environments. It will then be possible to determine whether or not the planning and design of offices in South Africa could be compared successfully with the developed studies of countries that specialise in this field. A set of minimum standards will be able to assist in the evaluation of existing offices and in the planning of future offices by providing a research document to base these investigations on.

It is anticipated that the comparison of the full scope of standards contained in the NBR and the SANS 10400 with international examples will result in a highly technical and thus complex design manual, it is thus necessary to define a simplified version thereof. It is envisaged that this simplified version could be used by facility managers in charge of extensive property portfolios as a compact reference guide on workplace planning and design standards.

Chapter 3

Research Methodology

South African offices need to be examined to determine a local standard for open-plan administration offices. These offices are compared against the Minimum Standards, as derived from NOPA, SANS (10400), NBR and a spatial indicator based on different workplace and meeting area types as developed by the Centre for People and Buildings (CfPB) in the Netherlands.. The measurement is structured according to the various stages of a Building Performance Evaluation (BPE) through a Post-Occupancy Evaluation (POE) process (Preiser et al., 1998). Stage one consists of the indicative-level POE. During this stage, members of the research team take a walkthrough (guided tour through the facilities) of the building to familiarise themselves with the environment, verify the accuracy of layout drawings received prior to the walkthrough and identify problem areas that require attention during the full survey (Stage two). The next step, Stage two (the investigative-level POE), is an in-depth survey, and determines the quality of the workplace environment. Information pertaining to workspace quality is obtained by measuring different aspects of workspaces. (This will be explained according to a case study, previously done by the research team (Le Roux & Esterhuysen, 2007). These aspects include:

- Movement studies
- Communications studies
- Questionnaires
- Layout studies

This will be explained further by using samples from a previous study done by the members of the research team.

3.1 Movement studies

Activities performed in individual workspace		Activities performed away from individual workspace	
Cw:	Computer work	Mf:	Formal meeting
D:	Desk work	Mi (away)	Informal meeting/ conversation
Tel.:	Telephone	F (away)	Filing
Mi (at):	Informal meeting/ conversation	F/C/P:	Fax/Copy/Print
F (at):	Filing	M	Movement
F/C/P:	Fax/Copy/Print	O	Other

Fig. 3.1: Range of activities performed in and away from individual workspace while in the office
(Le Roux & Esterhuysen, 2007)

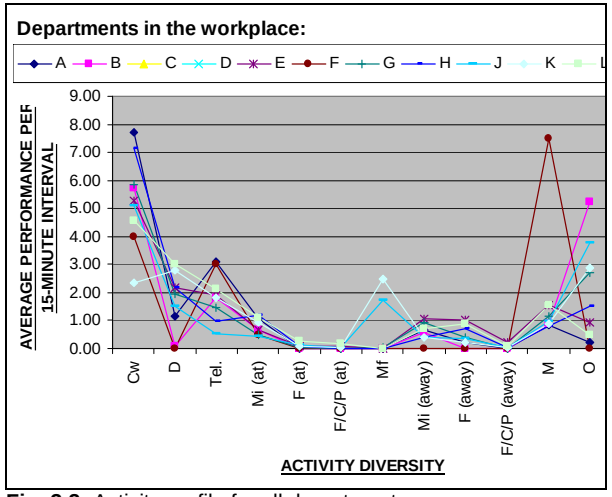


Fig. 3.2: Activity profile for all departments
(Le Roux & Esterhuysen, 2007)

3.1.1 Activity and Activity Duration Mapping:

The objective of activity mapping is to determine the range of activities that form part of employees' daily workplace activities, and also the duration or time spent on the various activities. Workplace activities consist of two main categories – (i) work performed in the individual workspace while in the office and (ii) work performed away from the individual workspace while in the office. The subcategories that represent the diversity of activities performed in the workplace are indicated in fig. 3.1.

Classification of employees' workplace activities according to fig. 3.1 enables the interpretation of (i) the frequency with which the various activities are performed (fig. 3.2) and (ii) the various locations where these activities are performed (fig. 3.3). This is extremely important, as it gives a clear indication of the extent to which individual workspaces are appropriated. By using this information, individual employee profiles can be formulated pertaining to the extent and location of workspace utilisation. A combination of these individual profiles enables the formulation of departmental profiles that improves the understanding of departmental characteristics and related spatial requirements, which ultimately provide for advanced organisational space budgeting.

Specific reference to the provision of territorial (fixed-address) and non-territorial (free-address) workspace settings and staffing typologies were also addressed by Becker (1990). Accordingly, fixed-address workspace is classified as workspace that is occupied for more than 60% of the day, while free-address workspace is classified as workspace that is occupied for less than 60% of the day as illustrated by fig.3.4.

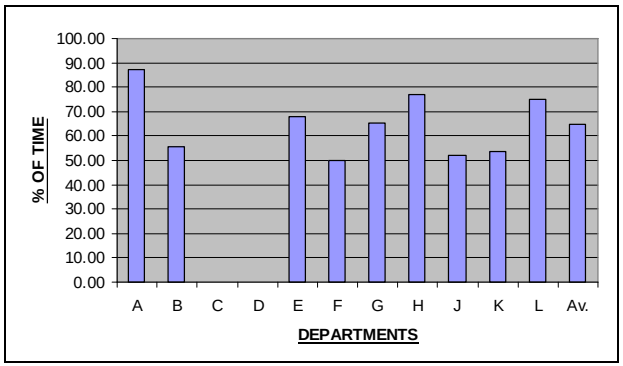


Fig. 3.3: Time spent in workspaces.
(Le Roux & Esterhuysen, 2007)

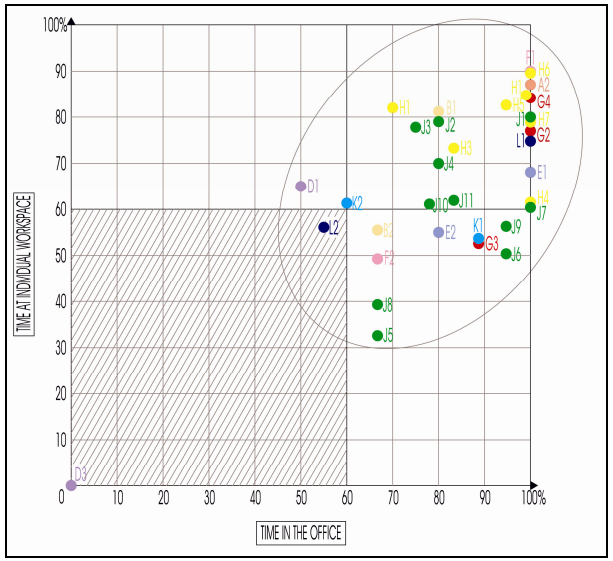
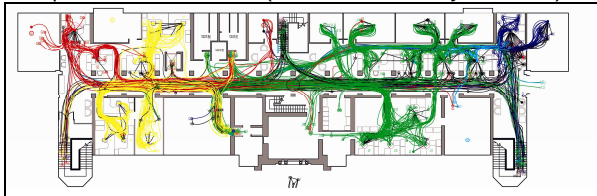
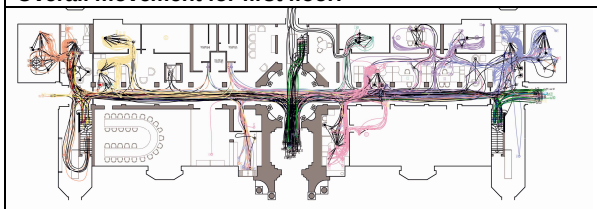


Fig. 3.4: Illustration of work styles according to time spent in the and time spent in individual workspace
(Le Roux & Esterhuysen, 2007)

Fig3.5: Overall results of the movement study, showing the extent of departmental movement (Le Roux & Esterhuysen, 2007)



Overall movement for first floor:

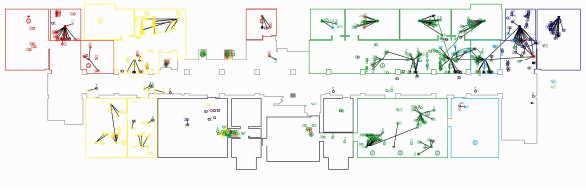


Overall movement for the ground floor.

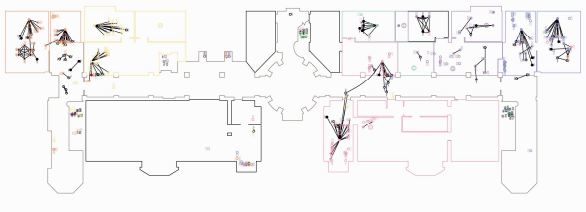
3.2 Communication studies

3.2.1 Movement and Communication Mapping:

Information regarding employees' movement and communication behaviour in the open-plan office environment provides better understanding of the extent of performance and workstyle diversity in the office. Movement-related information and activity mapping is used to illustrate where employees circulate in the course of work performance, as well as their preferences in terms of the location of communication and collaboration in the office. Movement routes for individual employees are constructed using the data collected during the 15-minute intervals. By combining these routes, it is possible to illustrate individual and departmental movement. The combined movement patterns illustrated in fig 3.5 show the overall movement for the ground and first floors



Overall communication nodes for the first floor

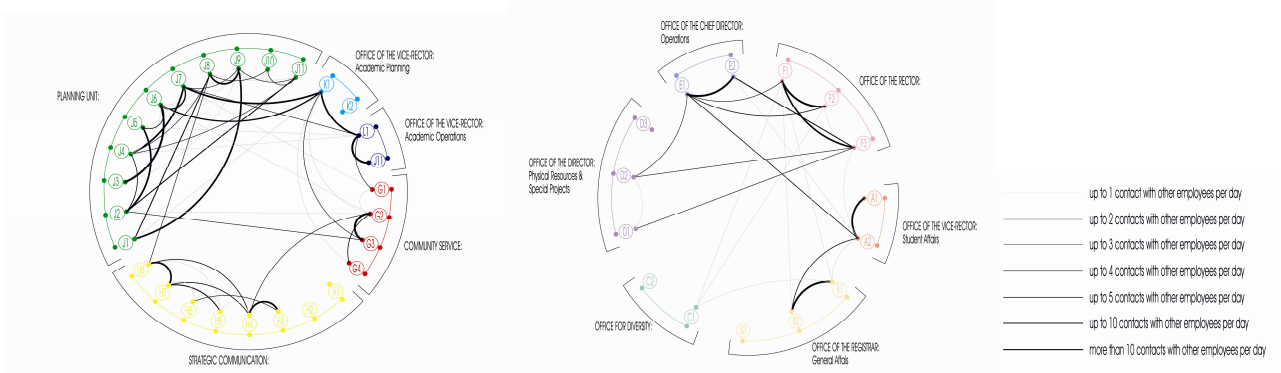


Overall communication nodes for the ground floor.

Fig.3.6: Overall points of communication in terms of departmental boundaries. The use of matching colours for points of communication and departmental boundaries illustrates the extent of intra- and interdepartmental communication (Le Roux & Esterhuysen, 2007).

respectively. By using this information it is possible to investigate the communication patterns between individuals and that of the different departments. This enables optimal planning during the layout of workspaces and the placing of different departments.

Expected cross-functional and cross-departmental communication and awareness should also be considered when planning the layout. A thorough study of the communication patterns should therefore be included as detail when designing a workplace as a whole. The communication behaviour observed in the departmental zones illustrated in fig 3.6 is also reflected in the communication wheels for the ground floor and first floor, as presented in fig 3.7. The *communication wheel* – as discussed by Kato et al. (2005) – is a circular diagramme that contains references to all employees in the office. Employees are grouped by department to facilitate illustration of the extent and frequency of communication between different employees and departments.



Communication wheel for the first floor **Communication wheel for the ground floor** **Key:**

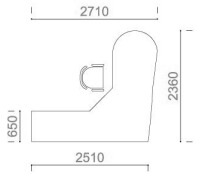
Fig.3.7: Visualisation of data collected during communication mapping. The *Communication Wheel* clearly illustrates the extent of communication between all employees in the office during the survey. Communication between employees of the ground and first floors was found to be minimal (Le Roux & Esterhuysen, 2007).

3.3 Questionnaires

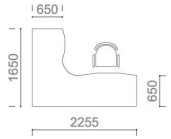
3.3.1 Questionnaire Analysis:

According to Kato et al. (2005, p.149-159), the mapping procedures depend on observations by the research team regarding employees' workplace behaviour, as well as their work performance and accomplishment. To improve the objectivity of the survey and to involve the user, which consists of the most insight of the current set-up, a questionnaire survey forms part of the data collection process.

Questionnaires are distributed to all employees in the office, or to a nominated group if time is limited. This provide employees with an opportunity to give feedback of their perceptions on the workplace environmental quality, facility functionality (user requirements), and facility serviceability (the extent to which the facility accommodates users' requirements).



Individual workspaces in enclosed offices (3.13 m^2)



Individual workspaces in the open-plan area (2.15 m^2)

Fig. 3.8: Dimensions of workspace settings in enclosed and open-plan offices (Le Roux & Esterhuysen, 2007)

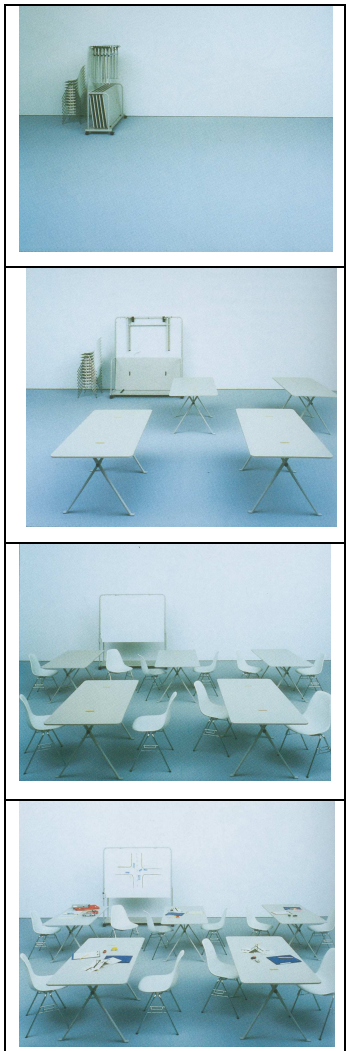


Fig.3.9: Effective settings that support spatial mobility (Antonelli, 2001:126)

3.4 Layout studies

3.4.1 Floor area per workspace:

The useable office floor area is calculated for this part of the survey. This excludes areas such as staff rooms, tea kitchens, and primary support spaces such as storage rooms, archives, and copy rooms. In certain cases the floor area of the top management's personal suites was also excluded due to the uniqueness of the specific environment.

3.4.2 Adjacency and proximity of location*:*

The frequency of movement and communication between employees, as well as the effectiveness thereof, can be managed through an improved understanding of adjacency relationships and the proximity of location. In most workplace layouts employees are accommodated where they are closest to those they have frequent interaction with, based on adjacency decisions that use spatial proximity to determine where employees should work.

According to research by Becker (1990), workplace planning and design methodologies that support spatial mobility effectively shift the focus from the design of individual "*cockpit*" workplace settings where employees are functionally isolated, to the notion of the office as a system of loosely coupled settings appropriated on the basis of functional need (fig.3.9). Considerations on adjacency and proximity thus either enforce departmental cohesion by grouping people closely together, or employ the concept of *functional inconvenience* to locate employees in such a manner as to promote cross-functional interaction and awareness. Rethinking such relationships on the basis of data resulting from the movement and communication mapping could enhance functional cohesion and improve perceptions of the office environment's level of serviceability (the extent to which the office layout accommodates user requirements and workstyle diversity).

3.4.3 Deployment of spatial resources according to workstyle diversity:

A discussion pertaining to the acknowledgement of employee and workstyle diversity. as illustrated in fig. 3.7 , the relationship between time spent in individual workspaces and time spent in the office emphasises the need for recognising that there are real differences in the way people work. This discovery enables the designer to create temporary spaces to accommodate different individuals during specific times of the day. Considerations in this respect are of special importance for employees identified as runners and walkers (employees who either spend more than 60% of their time in the office but less than 60% of the time working in individual workspaces, or employees who spend less than 60% of their time in the office or working in individual workspaces). By identifying these different workstyles, the workplace can be changed into a more accommodating space to minimise the size of permanent office space needed, and to maximise the usage of rented office space.

The process as described, is an in depth survey done on a specific workplace with specific needs. Due to the generic needs for this study the scope of the different POE tools will vary according to the information needed to be attained. Since the direct communication and movement patterns will not be needed for a generic study, these advanced steps for POE studies for workplaces such as mappings will not be done during this specific survey, but are highly recommended for the success of researching specific workplaces in the future.

Research by EDRA (Environmental Design Research Association) and the International Building Performance Evaluation study group (IBPE) aims to advance research and understanding of the interrelationships between people and the built environment with which they interact (Le Roux et al, 2005). Efforts in this regard are contributed to by Davis et al. (1993) and Szigeti & Davis (2001b), who undertake research on building performance evaluation and, more specifically, functionality and serviceability tools and methods for setting and determining occupant requirements as well as theory and research as constructed by the Centre for People and Buildings (CfPB) in Delft. That investigate the relationship between people and the workplace environment and the influence thereof on productivity. This has heightened awareness of the extent to which performance evaluation tools are able to contribute to improved facility performance, employee satisfaction, and overall

productivity. The aforementioned functionality and serviceability tools form part of the *ASTM Standards on Whole-building Functionality and Serviceability*, as used in the North American context. The comparison of the evaluative capabilities of the ASTM Standards with those of the *IBPE Investigative Level* and the *NOPA* (New Office Promotion Association of Japan) *Minimum Standard*, as illustrated in fig. 3.10, provides an analogy for the development of similar evaluation topics for workplace environments in the South African context.

GENERAL CRITERIA	IBPE INVESTIGATIVE LEVEL	NOPA MINIMUM STANDARD	ASTM ASPECTS AND TOPICS
CATEGORY 1: CRITERIA REGARDING FUNCTIONAL COMFORT			
1.1. Air Quality and Air-conditioning	• Temperature • Air movement • Odour	• Air quality • Air-conditioning operation	• A.4*(Thermal Environment & Indoor Air Quality)* • A.4.1 *(Temperature & humidity)*
1.2. Thermal Comfort	**X**	**X**	• A.4 *(Thermal Environment & Indoor Air)* – in ballot process • A.4.1 *(Temperature & humidity)*
1.3. Building Noise	**X**	**X**	• E 1662-95a *(Sound/visual)*
1.4. Office Noise	• Acoustics	• Background noise	• E 1661-95a *(Meetings)*
1.5. Privacy	**X**	**X**	• E 1661-95a *(Meetings)*
1.6. Spatial Comfort	• Aesthetic quality • Amount of space • Adequacy of space • Flexibility of use • Functional adaptability	• Workspace per person • Width of main passage • Floor to ceiling height • Layout consideration • Space comfort • Desks, chairs, cabinets	• E 1661-95a *(Meetings)* • E 1662-95a *(Sound/visual)* • E 1692-95a *(Churn)* 1664-95a *(Layout)*
1.7. Lighting Comfort	• Lighting considerations	• Lighting environment • Glare prevention	• E 1692-95a *(Churn)* 1662-95a *(Sound/visual)*
1.8. Filing, Information Management, and Office Technologies	**X**	• Implementation & maintenance of filing and referencing procedures	• E 1663-95a *(IT)* • E 1694-95a *(Special facilities)*

1.9. OA Considerations	**X**	**X**	• E 1660-95a *(Support)*
CATEGORY 2: CRITERIA REGARDING EMPLOYEE WELL-BEING AND SOCIAL WELFARE			
2.1. Fresh-up Area	**X**	• Refresh space	• E 1668-95 *(Amenities)*
2.2. OA Machines	**X**	• Employee well-being	**X**
2.3.Social Welfare Environment	• ADA compliance *(Accessibility for handicapped users)*	• Female employees • Elderly and physically handicapped users	• E 1668-95 *(Amenities)*
CATEGORY 3: CRITERIA REGARDING BUILDING CONVENIENCE			
3.1. Environmental / Energy Conservation	• Waste removal	• Energy conservation • Recycling	• E 1464-992 *(Energy use)* • E 1671-95a *(Cleanliness)*
3.2. Safety & Security	• Quality of building materials	• Floor safety • Cable management	• E 1665-95a *(Protection)* • E 1693-95 *(Safety of occupant assets)*
3.3. Electrical Power	**X**	**X**	• E 1663-95a *(IT)*
3.4. Cleaning and Maintenance	**X**	**X**	• E 1670-95a *(Operations)* • E 1671-95a *(Cleanliness)* • E 1700-95 *(Structure)*
3.5. Location, Access, and Way finding	**X**	**X**	• E 1669-95a *(Location, access, and way finding)*
3.6. Office Fit-out and Public Image	**X**	**X**	• E 1667-95a *(Public image)* • E 1692-95a *(Churn)*
3.7. HVAC	**X**	**X**	• E 1664-95a *(Layout)*
CATEGORY 4: CRITERIA REGARDING ORGANISATIONAL AND MANAGERIAL ASPECTS			
4.1. Facilities Management & General Management Aspects	• Relationship of spaces and overall layout • Maintenance	• Facilities Management strategy • Cost management • Operations management	• E 1480-92 *(FM terms)* • E 1670-95a *(Operations)* • E 1692-95a *(Churn)*

Fig. 3.10: Comparison of workplace environmental planning standards and evaluation topics (Le Roux et al. 2005).

Data as categorised and presented in fig.3.10 are an adaptation of subject-related research by Vischer (1996) on the relationship between work strategies and workplace environments. Accordingly, the various workplace environment evaluation criteria contained in each of the selected building performance evaluation (BPE) methodologies were categorically defined and classified into the following performance evaluation categories:

i. Category 1: Criteria on Functional Comfort

This category refers to work-related occupant requirements pertaining to comfort in the performance and completion of work;

ii. Category 2: Criteria on Employee Health, Comfort, and Social Welfare

This category includes criteria regarding workplace environment quality to ensure and maintain employee health, comfort, and well-being, as well as to prevent any form of discrimination;

iii. Category 3: Criteria on Building Convenience

Although criteria on building convenience do not directly impact on employees' work performance, this category includes those characteristics of the workplace environment that are considered to impact on employees' sensory stimulation and subsequently lower their effective performance level. Such performance impediment occurs either through overstimulation (sensory overload) or insufficient stimulation (sensory deprivation), as per Smith & Kearny (1994);

iv. Category 4: Criteria on Organizational and Managerial Aspects

Aspects of Facility Management are central to this group of criteria, and refer to the link between organizational effectiveness and the overall management of workplace environment resources.

The first three categories defined above also correspond to the habitability framework as discussed by Preiser (2001). This framework assimilates the nine different universal design (UD) performance criteria into three levels of priority, pertaining to i) Health, safety, and security performance, ii), Functionality, efficiency, and workflow performance, and iii) the psychological, social, cultural, and aesthetic performance of the specific facility or built environment.

According to Preiser (2001), this three-level breakdown of occupant needs in the physical environment is not only grossly analogous to Maslow's (1948) human needs hierarchy of self-actualization, love, esteem, safety, and physiological needs, but also to the three basic levels of performance requirements for buildings referred to by Vitruvius (Rowland and Howe, 2001), namely firmness, commodity, and delight.

Equally important in the evaluation of the built environment are the principles of universal design (UD). A comparison with aspects of the habitability framework systematically relates characteristics of the built environment (the open-plan office) to users and their respective needs (fig. 3.6). The combined consideration of the various performance evaluation tools, as discussed in Table 1, the habitability framework, and the principles of universal design therefore represent a conceptual and process-orientated approach to building performance evaluation. As such, it also presents the research team with a specific premise to formulating a comprehensive performance evaluation methodology for workplace environments in South Africa.

As the aim of this survey is to propose a set of minimum standards for offices in South Africa. For this purpose an organisation with nationwide representation has been selected. This enabled a comparison between offices in terms of planning and design standards, as applied to open-plan administrative work environments. These surveys included both questionnaires as well as POE, measuring certain elements such as lighting, spatial layout and size, furniture ergonomics and temperature control. The information was analysed to determine firstly, the existing office planning and design standards and methodologies, and secondly, the relation to, and applicability of the developed recommended minimum office standards.

The South African National Building Regulations (NBR), together with its upcoming replacement – the South African National Standards (SANS 10400) – serve as the basis of comparison to international examples. Due to the advanced degree of European (especially Dutch) and Japanese offices, these will be used as guidelines to measure the scope and comprehensiveness of South African workplace planning and design standards. In this respect, special attention will be given to the activities of the *Centre for People and Buildings* (CfPB) in Delft, the Netherlands, as well as to Dutch standards for healthy workplace management, as per Van Wagenberg (1999), and recommended minimum standards as developed by the *New Office Promotion Association of Japan* (NOPA). These examples were selected based on prior collaboration with these organisations in terms of the development of workplace performance-evaluating processes and methodologies. The combination of considerations pertaining to building functionality and serviceability with that of the theoretical premise as per Preiser (2001), enables the formulation of a general guideline for workplace design and evaluation in South Africa.

By making use of all the above-mentioned sources, recommended minimum standards for office design in South Africa will be developed and incorporated into a compact version that can be used by laymen.

Chapter 4

Investigative Survey

According to Preiser et al (1988) the Post-Occupation Evaluation (POE) is a comprehensive process that involves planning, research and thorough preparation of the survey. The building being investigated should be visited and all necessary information should be gained before the research commences. Information needed includes plans and other technical information, like air conditioning placements, photos, location of departments and different staff, and restrictions to the survey due to company safety regulations and the protection of sensitive information. When planning the POE, the effort level of the POE is also decided.

The POE can be done at four different levels of effort, according to the depth of the survey, the information needed and the size of the building. The survey time could be from a day or two to up to several years.

After all this information has been gained, the indicative survey is planned and performed, in preparation of the investigative level POE, which will follow. The indicative survey is the survey with least effort. It involves a walk-through of the building to investigate the validity of the built plans and for the research team to familiarise themselves with the work environment. This visit to the facility also includes the briefing of the client regarding the process of the POE. A selection of interviews to support the documentation can also be done. Further information is gained through the evaluation of the plans to prepare for the investigative level survey.

The investigative level is the more time consuming, an in-depth POE that involves at least two components (Preiser et al, 1988):

- Theoretical research, with supporting literature to strengthen the investigation; and
- Comparison with recent state-of-the-art facilities.

For this study the information gained through many studies in state-of-the-art facilities by organizations such as the New Office Promotion Association (NOPA) in Japan and Centre for People and Buildings (CfPB) in Delft, the Netherlands, was used as comparison to the available national building regulations in South Africa, that is currently used as the minimum standards when planning and designing offices. With this information a proposed set of minimum recommendations was created and then used in the measuring of the standards of selected South African offices.

The technical approach involved the selection of applicable open plan offices in South Africa, a basic functioning open plan office environment, and a more technical developed office environment, with the same funtions as the first building.

For the investigative level these buildings were then surveyed by physically measurement of the applicable workstations and areas of the different buildings as well as questionnaires to replace the interviews.
The information gained through these two levels of POE was then used to do the diagnostic level POE, as in Part 3 of this study.

4.1 Technical approach:

A South African company named Telkom, with nationwide offices was carefully selected and surveyed in July 2006 to establish a standard to compare against the guidelines obtained through the theoretical approach. Telkom is a substantial company with a range of offices that differ from low to highly technologically developed. Two of the company's buildings were used for the surveys, namely the Regional Head Office (RHO) Phase 1 in Bloemfontein and the National Business Solution Centre (NBSC) in Centurion. These buildings were selected for their range of different facilities for work accomplishment.

The highly technological building in Centurion, a more commercialised part of the country and the smaller, more intimate and simple office facility in Central South Africa were regarded as sufficiently representative of the various facilities of the organization in South Africa.

The research methodology for the Building Performance Evaluation (BPE) study conducted in the open-plan offices of Telkom's RHO Phase 1 and NBSC workplace environment was structured according to a description by Preiser et al. (1988) of the various stages of building performance evaluation through POE. Accordingly, Stage one (*indicative-level POE*) entailed a walkthrough of the office environment – members of the research team had the opportunity to familiarise themselves with the specific environment, determine the accuracy of layout drawings received prior to the walkthrough, and identify possible problem areas that should receive special attention during the actual survey (Stage two).

Following the indicative-level POE, a more in-depth survey was undertaken to determine aspects of workplace environment quality. Information was obtained through various mapping procedures, as well as a questionnaire survey distributed to a group of employees (as nominated by management) in the office (enclosed and open-plan offices). During the two-day survey of the open-plan office, data was collected by measuring three of each kind of workspace, communication space, meeting space and circulation area in order to determine an average for the specific space (see Addendum D). Since temperature has a great effect on the users' comfort, readings of temperature were also taken in various areas of the building over a week (a complete version of the results of the survey is available in Addendum B).

Firstly, for each workspace that was measured, the layout was checked on plan, and then the actual space was measured inclusive of, circulation space, furniture and borders of the space. At each site, the light quality of the task area (area where mostly general desk work is done) – VDU (Visual Display Unit) was measured, as well as the surface directly in front of the VDU. After all the workspaces had been measured, the same process was repeated in the support areas, such as storage, reception area, the main circulation routes and stairs.

Due to safety considerations, photos were not allowed at NBSC. Where allowed, however, photos were used to support observations made during the study. During the surveys the previously identified workspaces were measured.

The questionnaire (Addendum C) was handed out on the first day of the survey. The questionnaire was aimed at eliciting employees' perceptions pertaining to (i) their level of job satisfaction, (ii) the nature and extent or duration of their activities in the office, (iii) the extent and location of work-related movement and communication, and (iv) the overall level of satisfaction with the environmental quality of the new open-plan office layout. The questionnaire was distributed to 350 employees (identified by management). The structure of the questionnaire was in accordance with similar questionnaires used by the Centre for People and Buildings (CfPB) in Delft, the Netherlands. These questionnaires were divided into the following categories:

1) General details
2) Work method
3) Satisfaction with the organisation
4) Satisfaction with work
5) Satisfaction with facilities
6) Experienced productivity
7) Implementation process
8) Conclusion (for general suggestions and complaints)

As discussed by Kato et al. (2005, p.149-159), the POE procedures depend on observations by the research team regarding employees' workplace behaviour, as well as their work performance and accomplishment. Since these observations are

based on what members of the research team observe themselves, there are concerns regarding the objectivity with which data is recorded. In order to address these concerns, a questionnaire survey forms part of the data collection process. This provides an opportunity to employees to give feedback pertaining to their perceptions on workplace environmental quality, facility functionality (user requirements), and facility serviceability (the extent to which the facility accommodates users' requirements).

The questionnaire was based on that used by the Centre of People and Buildings and streamlined for this specific research by selecting and adding questions and details within questions to make it possible to gather the specific information needed for the current study. The management of Telkom guided the distribution process by selecting people in the organisation in such a way that the different work styles, such as runners and walkers, and different departments, were well represented. The questionnaires were collected during the site analysis. The cut-off time for submission was at the end of the second day of the survey in each facility Collection and analysis of the questionnaires were done in such a way as to ensure the anonymity of all respondents.

Employees' responses to the questionnaire provided an indication of their perceived level of satisfaction with the workplace layout and the resulting environmental conditions. All responses received were subjected to a screening process during which their validity was assessed and, where necessary, certain responses were disqualified for not having a direct bearing on matters related to the workplace environment quality.

This survey's results were used to start an indication of the level of existing open-plan offices in South Africa.

4.2 Theoretical approach

A comparison between the obtained standards of NOPA and the Workplace Guide from the CfPB with the existing standards in South Africa, SANS 10400 and SABS 0400, was used to compile a set of suggested minimum standards for offices in

South Africa. The guidelines of the above-mentioned countries were used to propose the expansion or refinement of existing South African standards. When compared, as in Addendum A, the areas requiring improvement are clearly visible and the international standards were then used to suggest possible standards for consideration as part of the national standard.

After this information was analysed, the applicable data was refined into a guideline for Recommended Minimum Standards (table 4.2.1.2). These standards are the end product of the first-round analysis, and will be used by the research team to evaluate the open-plan offices, as mentioned. After this evaluation, the standards will be refined according to the results to make them applicable to South African offices, to be used by facility managers and other professionals involved in the planning, design and management of new and existing offices in South Africa.

4.2.1 Recommended Minimum Standards for South African Offices

4.2.1.1 Bill of Rights (SANS 10400:iv)

Everyone has the right

a. to an environment that is not harmful to their health or well-being; and
b. to have the environment protected for the benefit of present and future generations, through reasonable legislative and other measurements that:
    i. prevent pollution and ecological degradation;
    ii. promote conservation; and
    iii. secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

4.2.1.2 Proposed Recommended Minimum Standards for Workspaces in South Africa.

Functional use:	Description	Min. Floor Area (m^2)	Location	Air Condition	Air Quality (min.)
1-person space	Enclosed workspace with temporary meeting space	Min. Length: 1200mm	Preferably access to natural light Pay attention to sound insulation	Room temperature: Summer – 24ºC max Winter – 20ºC min (22 ºC ± 2 ºC)	5 l/s air supply per person
Silent Workspace	Enclosed workspace for temporary use by 1 person	6	Access to natural light not necessary due to temporary use Transparency, might distract the user	Room temperature: Summer – 24ºC max Winter – 20ºC min (22 ºC ± 2 ºC)	5 l/s air supply per person
2-person space	Enclosed workspace for 2 persons	14	Preferably access to natural light Pay attention to sound insulation	Room temperature: Summer – 24ºC max Winter – 20ºC min (22 ºC ± 2 ºC)	5 l/s air supply per person

Team space	Enclosed workspace for 3 or more persons	7	Preferably access to natural light Pay attention to sound insulation	Room temperature: Summer – 24ºC max Winter – 20ºC min (22 ºC ± 2 ºC)	5 l/s air supply per person
Open workspace	Open workspace for more than 3 persons	7 (per person)	Preferably access to natural light Pay attention to sound insulation	Room temperature: Summer – 24ºC max Winter – 20ºC min (22 ºC ± 2 ºC)	5 l/s air supply per person
Half-open workspace	Half-open space for multiple persons. Half-height sides used to separate individual workspaces of groups	7	Access to natural light not necessary Pay attention to sound insulation	Room temperature: Summer – 24ºC max Winter – 20ºC min (22 ºC ± 2 ºC)	5 l/s air supply per person

Lounge workspace	Open workspace with 1 worktop for multiple persons' temporary use	6	Access to natural light not necessary due to temporary use Location close to entrance helps to reduce traffic	Room temperature: Summer – 24ºC max Winter – 20ºC min (22 ºC ± 2 ºC)	5 l/s air supply per person
Small meeting space	Enclosed space for use for meetings between 2-4 persons	2,2 (per person)	Access to natural light not necessary Pay attention to sound insulation	Room temperature: Summer – 24ºC max Winter – 20ºC min (22 ºC ± 2 ºC)	5 l/s air supply per person
Large meeting space	Enclosed space for use for meetings between more than 4 persons	2,2 (per person)	Preferably access to natural light Placed centrally for easy access of staff from other departments	Room temperature: Summer – 24ºC max Winter – 20ºC min (22 ºC ± 2 ºC)	5 l/s air supply per person

Brainstorming space	Enclosed space for brainstorming, with whiteboards, etc.	16 (3 per person)	Preferably access to natural light Not in the direct environment of workplace	Room temperature: Summer – 24ºC max Winter – 20ºC min (22 ºC ± 2 ºC)	5 l/s air supply per person
Open meeting space (small)	Open meeting place for short meetings between 2-4 persons	2 (per person)	Access to natural light not necessary Placed in the direct environment of the envisaged users	Room temperature: Summer – 24ºC max Winter – 20ºC min (22 ºC ± 2 ºC)	5 l/s air supply per person
Open meeting space (large)	Open meeting space for informal meetings. Can also be used as workspace.	2 (per person)	Access to natural light not necessary Placed in the direct environment of the envisaged users Location close to entrance helps to reduce traffic	Room temperature: Summer – 24ºC max Winter – 20ºC min (22 ºC ± 2 ºC)	5 l/s air supply per person

Informal meeting space	Open space with table at standing height for quick and easy meetings	1 (per person)	In the direct environment of pause space Due to noise, not in direct environment of workplace	Room temperature: Summer – 24ºC max Winter – 20ºC min (22 ºC ± 2 ºC)	5 l/s air supply per person
Print/copy space	Enclosed or half- open space for printing and copying	2,1 x 2,4, with open centre of 0,9m on side of machine	Access to natural light not necessary Placed in the direct environment of the envisaged users	Room temperature: Summer – 24ºC max Winter – 20ºC min (22 ºC ± 2 ºC)	5 l/s air supply per person
Dynamic archive	Enclosed or open space for the storing of documents that are used regularly	1 (per archive unit)	Access to natural light not necessary (it may even be harmful) Placed in the direct environment of the envisaged users	Room temperature: Summer – 24ºC max Winter – 20ºC min (22 ºC ± 2 ºC)	5 l/s air supply per person

Pigeon holes	Enclosed or open space for the separation of incoming post to workers or departments	Determined by number of pigeon holes	Access to natural light not necessary Placed in the direct environment of the envisaged users	Room temperature: Summer – 24ºC max Winter – 20ºC min (22 ºC ± 2 ºC)	5 l/s air supply per person
Waiting/ reception space	Area for visitors to wait for their appointments after arrival	Depending on activities	Directly at the entrance of relevant building, department, or public-private interphase	Room temperature: Summer – 24ºC max Winter – 20ºC min (22 ºC ± 2 ºC)	5 l/s air supply per person
Personal storage space	Area where workers can store their belongings before they go to their flexible workspace	0,3m min. (Determined by number of lockers)	Access to natural light not necessary Placed in the direct environment of the envisaged users	Room temperature: Summer – 24ºC max Winter – 20ºC min (22 ºC ± 2 ºC)	5 l/s air supply per person

Pause space	Open space close to pantry to pause or meet informally	2 (seating and circulation included) Per 10 persons	Access to natural light not necessary Close to the cafeteria	Room temperature: Summer – 24ºC max Winter – 20ºC min (22 ºC ± 2 ºC)	5 l/s air supply per person
Smoking area	Enclosed space for smokers	1,25 (per smoker)	Access to natural light not necessary Close to the cafeteria Easy access from inside the building Marked clearly	Room temperature: Summer – 24ºC max Winter – 20ºC min (22 ºC ± 2 ºC)	20 l/s air supply per person

4.2.1.3 Public Safety and Facilities for universal access

	Public safety	**Facilities for universal access**
Entrances	Entrances must be slip-free in all seasons	
Floors	Floors must be slip-free and level.	

	Unevenness in floors levels is deemed dangerous.	
Stairways	▪ The headroom at any point on any stairway shall be not less than 2,1 m, measured vertically from the pitch line, and the width of any stairway, measured to any enclosing wall or balustrade, shall be not less than 750 mm. ▪ No door shall open onto a stairway unless such door opens onto a landing and the width of such landing is not less than that of such door. The position of the door relative to the landing and its direction of opening must be such that it does not obstruct the flow of people on the stairway when in fully open position .	
Ramps	Ramp or driveway used by pedestrians other than those provided for the use of persons in wheelchairs, shall have a gradient of not more than 1 in 8.	Ramps provided for the use of persons in wheelchairs shall be in accordance with the provisions of the National Building Regulations as set in SANS 10400-S: - should have an angle of max 1:12 if the height difference between the to end of the ramp is more than 400mm and 1:10 if the difference is less than 400mm - should be open and free of obstacles and min. 1,1m

		wide - should have an even surface of at least 2m long where the door opens onto the ramp, and 1,8m long where the door open away from the ramp - should have a landing of at least 1,2m long and as wide as the ramp, for every 1,5m vertical rise - should have a landing of min. 1,2m long at every change in direction of the ramp - should have a handrail on the side if thedifference in height between the two ends are more than 600mm. This handrail should: o 850mm-1000mm measured from the the ramp surface o Should carry no danger for any user o Should be over the full length of the ramp - Should have a curb of min. 75mm high if the height difference on the side is not more than 600mm, and a balustrade according to regulations (see stairs) if the height difference is more than 600mm.
Escape routes	Escape routes and emergency exits must adhere to the regulations of the National Building Regulations (NBR) and be free from any obstacles, sufficiently sign-posted, and have fire extinguishers. In addition, the	

	number and dimensions of an escape route must be planned in accordance with its proposed use, its finishes, the size of the workplace area to be served, and the maximum number of building occupants. The width of escape routes must be no less than 1.2 m.	
Doors	Transparent doors and walls must be constructed and finished in such a way so as to pose no risk of harm or danger to the building occupants. In addition, transparent building elements should be either sufficiently sign-posted and screened/ protected, or they should be constructed and finished in accordance with safety regulations.	Doors provided for the use of persons in wheelchairs shall be in accordance with the provisions of the National Building Regulations as set in SANS 10400-S: - The minimum width of an opening of a door open at 90º should be 750mm. (this include a single door and at least one side of a double door.) - The handle of such door should be of the lever type and no higher than 1200mm measured from the floor.
Balcony & Mezzanine Floors	In the case of any interior balcony or any mezzanine floor, such balcony or floor shall be provided with a balustrade or wall not less than 1 m in height: provided that, where such balcony or floor is used for public seating in rows, such height may be reduced to not less than 800 mm opposite the seating in the front row.	

Halls		In accordance with the provisions of the National Building Regulations as set in SANS 10400-S: **SS6.** Auditoria and Halls. – Where any building contemplated in regulation **S1** contains one or more auditorium or hall fitted with fixed seating, floor space accessible to any person in a wheelchair shall be set aside for the accommodation of wheelchairs in such auditoria or halls, and – (a) such space shall be situated adjacent to an exit door, and shall be so arranged that a wheelchair will not obstruct any aisle or exit door; and (b) such space shall be of a size sufficient to accommodate: (i) one wheelchair, where the number of fixed seats for which the auditorium or hall is designed is not more than 50; (ii) two wheelchairs, where the number of fixed seats for which the auditorium or hall is designed is more than 50, but not more than 400; and three wheelchairs or a number of wheelchairs equal to 0,5% of the number of fixed seats for which the auditorium or hall is designed, whichever is the greater, where that number of fixed seats is greater than 400.
Toilet Facilities		Toilet facilities provided for the use of persons in wheelchairs shall be in accordance with the provisions of SANS 10400-S.

4.2.1.4 Lighting

1	2	3	4	5
Location/ Industries	**Type of work, task or activity**	**OHS Act Safety** Lux	**Productivity value** (min.) Lux	**Glare rating** (max.)
Offices	Entrance halls and reception areas	100	200	22
	Conference rooms, general offices, typing and filing	350	500	19
	Computer and business machine operation	500	500	19
	Drawing offices	500	750	16
Passages and lobbies	All areas	75	150	22
Stairs, escalators and ramps	General	100	150	22
Storage	General	100	200	25

1) Special attention required in respect of colour rendering

2) Supplementary local lighting might be required

A guideline for the minimum standards for offices has been drawn up, and should now be tested to streamline the result. During this stage, the results of the selected offices that were measured (as explained in the technical approach) were used to determine the level of the aspects concerned that were used in the guidelines.

An evaluation of the building – together with information obtained from Telkom's mechanical engineers and the questionnaires – was used, firstly to evaluate the guideline standards set beforehand and secondly to determine to what extent these standards are applicable in South Africa.

Chapter 5

Research Results

Conducting the POE (Post-Occupaction Evaluation) is the most important part of the research product and needs to be planned and monitored carefully. The main purpose of this step of the POE is data collection. A great deal can be learned while experiencing the building first-hand during the evaluation. Information gained through this exercise creates a more detailed anlysis of the environment, than would have been the case with data analysis alone (Preiser et al, 1988).

The data collection is done by involving the user through questionnaires and the physical measuring of applicable areas in the facility. Two of the selected company, Telkom SA's buildings were used for this investigation:

- Telkom Regional Head Office (Bloemfontein) – the smaller and less technilogical developed building; and
- National Business Solution Centre (Centurion) – the bigger and more technologically advanced building.

Both these buidings were surveyed in an identical manner to create a database that could be used in comparison to the final product: to establsh a general minimum standard of existing offices in South Africa. The purpose of this information is to determine the validity of the proposed minimum set of standards, compiled by using existing standards available in South Africa, as well as research standards set by field developed countries.

The results of these surveys are discussed in full in the course of this chapter.

5.1 Telkom Regional Head Office (RHO)

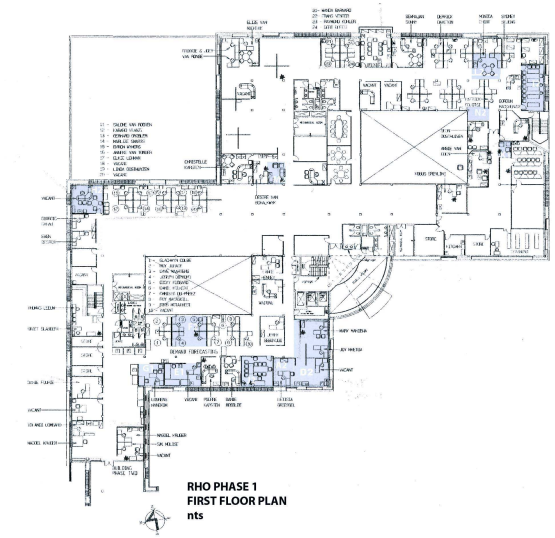
Bloemfontein

Fig. 5.1 (a): Regional Head Office Phase 1, Bloemfontein.

The Regional Head Office Phase 1 building (fig 5.1) is situated in Nelson Mandela Drive, Brandwag, Bloemfontein, in the Free State. It consists of three floors, and a basement parking area. The staff consists of 399 people in 24 different departments, with some staff members involved in more than one department, namely:

- Network Infrastructure Provisioning (NIP)
- Occupation, Safety, Health Environment
- Corporate Accounts
- Human Resources
- Employee Relations
- Debtors' Control
- Telkom Direct
- Legal Services
- Sales
- Netplan
- Radio Site Engineering
- Investigations
- Pay Phones
- Capital Work In Progress
- Resolution Centre
- Information Technology
- Centre For Learning
- Geographical Information Systems
- Regional Network Engineering

Ground floor plan (nts)



First floor plan (nts)

- Network Field Operations
- Quality Assurance
- Credit Management
- Asset Finance
- Public Policy

Staff members enter and leave the building as necessary. Most of the offices are open-plan, with enclosed offices for management. Individual workspaces are provided in both open and enclosed work areas. The total floor area (ground floor, first floor and second floor) available for useable office space is 7 232.25m^2, divided into the separate floors:

- Total for ground floor: 2 612.25m^2 (129 employees)
- Total for first floor 2 310m^2 (115 employees)
- Total for second floor: 2 310m^2 (155 employees).

5.1.1 Questionnaires Analysis

In the place of an interview, more private and timesaving questionnaires were used. These questionnaires could provide a more private and less intimidating alternative to an interview and more people could take part, which makes the results more efficient.

Of the 350 questionnaires handed out, 87 were received back – a return rate of 24,86%.
53,5% male and 46.5% female staff members answered the questionnaires. Of these, 80.3% were non-managerial, and 19.7% in managerial positions. The majority of people spend 40-46 hours per week at the office. 84% spend the full working day in the office, and 16% spend half of the day in the office and the rest of their time somewhere else, i.e. with clients or travelling. (fig.5.2)

Second floor plan (nts)

Fig. 5.1 (b): Floor plans of RHO

The questionnaires were formulated to cover the 4 categories as mentioned in Chapter 3 of this study, namely:

Category 1: Criteria on Functional Comfort

Category 2: Criteria on Employee Health, Comfort, and Social Welfare

Category 3: Criteria on Building Convenience

Category 4: Criteria on Organisational and Managerial Aspects

5.1.1.1 Category 1: Criteria on Functional Comfort

Functional comfort refers to work-related occupant requirements pertaining to comfort in the performance and completion of work. These tasks are routinely performed, and therefore determine productivity by time saving if their orientation, functionality and flow are planned well.

The aspects that affect the satisfaction of respondents' work could also be measured by the questionnaires. Figure 5.3 shows the results: 58.8% were satisfied that they could concentrate in their workspace, 23.5% were neutral, and the remaining respondents were either very satisfied or dissatisfied. Inquiries about the work method yielded the following results: 20% required no concentration when they are at work, versus the 50.6% that required 100% concentration while working. According to this information, the majority need an environment that supports concentration, and the employees were satisfied that the existing environment was suitable for this need.

Together with the report mark that was given to the organisation (66% rated it excellent), it was noted that the work process is favourable. Although ratings for the facilities were much lower, 26.7% rated the facilities average and 17.3% good, as shown in Figure 5.4 – the majority therefore has a favourable impression of the facilities.

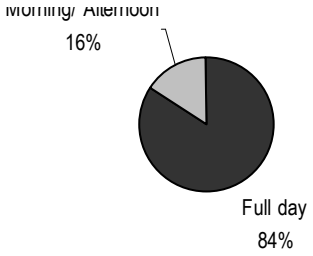


Fig. 5.2: Time spent in the office by day staff

A further 43.5% spend most their working time in the office, 13.3% spend 16-20% en route, travelling, and 8.4% spend 16-20% at another location, e.g. with clients.

According to Franklin Becker's (1995:84) 60% rule for fixed-address and free-address workspace (people who spend 60% or more of their time in the office need a permanent workspace, whereas the rest can be accommodated in temporary workspaces), the layout of the office could be changed to support this work method, so that all the available office space is used adequately.

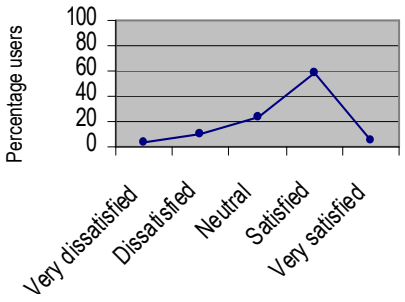


Fig.5.3: Level of satisfaction: concentration in the workspace

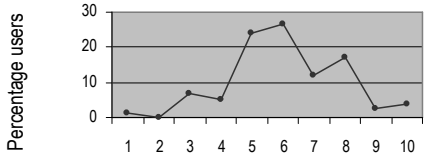


Fig. 5.4: Staff rating of facilities

Filing System (figures 5.5 – 5.8)

Relevant for the use of the filing system is the distance it is placed from the general user, and the amount and accessibility of personal and common filing space. This information is needed to help the designers to plan this facility to the benefit of the majority of users. The study indicates that 36.6% were satisfied with the amount of common filing space, 36.6% were satisfied with the personal filing space and 37.8% were satisfied with the accessibility of documentation. The distance to the filing area was satisfactory to 37.8% of the users. This information indicated that the majority of the users were satisfied with the filing system, and did not feel the need for improvement.

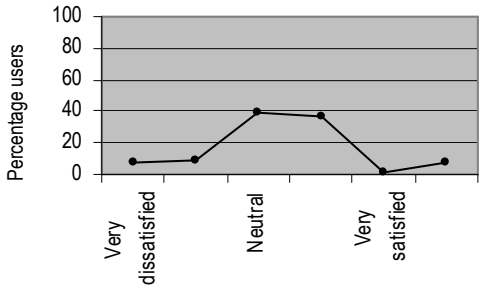


Fig. 5.5: Rating of amount of common filing space

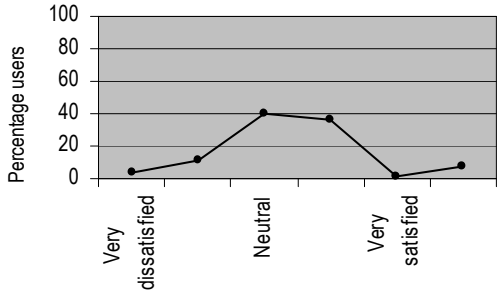


Fig.5.6: Rating of amount of personal filing space

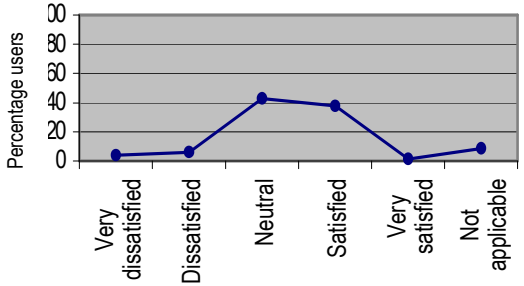


Fig.5.7: Rating of accessibility of documentation

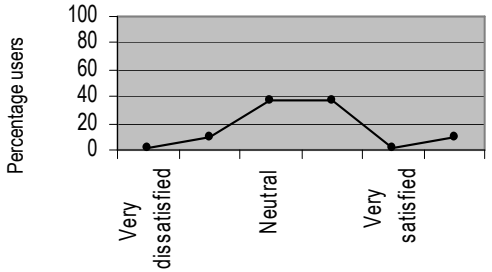


Fig.5.8: Rating of distance to filing area

Information Technology Facilities (figures 5.9 – 5.13)

The technology available in this building is experienced as follows: 66.7% of the respondents are satisfied with the computers, while 16.7% even indicated that they are very satisfied with this aspect. 27% of the users indicated their satisfaction with the laptops, where applicable. 61.9% of the users indicated that they are satisfied with the ease of using the phones, and 17.9% even indicated that they are very satisfied with this aspect, as can be expected from a phone company. The copier/fax machine/printer is easy to work with for 59.5%, and satisfactory for 59.5%.

Based on this information, it can therefore be concluded that the majority of the users experience the IT facilities as satisfying to very satisfying. The information technology is of such a standard that the users can complete their tasks successfully, and can easily exchange information to stay updated. This makes the company a competitive organisation in world-wide trade, and facilitates the exchange of information between the different departments and branches of the company, as well as outside the organisation's borders.

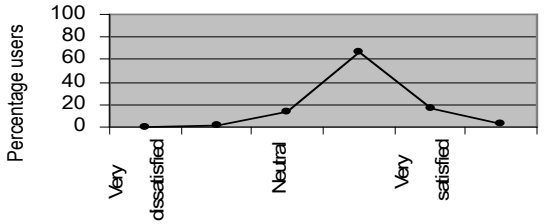


Fig.5.9: Rating of computers

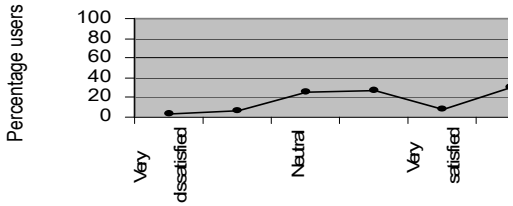


Fig.5.10: Rating of laptops

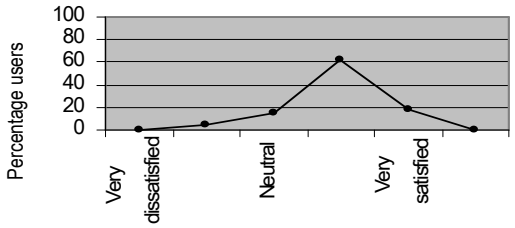


Fig. 5.11: Rating of ease of use of phones

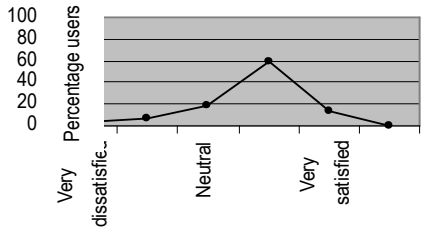


Fig.5.12: Rating of copier/fax machine/printer

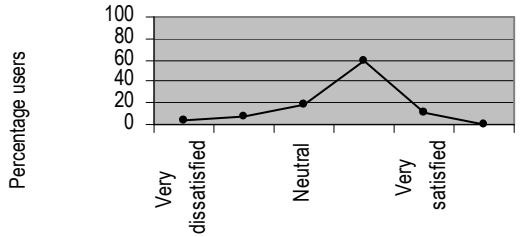


Fig.5.13: Rating of distance to copier/fax machine/printer

Communication Facilities (figures 5.14 – 5.16)

These facilities of the building are used to ease the flow of activities. Areas that serve the activities of arrival and departure, as well as the accommodation of meeting facilities, include reception, waiting areas, the lunch area and catering facilities, pause spaces, etc. – the facets of the normal work day that underlie the running of the processes and functions within the building. Lunch areas and catering facilities are experienced as very dissatisfactory by 31.3% of staff members. The provision of presentation aids is experienced as satisfactory by 52.4%. Reservation of rooms for meetings and project groups is satisfactory to 52%. The meeting, arrival and waiting areas of the building are experienced as satisfactory by the majority of the users – this therefore facilitates successful formal communication between employees of the company, at meetings with members of the organisation and outside the organisation. The lunch areas and catering facilities motivate informal communication between employees of the different departments of the organisation, and are therefore as important as the formal meeting areas with regard to supporting communication between employees, which results in better productivity due to the exchange of information that is required to improve each individual's task.

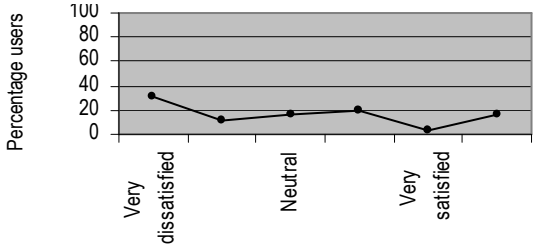


Fig.5.14: Rating of lunch and catering facilities

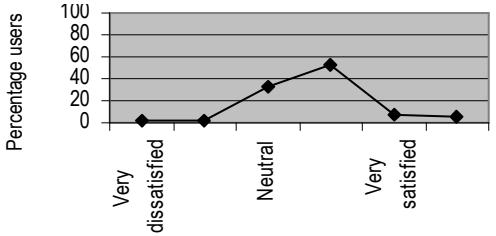


Fig.5.15: Rating of provision of presentation aids

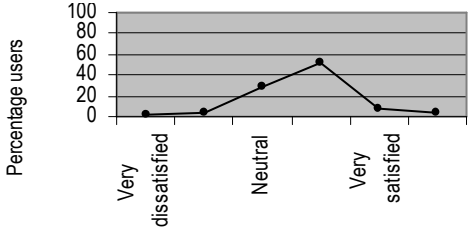


Fig.5.16: Rating of reservation of rooms

5.1.1.2 Category 2: Criteria on Employee Health, Comfort, and Social Welfare

This category includes criteria regarding workplace environment quality to ensure and maintain employee health, comfort, and wellbeing, as well as to prevent any form of discrimination.

Labour productivity is directly linked to the income and success of an organisation; therefore it is essential to have an optimum environment to encourage productivity. According to (Le Roux: 2003), most complaints about workplace environments in the Netherlands are related to health, comfort and wellbeing. This information was also included in the questionnaire, with the aim of measuring the standard of the work environment according to users' experience. The users indicated that 20.3% experience health, comfort and social welfare as neutral and 20.3% experience it as very good (fig. 5.17). This information then proves that

the majority of the users of this workplace feel that the environment supports labour productivity by providing sufficient space to perform the different tasks (tasks that require concentration, and tasks that require the communication of a group of people), as well as equipped workspaces to improve the work method, and workspaces that support and enhance the improvement of the work style of the company.

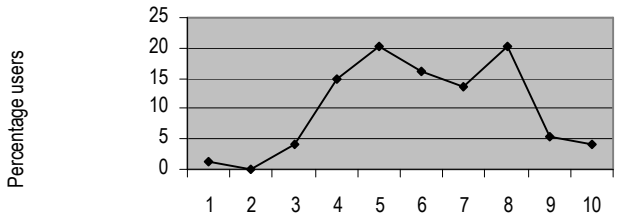


Fig.5.17: Rating of support of work environment with regard to labour productivity

In figures 5.18 – 5.22, the different aspects of the facility's space usage were rated, and the majority rated this as follows:

Accommodation

Different functions require different areas to accommodate their activities, e.g. brainstorming areas need whiteboards and space for groups of people to work informally, whereas confidential meetings need space where privacy is the focus. 50.6% of users were satisfied with areas for formal consultation, 43.5% were satisfied with areas for informal consultation, 46.4% were satisfied with office layout, i.e. the layout of individual workspaces, 51.2% were neutral about the alternating use of various workplaces, and 40.5% were satisfied with the orientation of the office, i.e. the placement of the different functions and departments of the office in relation to the users thereof.

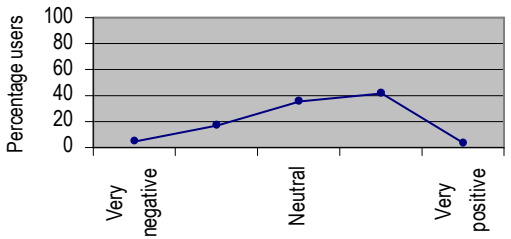


Fig. 5.18: Rating of formal consultation areas

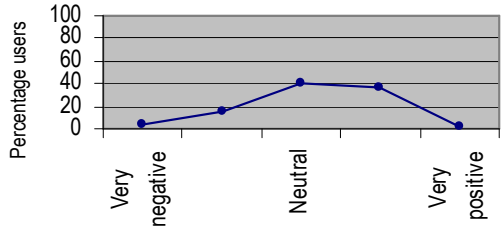


Fig. 5.19: Rating of informal consultation areas

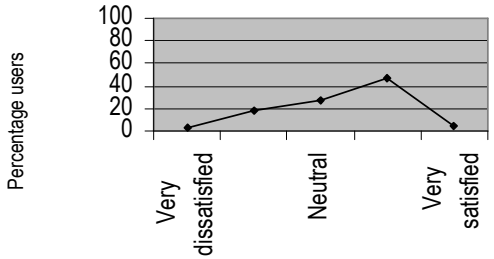


Fig. 5.20: Rating of office layout

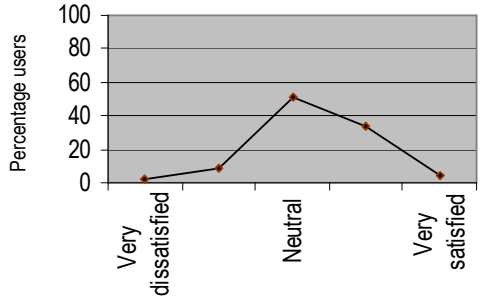


Fig. 5.21: Rating of alternating use of workspaces

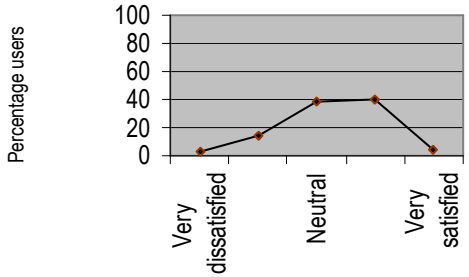


Fig. 5.22: Rating of orientation in the office

Psychological Factors (figures 5.23 – 5.30)

When employees feels dissatisfied in the area of psychology, productivity is affected. It breaks

concentration, demotivates workers and even leads to an increase in the number of sick leaves (Clements-Croome, 2000:96). 28.2% of the respondents were satisfied with the adio privacy, 42.4% were neutral about being seen by other staff members, 29.4% were satisfied about being disturbed by noise, 29.4% were neutral and 24.7% were dissatisfied. 27.1% felt satisfied about sharing a workspace, and 41.2% neutral. 24.1% were satisfied about not experiencing a sense of ownership, 33.7% were neutral and 24.1% were dissatisfied. Staff members' attitude about no distinction in workplaces according to status was 54.8% neutral and 27.4% satisfied. 40.5% of the respondents were satisfied about the space allowed for personal possessions such as photos, etc., and 44% were neutral. 50% were neutral about the degree of openness and transparency, and 25.6% satisfied. According to the majority of the users, the new workspace accommodates their work style, and creates a psychologically comfortable environment that motivates productivity. People need time to adjust to the new approach of not having a fixed-address workspace or enclosed office, so that they can learn to use the advantages of the ability to efficiently use all the different workspaces for the various functions they fulfil.

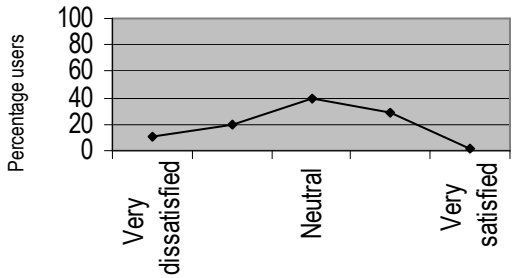


Fig. 5.23: Rating of audio privacy

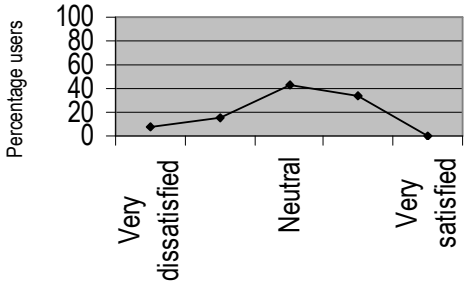


Fig. 5.24: Rating of visual privacy

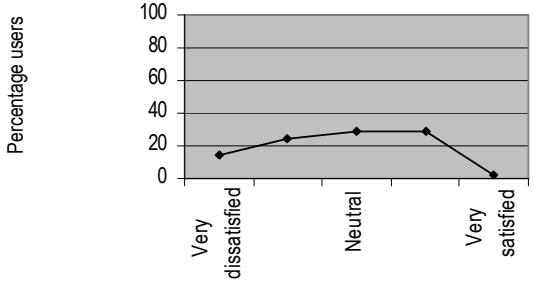


Fig. 5.25: Rating of noise disturbance

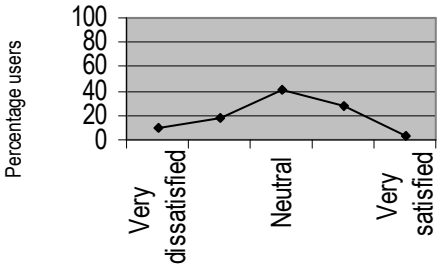


Fig. 5.26: Rating of sharing of workspaces

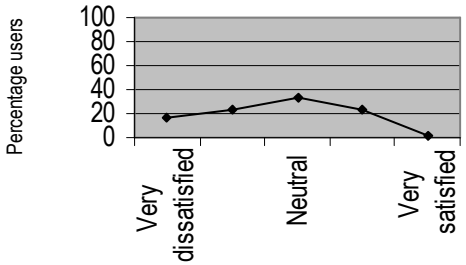


Fig. 5.27: Rating of absence of 'own place'

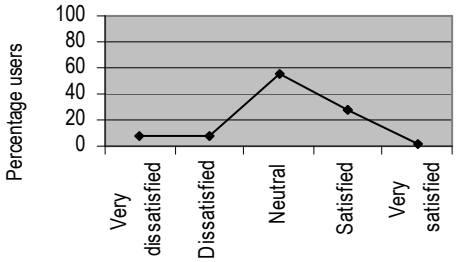


Fig. 5.28: Rating of absence of distinction in workplaces according to status

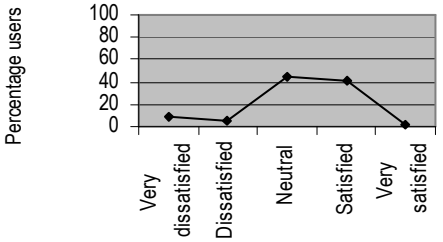


Fig. 5.29: Rating of space allowed for personal possessions

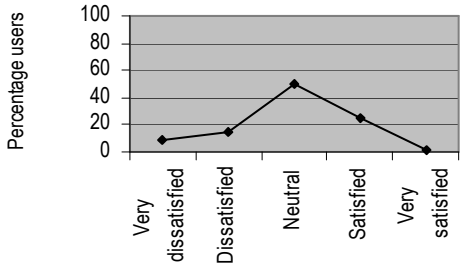


Fig. 5.30: Rating of openness and transparency

<u>*Ergonomic Aspects*</u> <u>(figures 5.31 – 5.40)</u>

An increased awareness of the importance of ergonomics in the work environment has developed since the effect of bad ergonomics became evident in the general standard of work (Galer, 1987: 2). Therefore it is very important that this aspect should be addressed in this study. The questionnaires were used to obtain the opinions of the building's users – very important information, as this could not be fully observed by the survey's physical measurement (with regard to people who do not use the building every day for an average of 46 hours a week). From this information, the study found that 52.4% of the users are satisfied with the size of the workplaces, 46.4% are satisfied with the workplace layout (arrangement of furniture) and 47.6% are satisfied with the adaptability of the workplace to specific tasks.

With regard to the furniture of the workplace, 53.6% of the respondents are satisfied with the worktop surface area, 67.3% are satisfied with the position of the monitor, keyboard and mouse, 63.1% are satisfied with the comfort level of the desk, and 42.3% are satisfied with the adjustability of the desk. 58.3% are satisfied with the comfort level of the office chair, and 87.1% are satisfied with its adjustability. 58.5% know how to adjust their furniture, 39% do it when they change workplaces and 43.4% can assume a comfortable position for all their activities. Ergonomic aids such as laptop stands are 28.9% satisfactory.

People vary in terms of height and proportions, and although two people may be the same height and the same weight, their proportions such as arm length and hand size could still differ – therefore the adjustability of furniture and other workspace elements is important in order to prevent injuries resulting from bad working postures. This work environment has the ability to accommodate the proportions of each user, according to the results from the questionnaires.

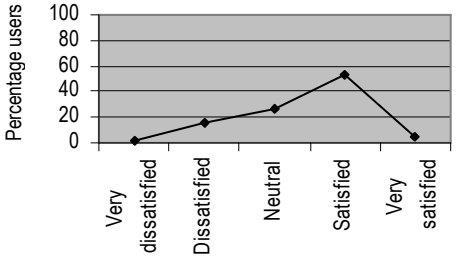


Fig. 5.31: Rating of size of workplaces

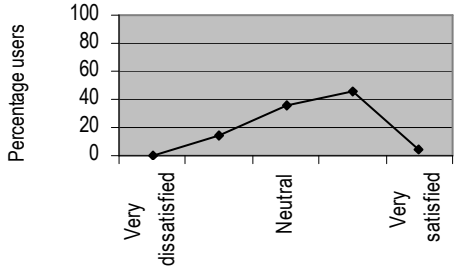


Fig. 5.32: Rating of workplace layout

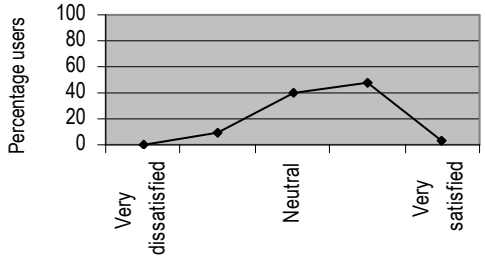


Fig. 5.33: Rating of adaptability of workplace

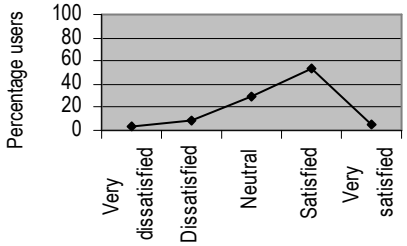


Fig. 5.34: Rating of worktop surface areas

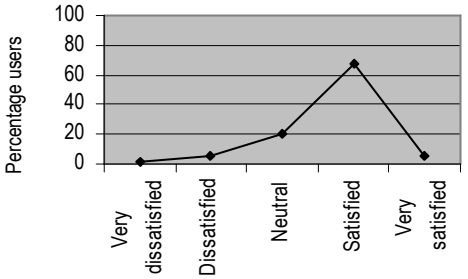


Fig. 5.35: Rating of the position of the monitor, keyboard and mouse

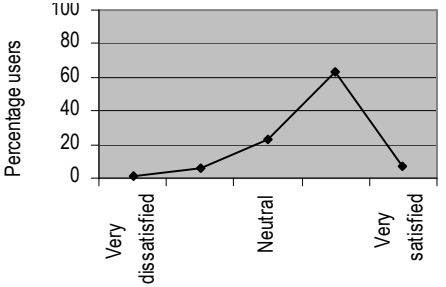


Fig. 5.36: Rating of comfort level of desk

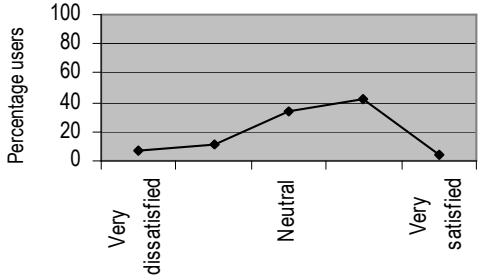


Fig. 5.37: Rating of adjustability of desk

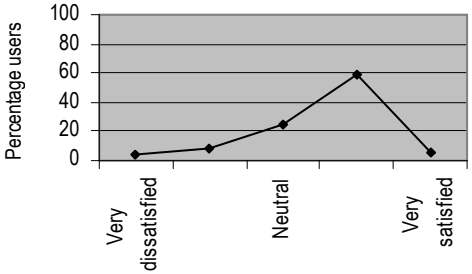


Fig. 5.38: Rating of comfort level of office chair

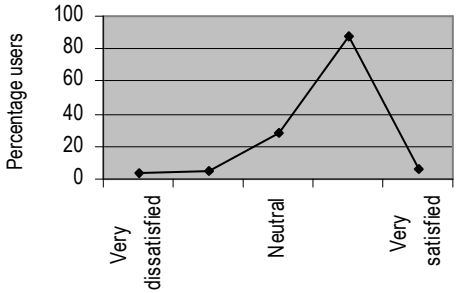


Fig. 5.39: Rating of adjustability of office chair

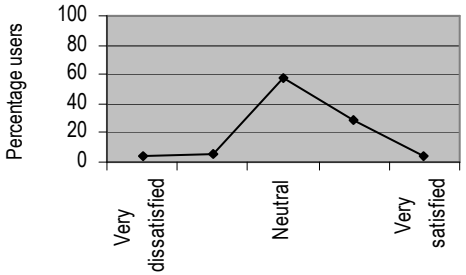


Fig. 5.40: Rating of ergonomic aids

Technical Aspects (figures 5.41 – 5.59)

Although the physical evaluation of these aspects has been done, it remains necessary to obtain the opinion of the experienced user in order to conduct a successful study. According to the users of the building, 32.1% are dissatisfied with the temperature, 26.2% experience the ventilation as satisfactory and 28.6% find the air quality dissatisfactory. The dissatisfaction with the temperature may be ascribed to the lack of ability to personally control the climate (29.8% dissatisfied). 29.8% of users have access to daylight, and although 34.5% are neutral about the ability to personally control the amount of daylight, 27.4% are satisfied with their ability in this regard.

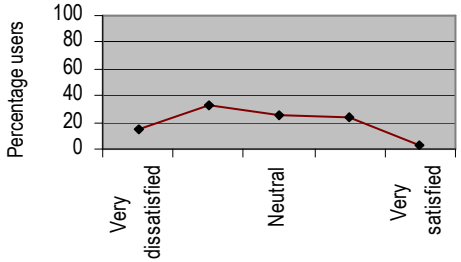


Fig. 5.41: Rating of temperature by staff members

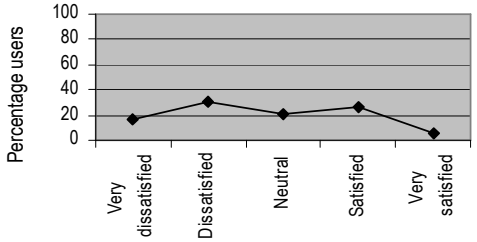


Fig. 5.42: Rating of ventilation by staff members

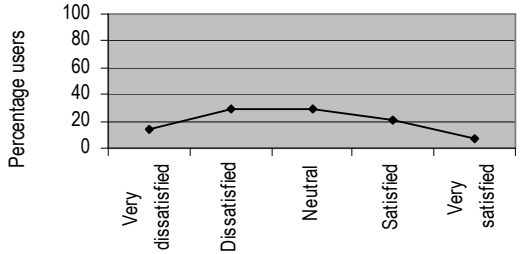


Fig. 5.43: Rating of air quality by staff members

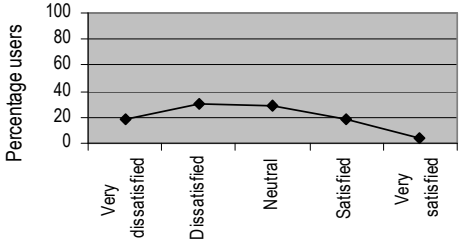


Fig. 5.44: Rating of personal control of the climate

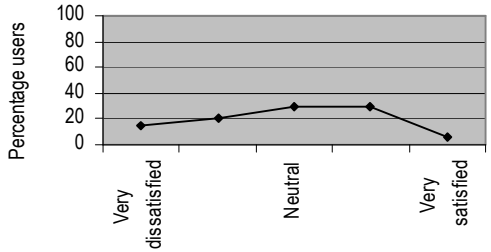


Fig. 5.45: Rating of access to daylight

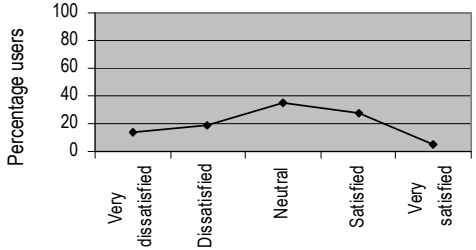


Fig. 5.46: Rating of personal control of daylight

General worktop lighting was satisfactory to 46.4% of the users, and while 22.6% were satisfied with their ability to personally control the artificial light, 48.8% were neutral on this aspect. Reflection on the monitor was not indicated as a problem, and 38.1% of the users were satisfied while 38.1% remained neutral in this regard. Although 48.1% of the users indicated that they felt neutral about acoustics, 34.9% were satisfied with the acoustics of the building, 36.6% were satisfied that they were not distracted due to the noise of air-conditioning systems, while 40.2% felt neutral about it.

These results, discussed above, together with the physical study, confirm that the light and climate of the building are according to the recommended standard and are satisfactory to the majority of the users.

Due to lack of personal control over the temperature and air quality of the building however, the climate should be set so that it is satisfactory to most of the users of the building (with the emphasis on users who are using the building 60% or longer per week), with a view to attaining a higher degree of work environment satisfaction for these users .

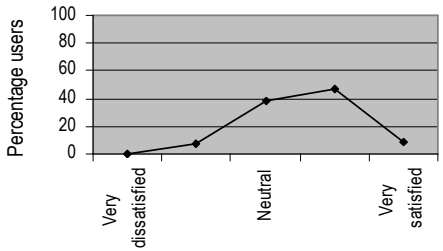


Fig. 5.47: Rating of general worktop lighting

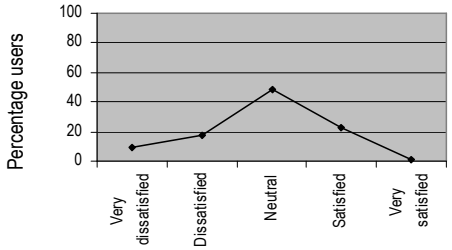


Fig. 5.48: Rating of personal control over artificial lighting

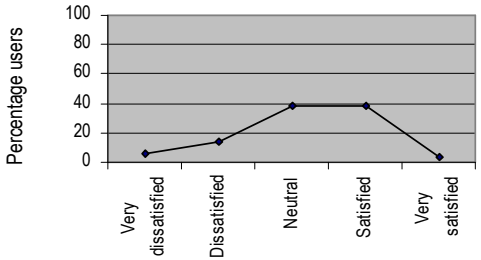


Fig. 5.49: Rating of reflection on monitor

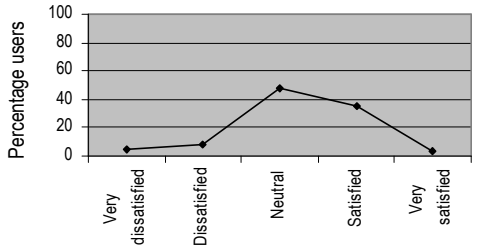


Fig. 5.50: Rating of acoustics of building

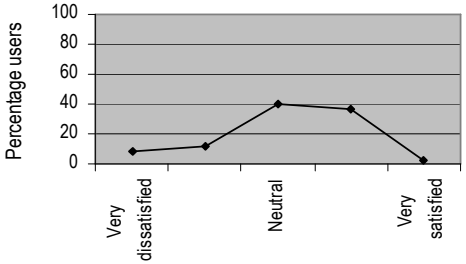


Fig. 5.51: Rating of noise due to air-conditioning

In general, the majority of the users find the workplace that the respondents wanted (49.4%), and always find a workplace for the day (60.2%). When almost all the workplaces are occupied, 30.5% find the work environment not enjoyable. 42.7% find the furnishings in the building inspirational, and 34.1% enjoy the degree of openness and transparency in the building. The openness and transparency of the building provide the opportunity for staff to engage in informal meetings as they travel through the building, which has the result of better communication between different departments of the company. A number of the users find the work environment not enjoyable, and in context of the number of staff members who prefer traditional work processes to new processes, the same people also need time to adjust their work methods to suit the new work style of the company in open-plan offices.

In general, 68% of the staff members rate the overall assessment of the facilities as average to good.

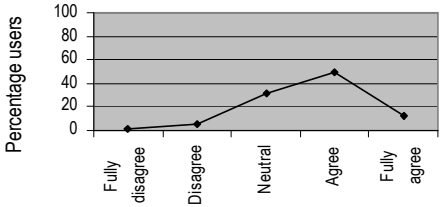


Fig. 5.52: Rating of availability of preferred workplaces

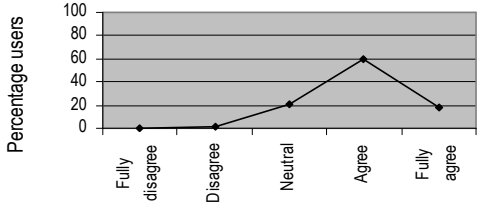


Fig. 5.53: Rating of availability of workplaces

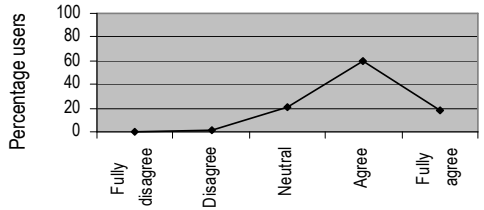


Fig. 5.54: Rating of availability of workplaces during peak times

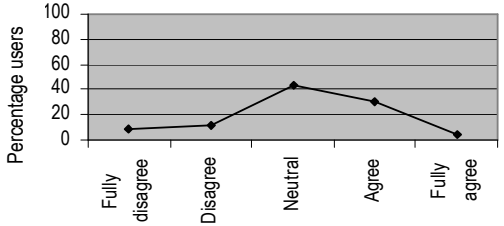


Fig. 5.55: Rating of enjoyability of work environment

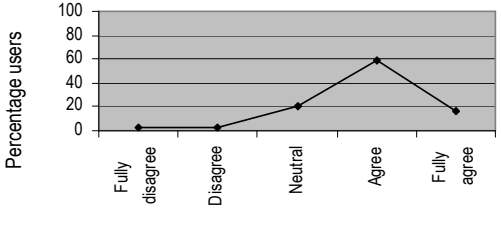


Fig. 5.56: Rating of knowledge regarding furniture adjustment

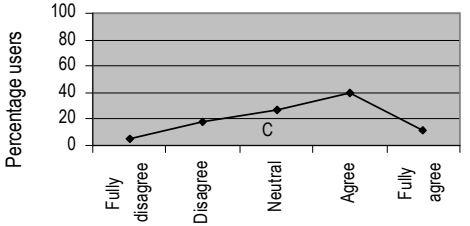


Fig. 5.57: Rating of actively adjusting furniture when changing workstations

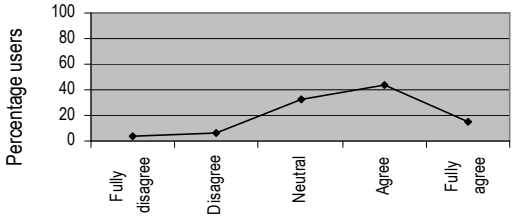


Fig. 5.58: Rating of comfortable positions for all activities

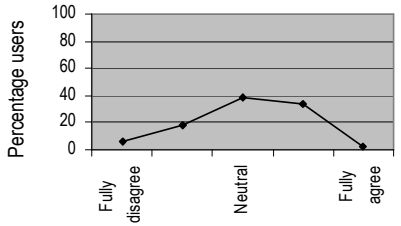


Fig. 5.59: Rating of openness and transparency of building

5.1.1.3 Category 3: Criteria on Building Convenience (figures 5.60 – 5.64)

Although criteria on building convenience do not directly impact on employees' work performance, this category includes those characteristics of the workplace environment that are considered to impact on employees' productivity by sensory stimulation, and subsequently lower their effective performance level. Such performance impediments occur through either over-stimulation (sensory overload) or insufficient stimulation (sensory deprivation), according to Smith & Kearny (1994). Decor is used to create a pleasant and aesthetic environment. The senses of a human being are always working, even while other activities are taking place. Modern technology allows simultaneous presentation of multiple sensory input (Dul & Weerdmeester, 1994: 72). In the work environment, this input should be limited to avoid sensory overload, which leads to a lower productivity level.

Continuous noise during an 8-hour working day that exceeds 80dB(A) can damage hearing, but annoyance during communication and thinking can already present at noise levels far below that (Dul & Weerdmeester, 1994:72). Noise that causes disturbance is usually noise generated by others, unexpected noise and high-frequency noise. In addition, auditory levels should not be dropped below 30dB(A), or other, distracting noise will become too obvious.

Visually, the sensory input should be limited in order to supply pause space for the eyes, especially during computer work and reading (Smith & Kearny, 1994). Prolonged close visual inspection is tiring, and the task worker should be able to look away onto a surface or out of a window at some distance, to rest the eyes. This surface should not be too bright, so that the eyes will not need to adjust when the task is resumed (Galer, 1987:130). Colour draws attention and should therefore be used appropriately, especially since colour has an emotional connotation – e.g. red represents danger and green safety.

Aesthetic aspects in the work environment are are considered to be an individual experience. Therfore it is an impossible task to maintain every staff member's standard. However, as this is a place where people work, and spend a great portion of their working day, it remains essential to create conditions that will be satisfactory to the majority of users. In this building, it was found that 42.9% of the staff were neutral about the use of materials (glass, wood, metal etc.) in furnishings and 44% satisfied, while 51.2% were neutral and 33.3% satisfied about the use of colour in the interior. The response to the use of decor (art, plants, etc.) in the interior was 51.2% neutral and 34.5% satisfactory, whereas architecture as a whole was perceived as 46.4% neutral and 35.7% satisfactory. Regarding the view from workspaces, 34.9% of staff members were neutral and 27.7% satisfied. There was no strongly announced discomfort or annoyance with the building convenience as a whole, and therefore it could be argued to be successful because the majority of the users of the building, are pleased.

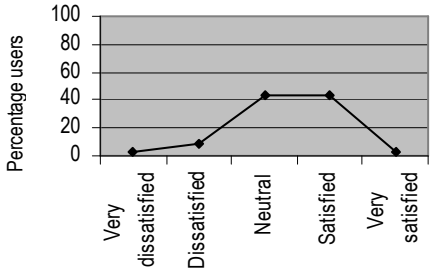


Fig. 5.60: Rating of use of materials in furnishings

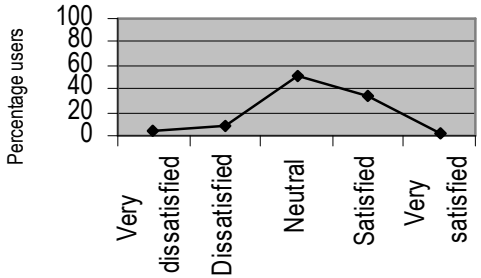


Fig. 5.61: Rating of colour in the interior

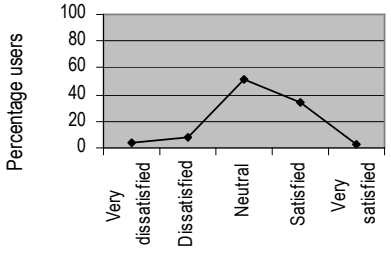


Fig. 5.62: Rating of use of décor in furnishings

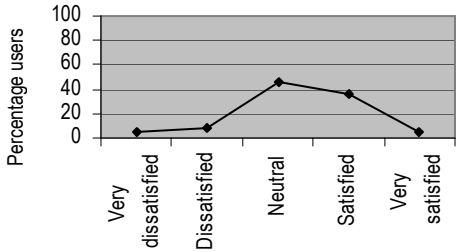


Fig. 5.63: Rating of architecture as a whole

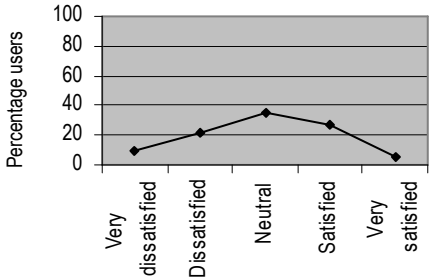


Fig. 5.64: Rating of view from workspace

5.1.1.4 Category 4: Criteria for Organisational and Managerial Aspects (figures 5.65 – 5.66)

Facility Management and organisational aspects are linked through organisational effectiveness and the overall management of workplace environment resources. The transparency and hierarchy (or the lack therof) of the manegerial style should be visible in the building envelope. The more contemporary managment style regcognises the qualities of individuals to achieve goals as a group. This improves productivity by sharing the responsibility amongst the whole staff, a motivation to stronger commitment by each staff member (Clements-Croome, 2000).

According to the questionnaires, the respondents characterise the organisation as hierarchical (27.3%), open (23.9%), centralised (23.5%), formal (20%), dynamic (20.3%), progressive (15.4%), monitoring output rather than attendance (15.6%), checking quality rather than time (23.4%), and national rather than international (39.1%). This indicates that the organisation is not traditional in its work process, and has already seen the advantages of the new work style accommodation.

Since the change in hierarchy in the office was implemented in the new office work style, where the focus is placed on the quality of the work and the end product, and all employees share the responsibility, it became necessary to involve the users of the planning of the workplace environment. The person who uses the environment wants to share in the planning thereof. According to the questionnaires, 80% of the staff were excluded from the planning and concept design of the workplace, and the majority rated it as unsatisfactory to poor. When people are excluded from decision-making, it is more likely that they will be more critical of the implementation, therefore it is important to include the affected staff in the planning and decision-making.

To conclude the questionnaires, the users were asked to what degree they agree with specified statements such as: the work environment contributes to general wellbeing, offers a pleasant atmosphere, is appealing to visitors and customers, and is safe. The majority of staff members agreed with all these statements, and experience the work environment as an excellent showpiece for the organisation. As was the case with the NOPA, this positive work environment motivates the employees to perform better in reaching the organisational goal, by creating a productive workspace.

Although the majority rated the organisation as hierarchical, the new concepts of openness and transparency, that the organisation is progressive, monitors output rather than attendance and checks quality rather than time, are experienced by 66.2% of the users, while the traditional work process was favoured by 9.1%. The traditional work style is replaced by the more dynamic and product-orientated work method, and therefore the work environment suits the work style. This, according to the users, is a productive work environment.

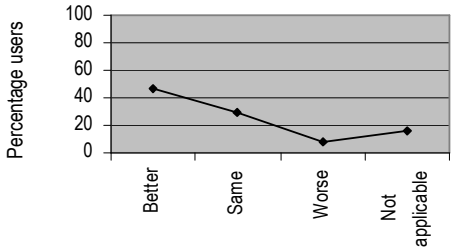


Fig. 5.65: Rating of staff who preferred the contemporary work process

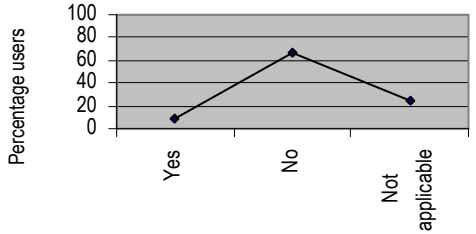


Fig. 5.66: Rating of staff who preferred the traditional work process

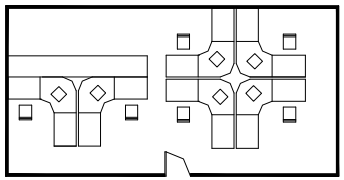


Fig.5.67: Average open-plan workspace

5.1.2 Physical measurements

37 offices were measured. The offices used are shown on the plan in Addendum D. The average individual open workspace area is 7.39m^2, compared to the average enclosed workspace area, which is 18.75m^2.

The workspace utilisation ratio – the relationship between the number of workspace settings provided and the number of employees accommodated – for the overall office was 87.5%. Office space was divided into both open and enclosed workspaces, with meeting spaces distributed throughout the building. There are 352 (85.02%) open-plan offices and 48 (11.59%) enclosed offices, and the remaining 14 spaces (3.38%) are support spaces that include meeting and brainstorming areas.

The interior finishes include painted walls, and tiles and carpeting on the floors in the circulation and office areas respectively. The partitioning was done according to the palette of the office, namely teal with navy blue and grey. The height of the partitioning was measured at 1500mm. The furniture of the building is first- and second-generation furniture, which means that it is ergonomically challenged and did not develop with time. (Fourth-generation furniture exist, with airflow provided in the leg space under the desk and desktops

	Workspace	Description
A	1-person space	Enclosed workspace with temporary meeting space
B	Silent Workspace	Enclosed workspace for temporary use by 1 person
C	2-person space	Enclosed workspace for 2 persons
D	Team space	Enclosed workspace for 3 or more persons
E	Open workspace	Open workspace for more than 3 persons
F	Half-open workspace	Half-open space for multiple persons. Half-height sides used to separate individual workspaces of groups
G	Lounge workspace	Open workspace with 1 counter for multiple persons' temporary use
H	Small meeting space	Enclosed space for meetings between 2-4 persons
I	Large meeting space	Enclosed space for meetings between more than 4 persons
J	Brainstorming space	Enclosed space for brainstorming, with whiteboards, etc.
K	Open meeting space (small)	Open meeting space for short meetings between 2-4 persons
L	Open meeting space (large)	Open meeting space for informal meetings. Can also be used as workspace.
M	Informal meeting space	Open space with table at standing height or couches, for quick and easy meetings
N	Print/copy space	Enclosed or half-open space for printing and copying
O	Dynamic archive	Enclosed or open space for the storing of documents that are used regularly
P	Pigeon holes	Enclosed or open space for the separation of incoming post to workers or departments
Q	Waiting/ reception space	Area for visitors to wait for their appointments after arrival
R	Personal storage space	Area where workers can store their belongings before they go to their flexible workspace
S	Pause space	Open space close to pantry to pause or meet informally
T	Smoking area	Enclosed space for smokers

Fig .5.68: Workspaces to be measured

and the chairs being fully adjustable to the user's individual needs.) Unfortunately first-generation furniture was not designed to accommodate the individual user. Some desks are not adjustable, and the modesty panel and side panels block airflow and restrict movement when sitting. The questionnaires indicate that this does not appear to be a problem for the users. The average depth of an open-plan workspace (measured from one end of the desk to the other end, after the L-shaped angle) is 1 800m – fig. 5.67.

The physical measurement part of the survey was done according to the building, i.e. where identical floors were found (as was the case with RHO Phase 1), representative samples were obtained from each floor (described in fig.5.68). Each workspace was identified on the plan, and the actual space, heights, sizes of furniture, circulation and lighting, etc. were subsequently measured. Three examples of each space were used to establish a general standard. From these measurements, the following information was obtained:

5.1.2.1 Ceiling height:

The average ceiling height is 2 500 mm, with the lowest being 2 470 mm. This height is fully compliant with the given regulations: 2 400 mm of the National Building Regulations (NBR).

5.1.2.2 Minimum length of workspaces:

The recommended minimum length for workspaces was set at 1 200 mm as prescribed in the NBR, and all the workspaces were compliant with this length.

5.1.2.3 Door openings:

The recommended minimum for door openings is 800 mm (NBR). The reason for this measurement is to accommodate people who are carrying items such as files, as well as people in wheelchairs. This is the minimum width a wheelchair can fit through, and therefore it is very important to comply with this requirement. Measurement showed that average door openings were compliant with this recommendation, but 5% were too small. The openings that were too small were situated in open-plan areas where the partitioning formed the opening; therefore it could be fixed reasonably easily.

Per floor			Recom-mended minimu m value
	Placement:	Roof	
	Cooling Capacity:	413kW	
	Airflow/$m^{2.}$	86 l/s	
	Airflow (fresh air):	300 l/s	7.5 l/s
	Airflow (fresh air) per person	10 l/s/per-son	5 l/s/pers on
	Total cooling capacity of building	1366kW	

Fig 5.69: Technical information regarding air-conditioning units

5.1.2.4 Light quality:

The light quality was measured in the different work areas of the workspaces, i.e. task lighting with visual display unit (VDU), task lighting without VDU, and general lighting of the area. Where available, all of these readings were taken alternatively with the window covering open and closed. The results showed negative areas where the lighting is insufficient and some places where it is too bright, with resulting glare on VDUs. The building openings are exposed to direct sunlight on the north side, east side (in the mornings) and west side (in the afternoons). This results in bright workplaces.

5.1.2.5 Primary circulation: (see plan: Addendum D)

The staircases and main circulation areas were measured. The average staircase measured 1 480 mm in width, with treads 300 mm deep and risers 170 mm high. A flight of stairs consists of 10 steps. Balustrades are 1 030 mm high, with openings of 90 mm. All these measurements are according to the National Building Regulations.

Corridors are divided into two sizes, primary and secondary. The entire building's users use the primary corridors, whereas secondary corridors are mainly for the users of the workspaces concerned. For this reason, the secondary circulation corridors are measured with the specific workspaces. The primary corridors measured 1 800 mm wide and, where columns were placed, this was narrowed down to 1 420mm. The recommended width for primary circulation is 2 100 mm, which leaves the building with a disadvantage in this area. Due to the number of people working in the building it is necessary to comply to these minimum standards – not only is this more ideal for carrying the amount of traffic, it is also very important with regard to safety implications. Primary circulation will be used as part of the emergency route, and therefore needs to be able to maintain the flow and allow the users to move as rapidly as possible to the nearest emergency exit without blocking the traffic.

5.1.2.6 Air-conditioning and air quality:

As everyone's judgement of a comfortable air temperature differs considerably, it is impossible to satisfy all the users in an office building, especially in an open-plan office – therefore a general regulation was

formulated, based on the sources, to comply with the suggested minimum standards. According to those standards, the building complied with the requirements to satisfy the general user. Although it complies with the minimum standard, the temperatures measured are at the maximum level allowed (24^{o}C), and a majority of users complained about the temperature – it can therefore be concluded that the temperature should be set lower, between 18 and 24^{o}C, at a level with which most users will be comfortable.

The air-conditioning system of this building is designed to service each floor separately.As mentioned in Chapter 2 of this study, of the 4 aspects of desirable comfort levels regarding climatic conditions, namely air temperature, radiant temperature, air humidity and rate of air movement, the most important aspect is air temperature. Therefore the average temperature of the building is an important figure. This information was obtained by taking the temperature reading of each floor, every ten minutes, over three days. Based on this information, the average temperature was established to be 23.96^{o}C, which means that this building complies with the recommended 24^{o}C. Measurements of the air quality and air-conditioning complied with the recommendations (fig.5.69). Physical measurements are within the minimum regulations, but the majority of users find the temperature and air quality dissatisfactory due to the lack of personal control over the climate – a problem that occurs in open-plan offices, as these spaces cannot be made suitable for each individual, but must meet the needs of the majority.

5.1.2.7 Facilities for universal access:

The regulations for these facilities are thoroughly discussed in the National Building Regulations (NBR); therefore they need not be included in the regulations for offices. However, this remains an important area to measure when doing the POE. The facilities in this building comply with the regulations of the NBR. The workplace does accommodate disabled users by providing sufficient toilets and lifts to enable travelling between different floor levels. However, the size of circulation routes still needs to be investigated, especially with regard to primary circulation, since the NBR only states sizes for residential users and the amount of office traffic needs to be adjusted – thus the suggested 2 100 mm.

5.2 Telkom National Business Solution Centre (NBSC)

Centurion

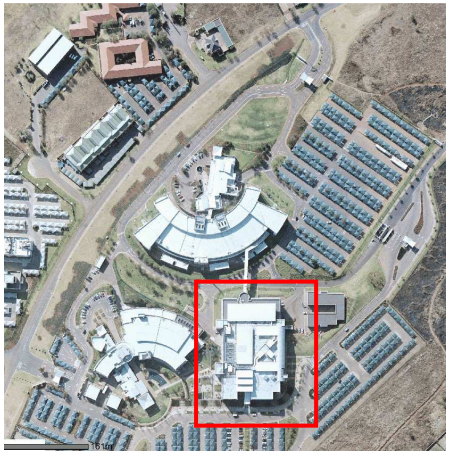


Fig. 5.70 (a): Arial Photo of Telkom Facilities, Centurion (NBSC in red rectangle) Retrieved 11 December 2007 from the World Wide Web: http://www.tshwane.gov.za/street search.cfm

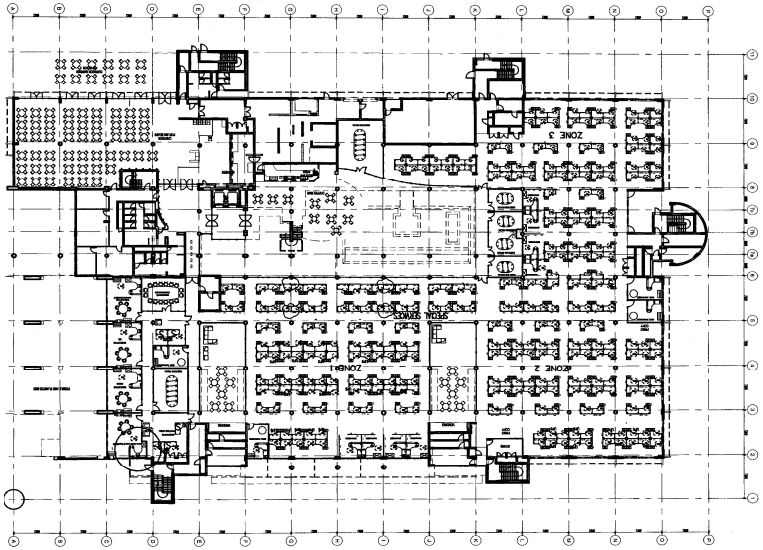
Fig.5.70 (b): Telkom National Business Solution Centre (Centurion)

The Telkom National Business Solution Centre building, situated at 55, 61, 91 Oak Avenue, Centurion, was built in 2005. The building consists of four floors, and accommodates 1 350 people who enter and leave the building at various times during the day. Most of the offices are open-plan, with enclosed or semi-enclosed offices according to hierarchical appointment within the company.

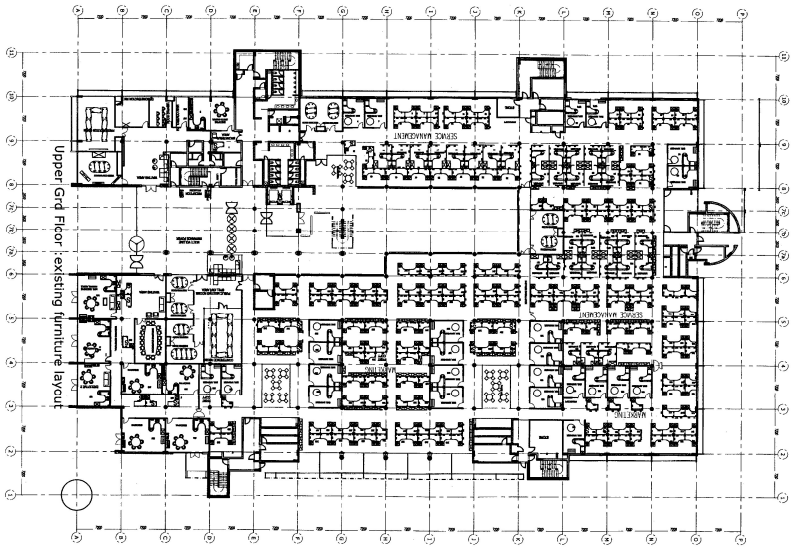
The total floor area available for useable offices space is 19211.04 m^2, divided into the following separate floors:

- Total for lower ground floor: 5 166.72 m^2 (342 employees)
- Total for upper ground floor: 5 184.00 m^2 (348 employees)
- Total for first floor: 4 428.00 m^2 (363 employees)
- Total for second floor: 4 432.32 m^2 (283 employees)

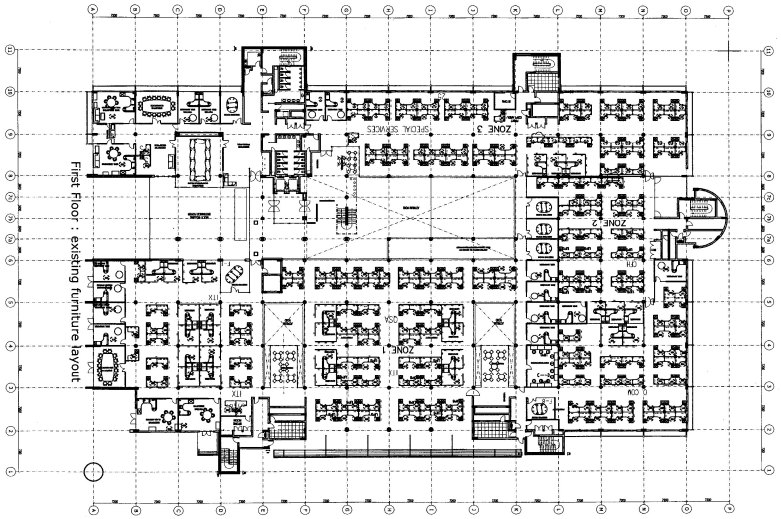
The Telkom NBSC was different from RHO Phase 1 in Bloemfontein, as the four floors house different activities. We identified 3 of each of the workspaces in discussion, and measured them (floor area, circulation, furniture sizes, lighting levels (lux) etc.), but not necessarily on different floors, as departments were placed together.



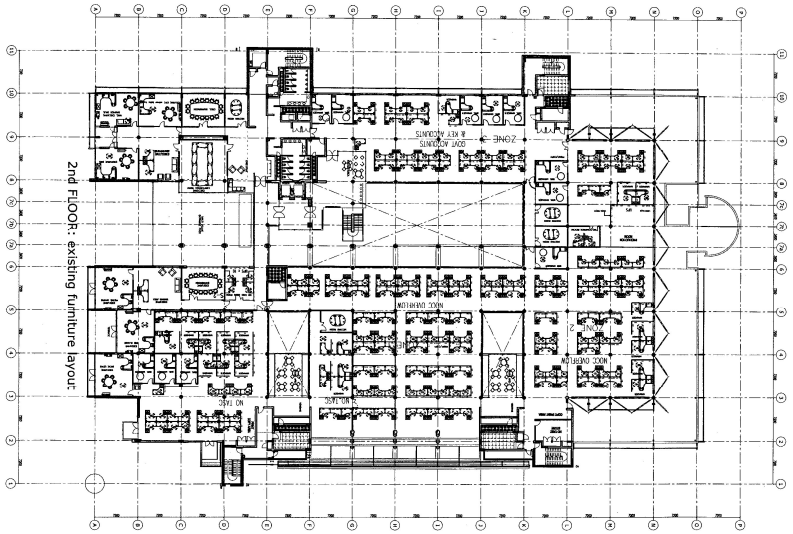
Lower ground floor (nts)



Upper ground floor (nts)



First floor (nts)



Second floor (nts)

Fig. 5.71: Floor plans of Telkom NBSC

5.2.1 Questionnaire Analysis:

In the place of an interview, more private and timesaving questionnaires were used. These questionnaires could provide a more private and less intimidating environment to an interview and more people could take part, which makes the results more efficient.

Of the 350 questionnaires handed out, 47 were received back – thus a return rate of 13,43%. 72.3% male and 27.7% female staff members answered the questionnaires. Of these, 70.2% were in non-managerial and 27.8% in managerial positions. The majority of users spend 40-50 hours per week at the office (fig. 5.72). 86% of the staff spend the full working day in the office, and 14% spend half of the day in the office and the rest of the time somewhere else (fig.5.73).

The questionnaires were formulated in exactly the same way as those used in Bloemfontein, to ensure an accurate comparison.

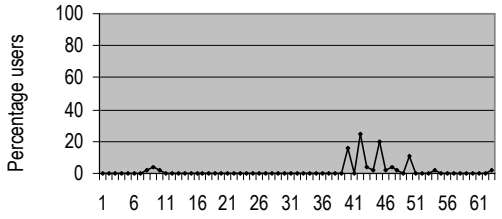


Fig.5.72: Time spent in office

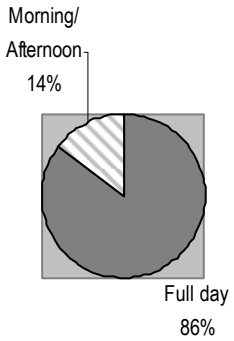


Fig.5.73: Portion of day staff spend in the office

5.2.1.1 Category 1: Criteria on Functional Comfort

Functional comfort refers to work-related occupant requirements pertaining to comfort in the performance and completion of work. The 60% rule for fixed-address and free-address workspace would influence the layout of the office, which could be changed to support this work method so that all the available office space is used sufficiently.

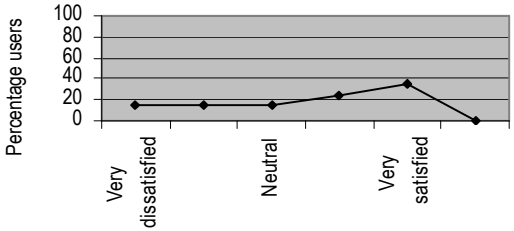


Fig.5.74: Staff rating of common filing space

Filing System (Figure 5.74 – 5.77):

In contrast with Bloemfontein, there are more storage and filing facilities that are distributed throughout the building. The system accommodates the different departments, and was placed close to the users. The study indicates that 34.9% were very satisfied and 23.3% were satisfied with the amount of common filing space, 22.2% were satisfied with the personal filing space and 22.7% were satisfied with the accessibility of documentation. The distance to the filing area was satisfactory to 31.1% of the users, and very satisfactory to 37.8%. This information indicated that the majority of the users are very satisfied with the filing system, and do not feel any need for improvement.

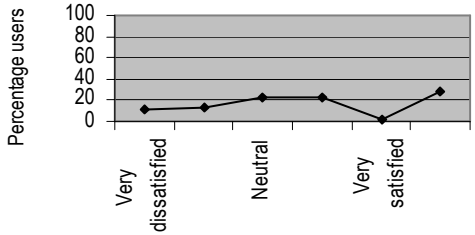


Fig.5.75: Staff rating of personal filing space

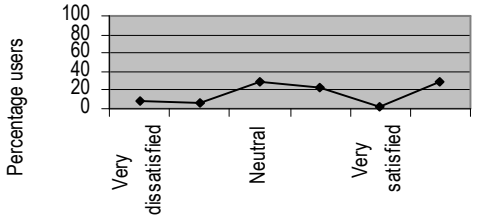


Fig.5.76: Staff rating of accessibility of documentation

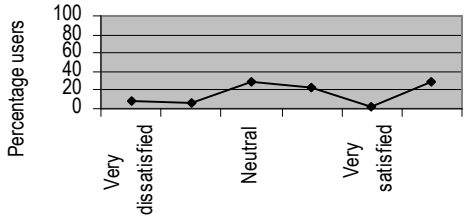


Fig.5.77: Staff rating of distance to filing area

Information Technology Facilities (figures 5.78 – 5.82):

This building is technologically more developed than RHO Phase 1. It is a newer building, and therefore the technology aspects played a bigger role in the planning and implementation. The different meeting rooms and brainstorming areas were more suitable for the use of computers and other digital appliances. The technology available in this building is experienced as follows: the computers were rated as satisfactory (58.7%). The laptops, where applicable, are satisfactory to 34% of the users. Ease of use regarding the

phones is satisfactory to 73.9% of the users, and even very satisfactory to 15.2%. The copier/fax machine/printer is easy to operate to 57.4%, and satisfactory to 52.2%. The conclusion can therefore be reached that the IT facilities are satisfactory to very satisfactory to the majority of the users. People in this region are more open to technology, as it is a fast-moving and very competitive region, unlike Bloemfontein. This also plays a role in the perception of technology. The information technology is of a high standard – users can complete their tasks successfully, and they can easily exchange information to stay updated. In some cases, however, the users are not fully trained in the use of the technologies that is available to them and some of the advantages are therefore lost, e.g. the system for white noise installed in the building remains unused, due to the lack of knowledge regarding how to control the system.

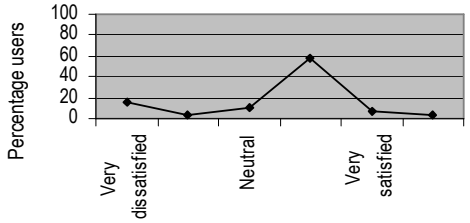


Fig.5.78: Staff rating of computers

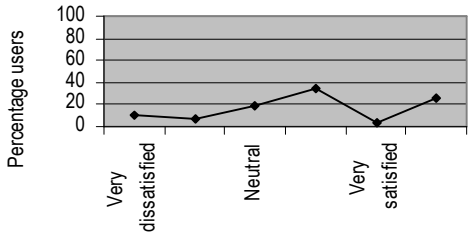


Fig.5.79: Staff rating of laptops

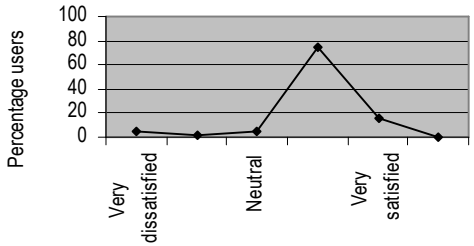


Fig.5.80: Staff rating of ease of use regarding phones

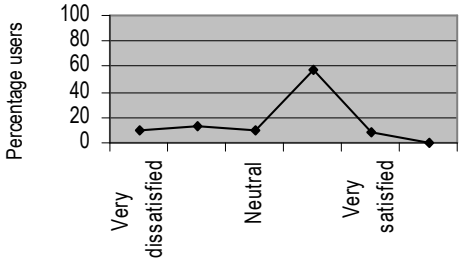


Fig.5.81: Staff rating of ease of use regarding copier/fax machine/printer

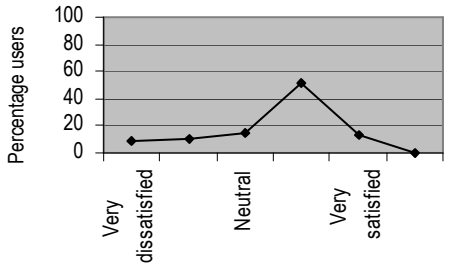


Fig.5.82: Staff rating of distance to copier/fax machine/printer

Communication areas (figures 5.83 – 5.85)

The waiting, meeting and circulation areas of this building are designed as per user requirements. Since there are 1350 users of the building, it is important that these services are able to smooth out the process in order to prevent usage problems such as double bookings of meeting facilities. The lunch area and the catering facilities are well planned for each wing and floor of the building; these facilities are easily accessible and provide adequate space to take time out and pause for breaks. In contrast with Bloemfontein, 50% of the users indicated that they are satisfied with these facilities. The provision of presentation aids is experienced as satisfactory by 33.3%, a lower value in view of the larger group of users, which creates a greater potential for problems. Reservation of rooms for meetings and project groups was rated as satisfactory by 42%. The majority of the users experience the communication areas of the building as satisfactory. The users are able to pause when needed, and these areas also support informal communication. Areas for formal meetings are easy to use and are therefore used regularly, and without complications – this has a significant timesaving effect.

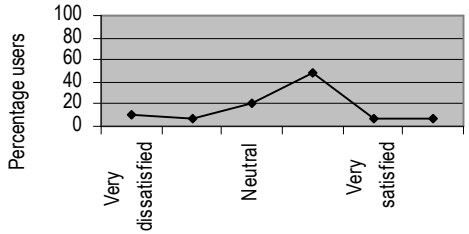


Fig.5.83: Staff rating of service facilities

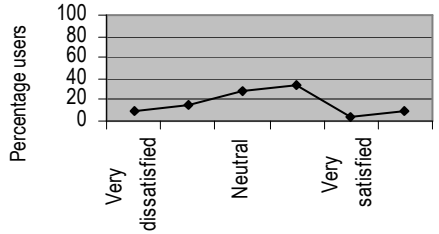


Fig.5.84: Staff rating of provision of presentation aids

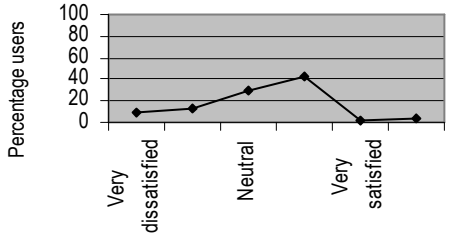


Fig.5.85: Staff rating of reservation of rooms for group projects and meetings

5.2.1.2 Category 2: Criteria on Employee Health, Comfort, and Social Welfare

Although this criterion is much more developed than in Bloemfontein due to the newer building and the awareness of these aspects when the planning was done, the user experience differ. Figures 5.86-5.87 show the results: 23.4% were satisfied that they could concentrate at their workspace, 21.3% were neutral, and the rest were either very satisfied or dissatisfied. The report score given to the organisation is much lower than in Bloemfontein. 22.5% experienced it as average, and 22.5% as just above average. When asked about their work method, the responses were as follows: 2.4% required no concentration while at work, versus the 50.6% who required 100% concentration while working.

Information about health, safety and wellbeing was obtained through the questionnaire (fig 5.88). The results indicate that 22.5% experience these aspects as above average, and 22.5% as good. This information thus proves that the majority of the users of this workplace feel that the environment supports labour productivity.

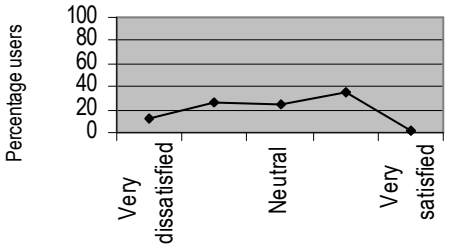


Fig.5.86: Rating of ability to concentrate in workspace

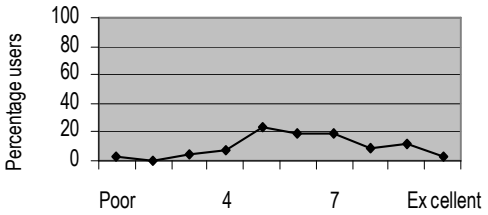


Fig.5.87: Staff report score regarding overall assessment of work process

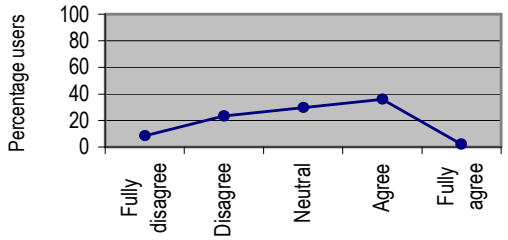


Fig.5.88: Staff rating of health, safety and wellbeing regarding the building.

Accommodation (figures 5.90 – 5.96)

A further 31.1% spend most their working time in the office, 20% spend 6-10% of their time en route, travelling, and 25% spend 6-10% of their time at another location, e.g. with clients.

Areas for formal consultation were rated as satisfactory (61.7%), areas for informal consultation were rated as satisfactory (63.8%), office layout was experienced as satisfactory, dissatisfactory and neutral by 25.2%, alternating use of various workplaces was rated as neutral (40.4%) and satisfactory by 30.9%, and orientation in the office was experienced as neutral (38.3%) or satisfactory (36.2%) by most of the users. The availability of workspaces was no problem in a building of this size, and the positioning of the different work areas in relation to one another was done in such a way that it had a positive influence on productivity, as specialised areas such as printing, copying and storage were easy to reach, thus saving time.

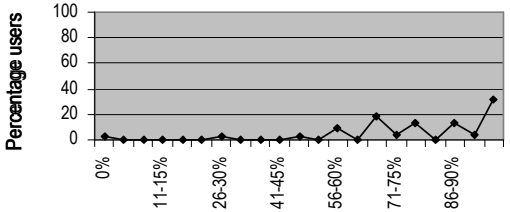


Fig.5.89: Spending time in the building.

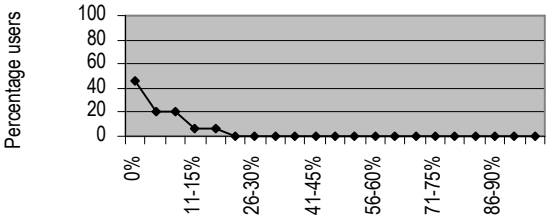


Fig.5.90: Spending time en route and travelling.

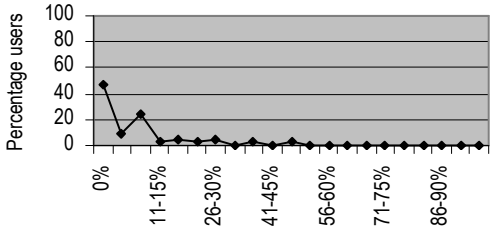


Fig.5.91: Spending time at another location, e.g. with clients

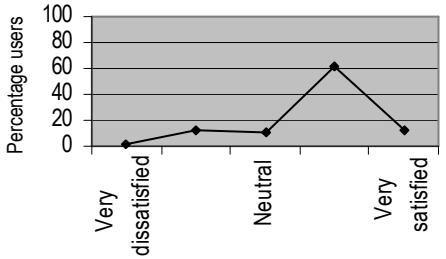


Fig.5.92: Staff rating of formal consultation areas

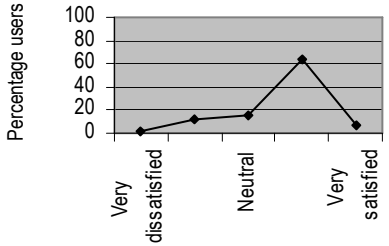


Fig.5.93: Staff rating of informal consultation areas

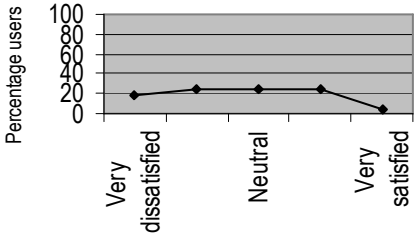


Fig.5.94: Staff rating of office layout

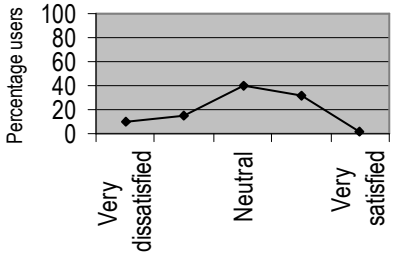


Fig.5.95: Staff rating of alternating use of various workplaces

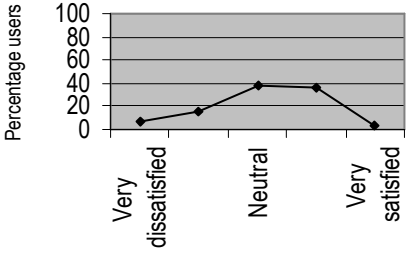


Fig.5.96: Staff rating of orientation in the office

Psychological Factors (Figures 5.97 -5.103):

The open-plan layout played a bigger role in dissatisfaction among users of this building than in Bloemfontein. 30.4% were dissatisfied that others could hear them, 31.9% were neutral and 27.7% were dissatisfied about being seen by other staff members; 37% were dissatisfied about being disturbed by noise, and 26.1% very dissatisfied. Regarding the sharing of a workspace, 23.4% were satisfied, 23.4% neutral and 27.7% dissatisfied. Regarding not having an 'own place', 22.2% were satisfied, 33.3% neutral and 24.4% dissatisfied. Staff members' attitude regarding no distinction being made in workplaces according to status was 39.1% neutral and 28.3% satisfied. 38.3% of users were neutral and 23.4% satisfied regarding the space allowed for personal possessions such as photos, etc. The degree of openness and transparency was experienced as neutral by 38.3%, and satisfactory by 27.7%. The absence of privacy played a significant role in the degree of dissatisfaction among users with the open-plan layout. During the physical measurement, contact with the users revealed that specific tasks that require greater confidentiality than others were placed in the opening with a double volume above – this intensified the problem by being placed on display, thus with no visual or auditory privacy. The settings should be considered thoroughly when placements are made, in order to avoid this problem.

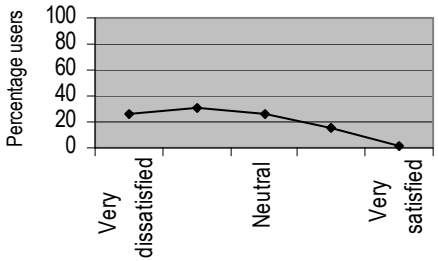


Fig.5.97: Staff rating of auditory privacy in workspace

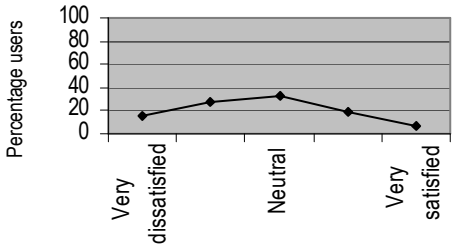


Fig.5.98: Staff rating of visual privacy in workspace

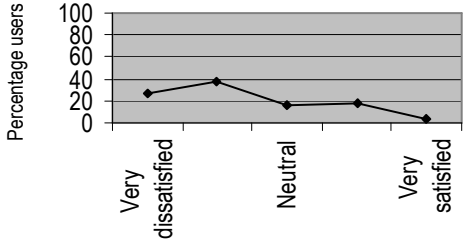


Fig.5.99: Staff rating of noise disturbance in workspace

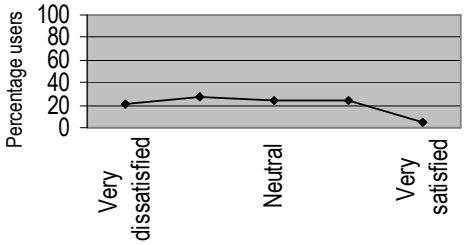


Fig.5.100: Staff rating of shared workspaces

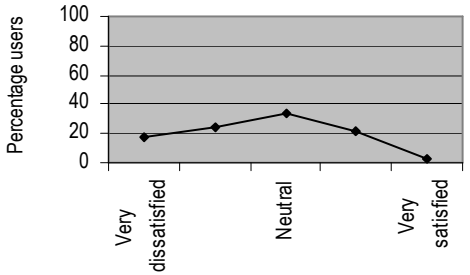


Fig.5.101: Staff rating of absence of 'own place'.

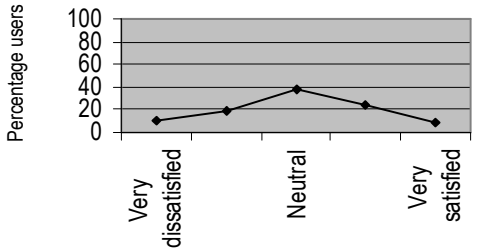


Fig.5.102: Staff rating of space allowed for personal possessions

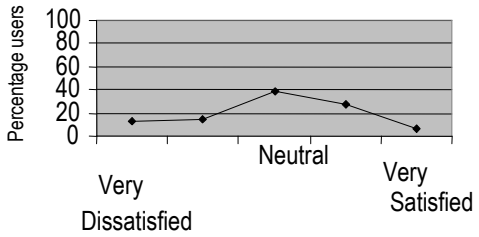


Fig.5.103: Staff rating of degree of openness of organisation

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*Ergonomic Aspects (*figures 5.104 – 5.113)

The opinions of the building's users could be obtained from the questionnaires – very important information, as this could not be fully observed by the survey's physical measurement (people who do not use the building every day for an average of 45 hours a week). Based on this information, it was found that 39.1% of the users are satisfied with the size of the workplaces, 37% satisfied and 39.1% neutral regarding the workplace layout (arrangement of furniture), and 30.4% are satisfied and 39.1% neutral regarding the adaptability of the workplace to specific tasks.

The staff experience of the furniture in the workplace is as follows: 47.8% are satisfied with the worktop surface area, 47.8% are satisfied with the position of the monitor, keyboard and mouse, 52.2% are satisfied with the comfort level of the desk, 30.4% are satisfied and 34.8% neutral regarding the adjustability of the desk. 45.7% are satisfied with the comfort level of their office chair, and 52.2% are satisfied with the adjustability of the office chair. 61.7% know how to adjust the furniture, 47.7% do so when they change workplaces and 50% can assume a comfortable position for all their activities. Ergonomic aids such as laptop stands are considered satisfactory by 29.5%, and 56.8% are neutral regarding this aspect.

Because people vary in size and proportion, and workspaces often change owners, it is important to be able to adjust the furniture of the workspace. Not only must the furniture be adjustable, the user must know how to adjust it to specific settings in order to avoid injuries and strain caused by poor working postures. According to this survey, the ergonomic design of workspaces and their elements comply with both the users' standards and the recommended standards.

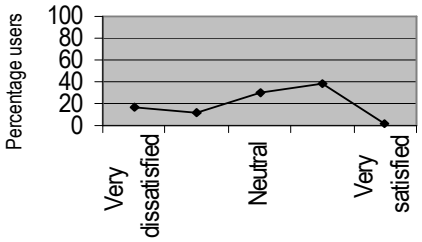


Fig.5.104: Staff rating of workplace sizes

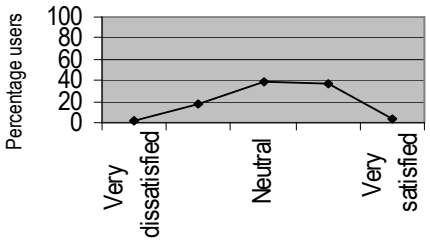


Fig.5.105: Staff rating of workplace layout

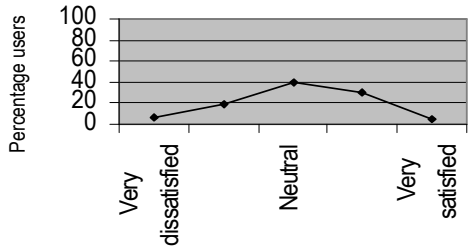


Fig.5.106: Staff rating of workplace adaptability

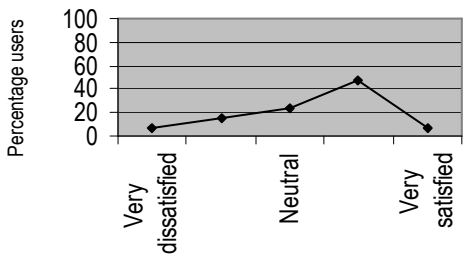


Fig.5.107: Staff rating of worktop surface area

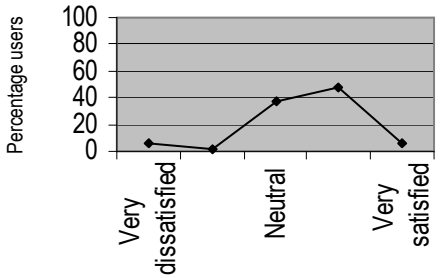


Fig.5.108: Staff rating of position of monitor, keyboard and mouse

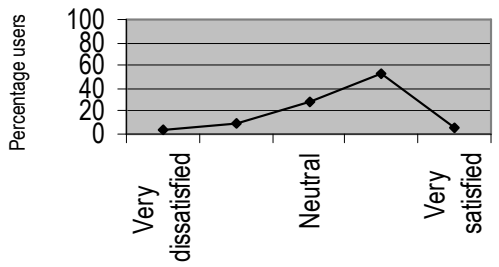


Fig.5.109: Staff rating of desk comfort level

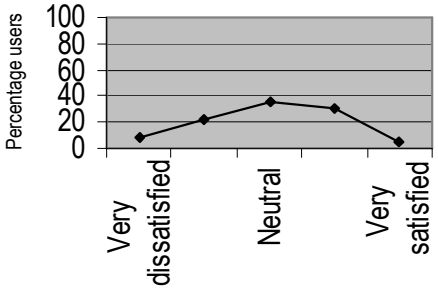


Fig.5.110: Staff rating of desk adjustability

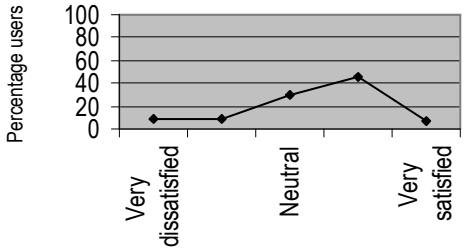


Fig.5.111: Staff rating of office chair comfort level

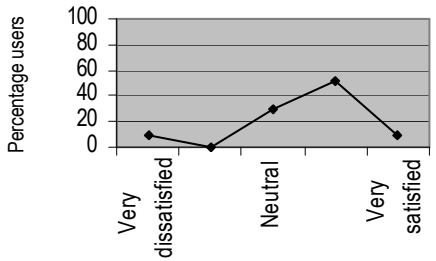


Fig.5.112: Staff rating of office chair adjustability

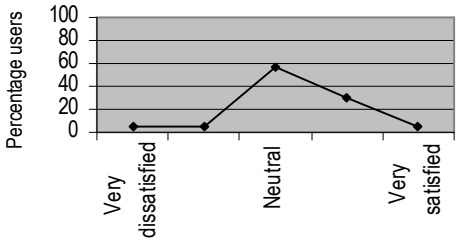


Fig.5.113: Staff rating of ergonomic aids

Technical Aspects (figure 5.114 – 5.132)

Although the physical evaluation of these aspects has been done, it remains necessary to obtain the opinions of the users who experience these aspects in order to conduct a successful study. According to the users of the building, 58.9% are satisfied with the temperature, 26.7% experience the ventilation as satisfactory and 26.7% as dissatisfactory, 24.4 % are neutral on this aspect and 22.2% experience it as very dissatisfactory. 30.4% find the air quality satisfying. The ability of the individual to control the climate left 28.3% dissatisfied, 28.3% very dissatisfied and 37% neutral. 27.7% of the users have access to daylight, and although 41.3% are neutral regarding their ability to personally control the amount of daylight, 17.4% are satisfied with their ability in this regard, 17.4% are dissatisfied and 21.7% very dissatisfied. General worktop lighting was satisfactory to 39.1% of the users; 23.4% were dissatisfied with their ability to personally control the artificial light and 19.1% were very dissatisfied in this regard, while 40.4% remained neutral. Reflection on the monitor was a problem to 21.3% very dissatisfied users, 27.7% of the users were satisfied with this aspect and 31.9% remained neutral. Although 28.9% of the users indicated that they felt neutral regarding the acoustics of the building, 28.9% were dissatisfied with this aspect, and 24.4% very dissatisfied. 27.3% were not distracted by the noise of air-conditioning systems, while 40.9% felt neutral about it.

The design of the office building has it constraints, due to the fact that it was not originally designed for this specific use. In addition, according to the questionnaires, the users (people who spend an average of 45 hours a week in their workspace) were not involved in the design process of the existing offices. This, together with the lack of individual control over the building climate, increases the level of dissatisfaction among the employees. As cross-ventilation is not easily achieved in an open-plan office, the layout of the building should be planned with the designers as early as possible in the design process, and the input of users should also be taken into account.

In general, the average user finds that the office meets his/her needs (38.6%), and that he/she can always find a workplace for the day (57.8%); when almost all the workplaces are occupied, 25% find the work environment not enjoyable, but 52.3% are neutral about this. 36.2% find the furnishings in the building inspirational, 36.2% feel neutral about this aspect and 26.1% enjoy the degree of openness and

transparency in the building, while 45.7% feel neutral about it. If there is always a workplace available for users, productivity is increased by not wasting time trying to accommodate the user in a less than ideal workspace, so that this link in the problem chain of not providing the desired facilities to perform the required tasks is avoided.

With the exception of the technical aspects, the majority of the staff members rate the overall assessment of the facilities as average to good.

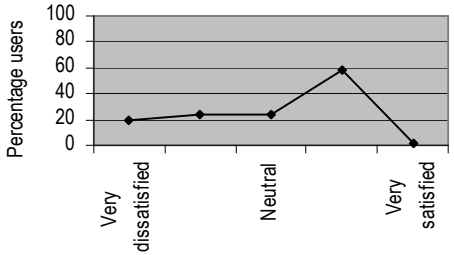


Fig.5.114: Staff rating of temperature

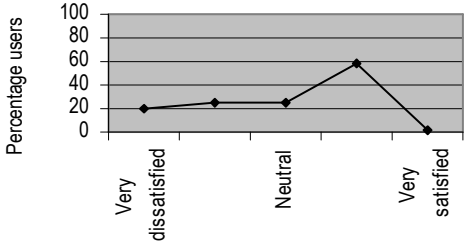


Fig.5.115: Staff rating of ventilation

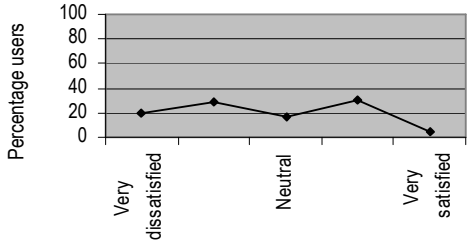


Fig.5.116: Staff rating of air quality

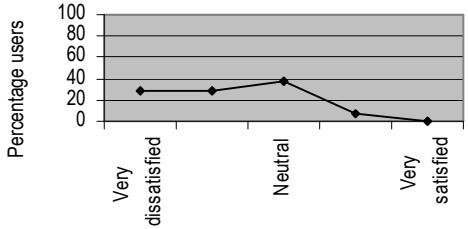


Fig.5.117: Staff rating of personal control over building climate

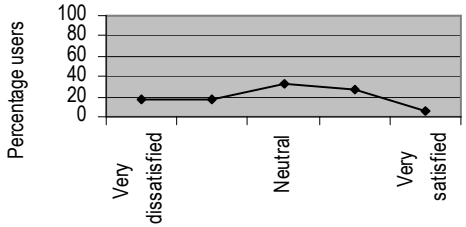


Fig.5.118: Staff access to daylight

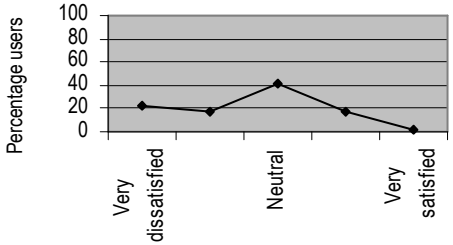


Fig.5.119: Staff rating of personal control over daylight

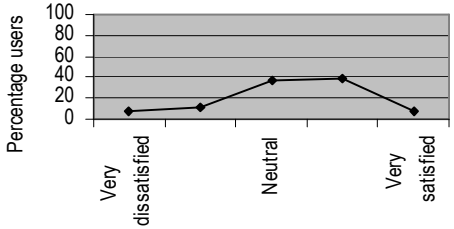


Fig.5.120: Staff rating of general worktop lighting

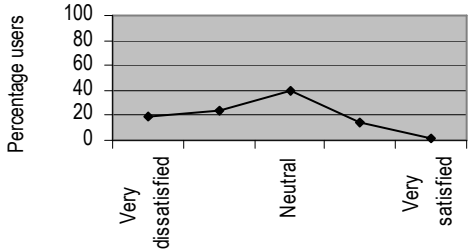


Fig.5.121: Staff rating of personal control over artificial lighting

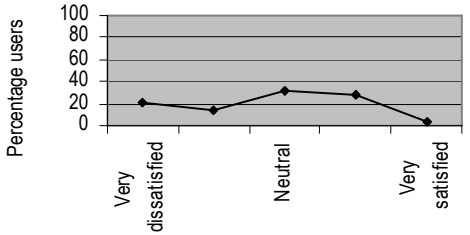


Fig.5.122: Staff experience of reflection of light on monitor

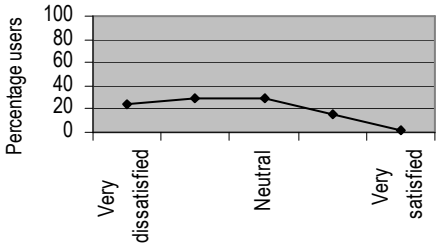


Fig.5.123: Staff rating of acoustics

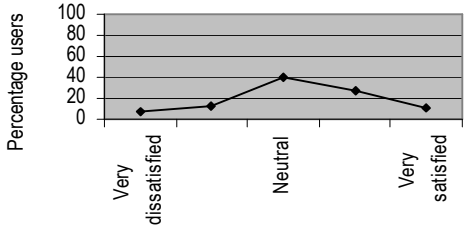


Fig.5.124: Staff experience of distraction due to air-conditioning systems

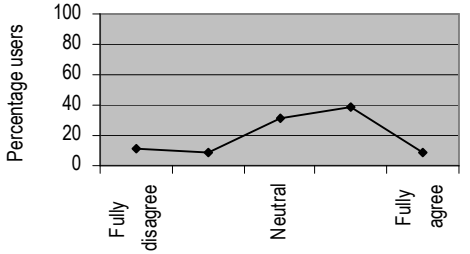


Fig.5.125: Staff rating of accessibility of preferred workspaces

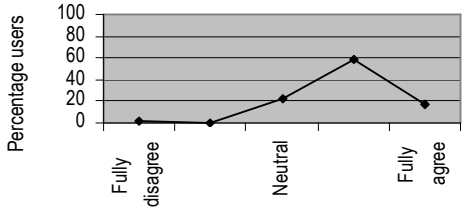


Fig.5.126: Staff rating of accessibility of workspaces

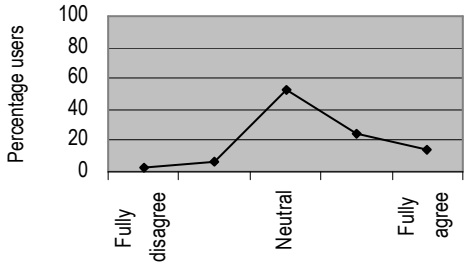


Fig.5.127: Staff experience of office environment

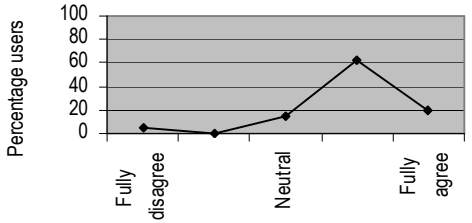


Fig.5.128: Staff knowledge on furniture adjustability

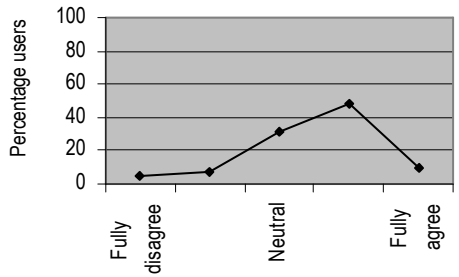


Fig.5.129: Staff active adjustment of office furniture

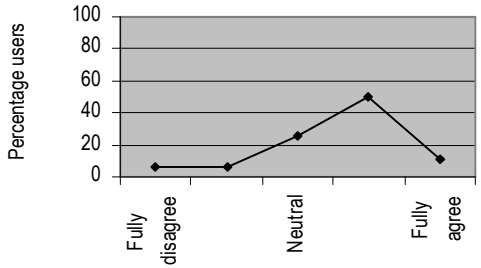


Fig.5.130: Staff experience of comfort during all activities

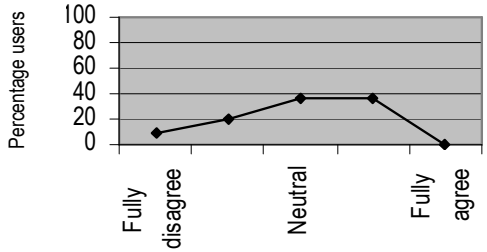


Fig.5.131: Staff experience of building furnishings

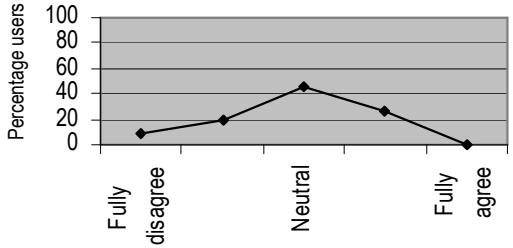


Fig.5.132: Staff rating of openness and transparency of building

5.2.1.3 Category 3: Criteria for Building Convenience (figures 5.133 – 5.137)

As the assessment of aesthetic aspects in the work environment is an individual experience, it is an impossible task to maintain every staff member's standard; however, as this is a place where people work and spend a lot of their time, it remains essential that this aspect should be to the satisfaction of the majority. In this building, it was found that 54.3% of the staff were satisfied with the use of materials (glass, wood, metal, etc.) in furnishings, and 43.5% were satisfied with the use of colour in the interior. The use of decor (art, plants, etc.) in furnishings was perceived as satisfactory by 41.3%, whereas architecture as a whole was perceived as satisfactory by 45.7%. 32.6% of staff members feel neutral regarding the view from workspaces, and 32.6% are satisfied with this aspect.

Decor is used to create an aesthetically pleasing environment. In the work environment, the sensory input should be limited in order to avoid overload, which leads to a lower productivity level.

Continuous noise should be limited, but not dropped to lower than 30dB(A), which would have been ideal in this building; however, due to lack of knowledge, the available white noise system remains unused.

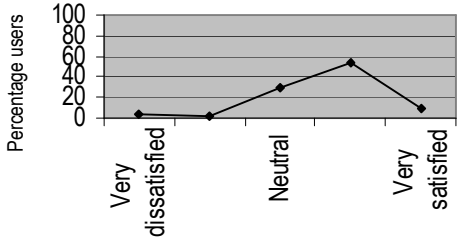


Fig.5.133: Staff rating of use of materials in furnishings

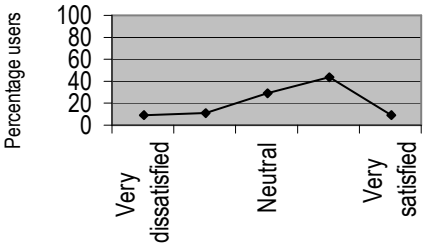


Fig.5.134: Staff rating of use of colour in interior

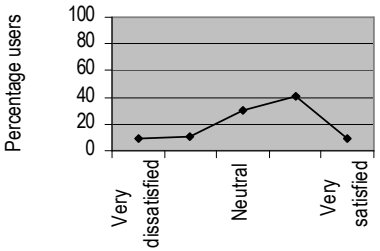


Fig.5.135: Staff rating of use of decor in furnishings

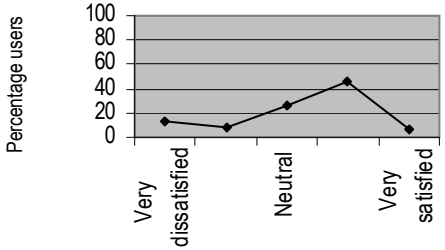


Fig.5.136: Staff rating of architecture as a whole

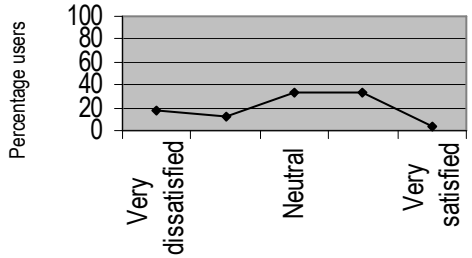


Fig.5.137: Staff rating of the view from workspaces

5.2.1.4 Category 4: Criteria for Organisational and Managerial Aspects

According to the questionnaires, users characterise the organisation as hierarchical (22.7%), between open and closed (28.6%), between centralised and decentralised (28.6%), between formal and informal (25.6%), evenly static and dynamic (14.6%), between traditional and progressive (26.2%), monitoring output rather than attendance (24.4%), checking quality rather than time (17.1%), and national rather than international (26.2%). This indicates that the organisation is not traditional in its work process, and has already seen the advantages of switching to a more progressive managerial style.

Although the change in hierarchy in the office was implemented and the advantage of involving the users in the planning of the workplace environment had become clear, this was not yet implemented when this workplace was planned. According to the questionnaires, 76.1% of the staff were excluded from the planning and concept of the workplace (fig 5.138), and the majority rated it unsatisfactory to neutral. When people are excluded from decision-making, it is more likely that they will experience the final result as negative; therefore it is important to include the affected staff in the planning and decision-making.

To conclude the questionnaires, the users were asked to what extent they agree with specified statements such as: the work environment contributes to general well-being, has a pleasant atmosphere, is appealing to visitors and customers and is safe. The majority of staff agreed with all of these statements and experience the work environment as an excellent showpiece for the organisation, with the exception of 34%, who feel that the environment has a detrimental effect on their health (fig. 5.139). An interesting result is that, although the majority rated the organisation as hierarchical, the new concepts of openness, transparency, being progressive, monitoring output rather than attendance and checking quality rather than time are equally preferred by 40.9% of the users (fig. 5.140), while the traditional work process was more favourable to 40.9% (fig. 5.141).

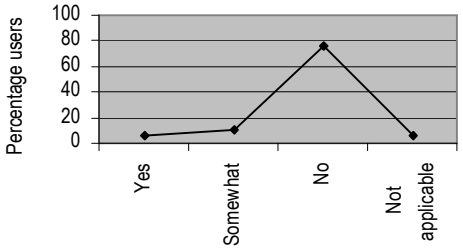


Fig.5.138: Staff rating regarding inclusion in planning and decision-making

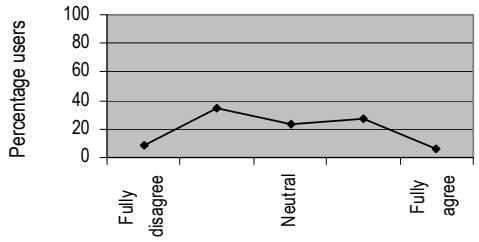


Fig.5.139: Staff rating regarding negative effect of environment on health

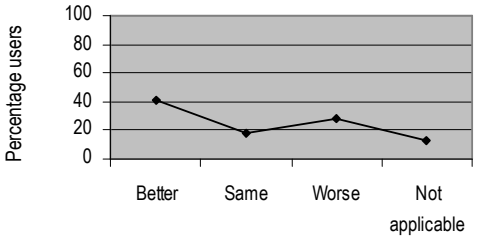


Fig.5.140: Staff rating regarding preference for the contemporary work process

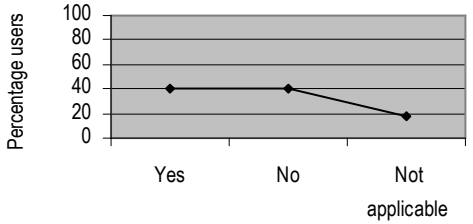


Fig.5.141: Staff rating regarding preference for the traditional work process

5.2.2 Physical Measurement:

44 offices were measured. The offices used are shown on the plan in Addendum D. The average individual open workspace area is 3.24 m^2, compared to the average enclosed workspace area, which is 16.58 m^2.

The workspace utilisation ratio – the relationship between the number of workspace settings provided and the number of employees accommodated – for the overall office was 90%. Office space was divided into both open and enclosed workspaces, with meeting spaces distributed throughout the building. There are 1219 (88%) open-plan offices and 117 (8.47%) enclosed offices; the remaining 45 (3.26%) are support spaces that include meeting areas and brainstorming areas, etc.

The interior finishes include painted walls, and tiles and carpeting on the floors in the circulation and office areas respectively. The partitioning is according to the palette of the rest of the office, namely teal with navy blue and grey. The height of the partitioning was measured at 1 405 mm and 1 205 mm. As in the case of the Bloemfontein building, the furniture is first- and second-generation furniture. Some desks are not adjustable, and the modesty panel and side panels block airflow and restrict movement when sitting. According to the questionnaires this does not seem to be a problem to the users. The average depth of an open-plan workspace (measured from one end of the desk to the other end, after the angle of the L-shape) is 1 800 mm (fig. 5.142).

5.2.2.1 Ceiling height

The average ceiling height is 2 630 mm, with the lowest point at 2 600 mm. This height fully complies with the required 2 400 mm stipulated by the regulations.

5.2.2.2 Minimum length of workspaces

The recommended minimum length for workspaces was set at 1 200 mm, and all the workspaces complied with this length.

5.2.2.3 Door openings

The door openings are all above the recommended 800 mm, with an average of 1 300 mm – a very favourable size to accommodate people in wheelchairs and people carrying items.

5.2.2.4 Light quality

As in the case of RHO Phase 1, the light quality was measured in the different work areas of the workspaces, i.e. task lighting with visual display unit (VDU), task lighting without VDU, and general lighting of the area. All of these readings were taken with window coverings open and closed respectively, where available. The results showed negative areas where the lighting is insufficient, and certain areas where it is too bright, with resulting glare on VDUs.

5.2.2.5 Primary circulation

The staircases and main circulation areas were measured. The average staircase measured 1 390 mm in width, with treads 285 mm deep and all first treads of a flight 310 mm deep. Risers are 190 mm high. A flight of stairs consists of 10 steps. Balustrades are 100 mm high. All these measurements are according to regulations.

The primary corridors that are utilised by all the users of the building measured 2 500 mm wide on average; where columns were placed, this was narrowed down to a 1 560 mm minimum. The recommended width for primary circulation is 2 100 mm, which leaves the building with a disadvantage in this area. Due to the importance of the primary circulation routes in the emergency route to the exit and the number of people in the building, this is a potential dangerous situation that needs to be addressed.

5.2.2.6 Air-conditioning and air quality

As everyone's judgement of a comfortable air temperature differs considerably, it is impossible to satisfy all users in an office building, especially in an open-plan office – therefore a general regulation was formulated, based on the sources, to comply with the suggested minimum standards. According to those standards, the building complied with the requirements to satisfy the general user.

Air-conditioning: The air-conditioning system consists of 6 units that feed different areas, and are distributed throughout the building. These units feed the whole building, and not per floor (as is the case with RHO Phase 1). This system is designed to open the quellers as soon as the outside temperature is below 22^{o}C, which means that the airflow per second consists of 100% fresh air. This is also relevant to the evenings, when the quellers are open as well. The engineers took air samples, and all the acquired levels were below legislation maximums. The average temperature was established to be 23.96^{o}C, which means that this building complies with the recommended 24^{o}C. According to the questionnaires, the temperature is satisfactory to the majority of users, although it is at the maximum of the recommended temperature range of 18 - 24^{o}C.

Unit 1			Recom-mended minimum value	Unit 2			Recom-mended minimum value	Unit 3			Recom-mended minimum value
	Placement	Roof			Placement:	Roof			Placement:	Roof	
	Cooling capacity:	480 kW			Cooling capacity:	300 kW			Cooling capacity:	154 kW	
	Airflow /$m^{2:}$	24 000l/s			Airflow /$m^{2:}$	20000 l/s			Airflow /$m^{2:}$	10 000l/s	
	Airflow (fresh air):	2 000 l/s	7.5 l/s		Airflow (fresh air):	2000 l/s	7.5 l/s		Airflow (fresh air):	1 000 l/s	7.5 l/s
	Airflow (fresh air) per person:	7.5 l/s/person	5 l/s/person		Airflow (fresh air) per person:	7.5 l/s/ person	5 l/s/person		Airflow (fresh air) per person:	7.5 l/s/person`	5 l/s/person

Unit 4			Recom-mended minimu m value	Unit 5			Recom-mended minimum value	Unit 6			Recom-mended minimum value
	Placement:	Roof			Placement:	Roof			Placement:	Basement	
	Cooling capacity:	107 kW			Cooling capacity:	480 kW			Cooling capacity:	105 kW	
	Airflow /$m^{2:}$	7 000l/s			Airflow /$m^{2:}$	24 000 l/s			Airflow /$m^{2:}$	12 000 l/s	
	Airflow (fresh air):	700 litres	7.5 l/s		Airflow (fresh air):	2 000 l/s	7.5 l/s		Airflow (fresh air):	1 200 l/s	7.5 l/s
	Airflow (fresh air) per person:	7.5 l/s/person	5 l/s/person		Airflow (fresh air) per person:	7.5 l/s/perso n	5 l/s/person		Airflow (fresh air) per person:	7.5 l/s/person	5 l/s/person

Fig. 5.142: Technical information regarding air-conditioning units

5.2.2.7 Facilities for universal access

The regulations for these facilities are thoroughly discussed in the National Building Regulations (NBR); therefore they need not be included in the regulations for offices. However, this remains an important area to measure when doing the POE. These facilities comply with the regulations of the NBR. The workplace does accommodate disabled users by providing sufficient toilets and lifts to enable travelling between different floor levels. However, the size of circulation routes – which is crucial for the primary circulation – still needs to be investigated, since the NBR only states sizes for normal use and the amount of office traffic needs to be adjusted – thus the suggested 2 100 mm.

5.3 The Comparison

A comparison of the two case studies reveals that the same main problem occurs in both buildings, namely:

- that the users had no input in the design of the workplace and the same mistakes were therefore repeated.
- the building was changed into the now existing workplace, and not originally designed for this purpose, with the result that the building climate and layout were not part of the early design process, and needed to be adjusted afterwards.

Awareness of this problem could enhance the quality of workplace design in the future.

Chapter 6

Recommendations:

In the previous chapter, the problem areas of the evaluated workplaces were identified. Although some of the problem areas that were identified on the basis of the questionnaires were within the recommended values, it is the end-user who determines the effectiveness of the recommended minimum standards with which the workplace environment should comply. The following problems were identified on the basis of the questionnaires and POE. Recommendations to for the improvement of the surveyed offices will now be made as a first-step approach to evaluating the suitability of the recommended minimum standards for offices. The recommended minimum standards will be a final round of assessment subjected to after the survey and the results have been analysed.

6.1 Building Climate

6.1.1 Influences of climate

To create a satisfactory climate for indoor offices, one need to consider how body temperature is regulated, how heat travels, and what factors are important, i.e. air temperature, radiant temperature, air humidity and rate of air movement.

6.1.1.1 Body Temperature Regulation

Metabolism, a chemical process, is constantly generating heat from deep within the body. Even when no activity is taking place and a person is not moving, heat equivalent to a 60-watt electric light bulb is generated (Galer, 1993:83). Only 20% of the chemical energy is converted into mechanical power during physical work; the other 80%, is converted into heat. If the temperature is too high, the difference between the temperature of the skin and the air is too small, and the body temperature begins to rise. When the temperature is too low, shivering sets in – a muscle activity that produces heat. This has a direct influence on the work quality – for instance, both the accuracy

and speed of typing decline due to cooling down of the hand muscles. The aim should therefore be to maintain an ideal body temperature through proper control.

6.1.1.2 Rate of Air Movement

Heat travels by convection, conduction, radiation and evaporation.

Convection of heat is the actual transfer of heat by air in motion. Air particles expand when heated and become lighter, therefore warm air moves upwards. When cooled, the opposite happens and the air becomes heavier and sinks again. This results in air movement. Heat loss by convection can cause draughts in the building. Cooling fans used for visual display units (VDUs) further contribute to the potential problem of air movement in offices that could cause documents and other items on desks to move and also discomfort users by sitting in a breeze.

Conduction of heat takes place through direct movement, by a substance touching the human body. The thermal conductivity depends on the material's heat insulation properties.

Radiation of heat is the transfer of heat to and from the body by means of electromagnetic waves. The length of the waves determines the level of heat radiated – for instance, the sun has comparatively short wavelengths that are visible to the eye; polished surfaces reflect the waves, thus reflecting the heat.

Evaporative cooling takes place when water is evaporated from a surface. The rate is determined by the humidity of the surrounding air. This is the body's method of cooling down when the temperature rises too high.

6.1.2 Climate conditions

6.1.2.1 Air temperature

A comfortable air temperature for office workers, whose muscles do not work hard enough to generate adequate body heat, is between 18^{o}C and 24^{o}C (Dul, & Weerdmeester, 1994:85); the optimum temperature is 18.3^{o}C. In an open area, control over the climate by each individual is not possible; however, the majority will be satisfied with the temperature between 18^{o}C-24^{o}C. Since the temperature in RHO Phase 1 is at the highest level, 24^{o}C, the ideal solution would be to lower the temperature (within the recommended guidelines) to a level that suits the majority.

6.1.2.2 Radiant Temperature

As discussed above, radiant heat travels in the form of electromagnetic waves. Offices contain many radiant heat sources, such as computers, lights, windows or skylights, as well as electrical equipment. This will have an influence on the overall temperature and it is worth investigating this factor when planning the climate control. These influences should be incorporated in the temperature control solution, for this will heat up the general environment and therefore affect the air temperature. The optimum level is 18.3^{o}C, and the comfort zone 16.7^{o}C - 20.0^{o}C. In RHO Phase 1, the atrium functions as a radiant heat source, generating excessively high temperatures in that area. This could be solved by reflectors, which would still let the light through, but would reflect the heat waves.

6.1.2.3 Air Humidity

Although air humidity has very little influence on climate comfort, extremes should be avoided. Humidity levels that are too high cause stuffiness in crowded environments and badly ventilated rooms, and excessive humidity limits the rate at which persperation can evaporate, making it difficult for the body to regulate its own temperature. The relative humidity should not exceed 70%, and very low humidity may also cause discomfort. The relative humidity of both buildings, measured over seven days, is within limits (Addendum E).

6.1.2.4 Rate of Air Movement

The ideal level of air movement (provided that the radiant and air temperatures are correct), is 0.15m/s (metres per second), according to Galer (1993:84). Above 0.15m/s is regarded as ‘draughty’, and below 0.1m/s as ‘airless’ (Galer, 1993:84). This is hard to control in rooms that are occupied by a large number of people, have few windows, or are very large or very small. The solution in such a case would be a fan or an air-conditioning system.

It is therefore clear from the explanation of the advanced level of climate control investigation that planning in this regard should ideally be included in the early design stages of the building. Including climate comfort planning in the design stages is much cheaper and more satisfactory than trying to solve the problem afterwards.

6.2 Lighting

Both NBSC and RHO Phase 1 had areas where lighting was not desirable. Most of these problems were either insufficient lighting, or lighting that was too bright. The existing (insufficient) lighting was not designed for task lighting and it was therefore too dark to perform general desk work and related tasks properly. Areas where lighting levels were excessive were mainly in areas on the western side of the building where daylight was too harsh, or in the atrium, where the daylight reflected off VDUs causing glare. As artificial lighting can be tailored to fit the needs of the specific tasks, it is easier to design this according to the building.

Another problem that was identified was that the structural elements, such as columns, that interfered with the planned lighting. It is therefore important to design the lighting together with the building, and not afterwards. More importantly, lighting should be designed by keeping in mind the specific function that is to be performed in the spaces. Although artificial lighting is an easy option, it should not be used without daylight , especially in the view of sustainanbility and to save energy. Therefore artificial light should be planned to be used in conjunction with

daylight (Galer, 1993:134):

- Artificial light should be planned for continuous integration with daylight and not solely for use after dark.
- Supplementary light should raise the level of illumination to at least that necessary for the tasks involved, and such lit areas should compare favourably with the areas that are receiving maximum daylight.
- The colour of the supplementary light should match the daylight.

Daylight illumination can reach to up to 4 500mm in depth from the window, depending on the placement of the building,(Neufert & Neufert, 2000:346). This means that daylight can be successfully used even with open plan offices where the workspace is not directly at a window, when windows are big enough and also when there is a relatively clear view (not obstructed by other buildings etc.) in front of that window.

To maintain the quality and standard of the lighting, the lighting equipment should be maintained properly – cleanliness is of vital importance. If this aspect is neglected, neither daylight nor artificial light will fulfil its purpose adequately. Properly planned maintenance schedules are desirable for the room surfaces, windows and artificial lighting equipment:

- All glazing should be cleaned regularly, both inside and outside.
- Light fittings should be regularly serviced and cleaned.
- Lamps should be when they have reached the end of their economically useful life.

6.2.1 Planning of lighting:

Lighting technology has advanced considerably, especially with regard to the relationship between people and the lighting they require for their work. It is therefore important for the architect, lighting engineer and

ergonomist to collaborate during the design stage, and not to work in isolation.

General requirements for good lighting are as follows (Galer, 1993: 135):

- Up to a certain point, the eyes function better if they receive more light; after that point, the light causes glare. The desired level for lighting varies from 200lux for adequate visual performance to 2 000 lux for difficult or fine work (Dul & Weerdmeester, 1994:58).
- The visual task should be brighter than its surroundings.
- No source of light should cause glare discomfort.
- To provide general lighting, daylight and artificial lighting should be properly integrated.
- Artificial light should be chosen to provide good colour rendering.
- Discharge lamps should be used with care to minimise flickering or stroboscopic effects.
- The lighting should allow work to proceed in comfort, with the minimum visual or physical fatigue.
- Maximum economy should be sought in the design, consistent with the effective functioning of the lighting.
- The decoration scheme should be planned in conjunction with the lighting installation.

During the survey as well as from feedback from the questionnaires it became apparent that the lighting in certain areas, such as in the atrium and on the western side of the buildings were too bright, and caused glare on VDUs with the resulting discomfort to the eyes of users. There were readings that were too low at especially the south side of the building, and again questionnaires confirmed this problem. This indicates that the levels suggested in the recommended minimum standards for lighting are more suitable to the functional characteristics of work processes in offices.

6.3 Sustainability through energy efficiency

Due to rapid development in our country, the electricity supply and demand situation has become a problem. The

number of megawatts installed each year did not keep up with the growth in user-numbers. Efficient use of electrical resources is the responsibility of each user to help overcome this problem.

The rapid growth of our country, with single stands being converted into group housing, more office buildings being built and electricity being supplied to the all of South Africans, led to an electricity shortage. The main supplier, Eskom, does not have the capacity to supply enough electricity to all the users at this growth rate. Therefore it has become necessary to improve our buildings with a view to greater energy efficiency. This is a study in itself, and will therefore not be discussed in full.

When designing buildings, especially multi-purpose buildings such as offices, energy efficiency is an important consideration. The building envelope includes everything (windows, walls, foundation, basement, slab, ceiling, roof and insulation) that separates it from the outdoor environmental conditions such as cold, heat, light, etc. Insulation helps to maintain the desired interior temperature. If the insulation is insufficient, air-conditioning systems use more electricity to maintain the desired indoor climate. Also, the lighting and other electricity equipment inside a building contributes to the amount of heat buil-up in buildings. This contributes to air-conditioning systems using more electricity. Electrical equipment, especially VDUs and lighting, can be changed to more energy-efficient versions to help reduce the overall energy consumption in office environments.

6.4 Comfort, health and safety of a building

When planning a building, specialists like ergonomics and mechanical engineers, all identify problems in their own area in advance. It is therefore important to involve all these experts in the early design stages. Specialists will need to know more than just the size of the room. It is important to know the number of occupants of the building, tasks that will be carried out, equipment that will be used and the heat released by such equipment. The

ergonomist will advise on the partitioning and the furniture of the building, as well as other environmental factors such as noise and lighting; the heating and ventilation specialists, together with the architect, will then plan to meet these requirements.

Maintenance of the building is also important with regard to the sustainability of the required level of comfort. The different factors, such as air temperature, lighting and level of furniture standard, should be checked regularly to ensure that they are still within the recommended limits.

6.4.1 Floor space usage

Workplaces change constantly and the building must be designed to accommodate these changes. An adaptable building is more rentable and more flexible to adapt changes of the user-company.

6.4.1.1 Calculating floor space

When calculating a client's requirements for accommodation, a process that allows growth and change should be used. Therefore all calculations would only be approximate numbers. The New Metric Handbook (Tutt & Adler, 1990:115) provides a formula for calculating office area requirements. Of the gross area calculated, 80% is netto area and 20% will be used for structural elements. Fig. 6.1 includes the full calculation for accommodation area for both the Telkom facilities and the actual area as measured for comparison.

The figures shown in fig.6.1 indicate that the actual office area of both the buildings is too small. Before any presumptions are made, two factors should be taken into consideration. Firstly the flexibility that should be allowed for accommodation by different companies, since the needs for individual companies and even branches of the same company do differ. Secondly, the workstyle of the organisation should be considered. Both these workplaces

use the system explained earlier, where people spending less than 60% time in the office use free address workspaces and staff spending more than 60% of the week in the office use fixed address workspaces. This system works well by using the maximum rented floor area actively. According to the questionnaires this system has positive and negative input. Although the users are satisfied with the size of the workspaces, both RHO and NBSC had problems with reserving workspaces. This is a problem that could easily be solved by putting a system in place to organise the reservation of facilities in the workplace according to the work patterns of the involved staff. Also team spaces, where mainly part-time staff is accommodated, should be planned with more detail as to the work patterns of these users. This will prevent over- or under-accommodation in different time periods.

6.4.1.2 Minimum usable width for workspaces

The minimum width for a habitable room, according to the national building regulations (NBR) is 1 200mm. During the survey the insufficiency hereof became noticeable. Since the longest part of a desk varies between 750mm and 2 000mm, it doesn't leave sufficient space for movement. Therefore it is suggested that the minimum length should be changed to 2 400mm providing the desk has no bigger length than 1 800mm, leaving movement space of at least 600mm.

6.4.1.3 Ceiling heights

The minimum height for ceilings according to the NBR is 2 400mm over 70% of a habitable room. The exception at corridors and bathrooms is 2 100mm. Cabling and air conditioning ducts needs to be incorporated either by a suspended ceiling or a raised floor and therefore the height of a workplace should be 2 750mm to permit later installation of either suspended ceilings or raised floors. Ceiling heights measured during the survey were all 2500mm after installation, which complies with Neufert: "Ceilings should be a clear height of 2500mm and 2300mm for corridors and bathrooms" (Neufert & Neufert, 2000:346). This more functional height would be incorporated in the minimum standards

Action	Accumulating area allowance per person – m^2	Number of personnel Telkom RHO	Accumulating total area required Telkom RHO	Actual total area of Telkom RHO	Number of personnel Telkom NBSC	Accumulating total area required Telkom NBSC	Actual total area of Telkom NBSC
1. Take sum of workplace areas	$7m^2$ per person	399	2 793m^2		1 350	9 450m^2	
2. Add 10% for access to workspaces (circulation within departments)	$7m^2$ + 10% =$7.7m^2$ per person	399	3 072.3m^2		1 350	10 395m^2	
3. Add area for special, within-department facilities; eg. Meeting and conference rooms, display and exhibition areas, etc.	$7.7m^2$ + $2.5m^2$ = $10.2m^2$ per person	419 (additional 20 serving special facilities)	4 273.8m^2		1 370 (additional 20 serving special facilities)	1 3974m^2	
4. Add 15% for inter departmental circulation	$10.2m^2$ + 15% = $11.73m^2$ per person	419	4 914.87m^2		1 370	16 070.1m^2	
5. Add area for support facilities to office areas – filing, registries, archives, vending machines, etc.	$11.73m^2$ + $3.3m^2$ = $15.03m^2$ per person	419	6 297.57m^2		1 370	20 591.1m^2	
6. Add areas for special facilities – computer rooms, restaurants etc. Provision varies so much from company to company that no general rules apply. Areas must be determined by preparing rough layouts	15.03 + $1.5m^2$ = $16.53m^2$ per person	419	6 926.07m^2		1 370	22 646.1m^2	
Net usable area (NUA) (all the above)	$16.53m^2$ per person	419	6 926.07m^2		1 370	22 646.1m^2	
Gross overall area (NUA + core and colomns, etc – allow 18-20%)	**$16.53m^2$ + 20% = $19.84m^2$ per person**	**419**	**8 312.96m^2**	**7 232.25m^2**	**1 370**	**27 180.8m^2**	**19211.04m^2**

Fig 6.1: Calculating office area requirements (Tutt & Adler, 1990:115).

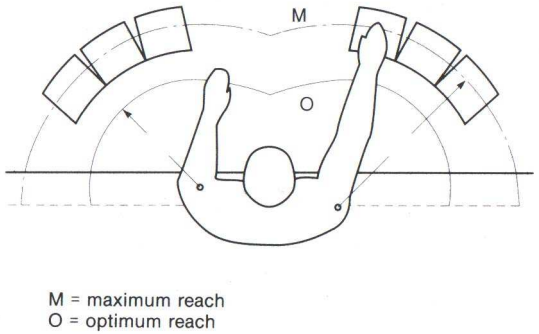


Fig. 6.2: Acceptable limits for reach (Dul & Weerdmeester. 1994: 56)

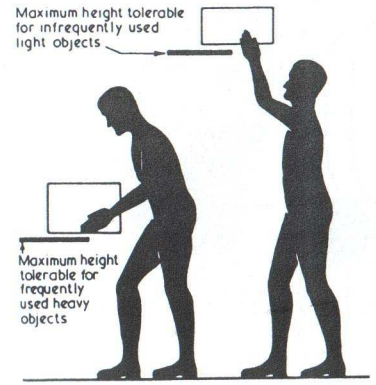


Fig. 6.3: Acceptable limits for reach (storage) (Galer. 1987: 81)

6.4.1.4 Circulation

Circulation in workplaces carries a heavy traffic load and should therefore be carefully planned. These paths should be clear and signage should be provided to ease use. Circulation can be divided into 3 levels of traffic load (Tutt & Adler, 1990:122):

- Primary circulation – that links the major points and access routes. These should not be less than 2000mm wide and should increase in width as traffic increases.
- Secondary circulation – connects workspaces or areas adjacent to the primary routes with the primary routes. Minimum width for these routes is 1 500mm.
- Tertiary circulation – the circulation within working groups. Minimum width for these routes is 750mm.

Other information regarding the paths should also be part of the planning of the circulation, such as whether or not the path forms part on an escape route, and that circulation should not be crossed within workstations. The path width should always allow two people to pass each other with ease.

Both the Telkom facilities adhere to this rule. All routes were planned according to the traffic load, and primary circulation paths that form part of escape routes are wide enough to carry the traffic.

According to the suggested minimum standards the circulation (3 levels as mentioned above) should not be less than 1 200mm. The study has now proved that this should be changed to the width recommended for the level of traffic.

6.4.2 Furniture and Storage

Since the 'average person' exists only on paper, an ergonomically designed formula assists in designing according to the majority of people. Thus with this formula 90% of people will be satisfied while the other 10% will be dissatisfied. These measurements will include 95% of the group, and 5% will be lower and 5% will be higher. These measurements enable the setting of limits to form a minimum and maximum level or size where to start from.

"A well-laid-out workspace, or a well-designed piece of equipment, is one in which the operator can see and reach quickly and easily all the items of equipment necessary for successful completion of tasks" (Galer. 1987:82).
In addotion, there is a difference in the distance that can be reached comfortably and frequently, and the distance that takes effort to reach. The layout of furniture and equipment should therefore include this information during the planning stage. Fig 6.2 and fig 6.3 give the acceptable limits for reach.

Since the measurements of all individuals are different, the desks and chairs available should be adjustable. Furthermore all users should be informed of how to adjust this furniture. According to Neufert (2000:351) there are two ergonomic systems to be used:

System 1:	
Adjustable-height table:	600-780mm
Adjustable-height chair:	420-540mm
System 2:	
Fixed height table:	720mm
Adjustable-height chair:	420-500mm
Adjustable foot rest:	0-15mm

Fig 6.4: Ergonomic systems for office furniture (Neufert & Neufert.2000:351)

When humans use desks and chairs, they act as a link between the two. Efficiency of this link will be determined by the layout of the workspace and the position of the chair to the desk. The optimal position will be when desks or task surfaces are at elbow height or lower and that the elbow bend is 90^{o} or more (Galer, 1993:91). Knee and leg room should also be planned to allow the user to come close enough to the desk. This posture ensures that the arms need not be extended and that the legs are comfortable. This prevents needless fatigue that lowers productivity.

Storage in workplaces also needs to be designed from minimum standards. Since items stored vary in size and weight, the place they are stored as well as the space surrounding the storage unit need investigation. Heavier items should be stores lower to the ground, and there should be enough space in front of the storage unit to move comfortably when using the unit. As the cabinet's width increases, so should the aisle in between units (Neufert & Neufert, 2000: 350)

L × W (storage unit)	= space for furniture
+ ½L × W + 0.5	= aisle space
Total requirement	= space for furniture + aisle space

This includes storage in workspaces as well as storage spaces such as archives.

6.4.3 Entrances

The functions of entrance spaces include reception, security control, exhibition space, waiting area, circulation node for lifts, stairs and bathrooms. All these functions complicate the design of an entry. A further complication includes draughts from open doors. By locating the reception counter out of the draught area or by partitioning it

off, results in less of the area being visible. This also lowers the security of the area.

Both Telkom RHO and Telkom NBSC have good solutions to this problem. At NBSC the reception area is a long counter at the side of the space with security gates in front preventing anyone from entering without permission or recognition.

At RHO, the reception area is turned 45^{o} from the entry with security booms that controls access to the building. This takes care at the draught and does not lower visibility. Although the problem of security and draughty space was solved, another problem was created. The entrance was also the main exit of the escape route with the security gate trapping the users inside. The escape route needs to be replanned to overcome this problem.

6.4.4 Legislation regarding fire safety, stairs and facilities for disabled persons

6.4.4.1 Fire safety

Office buildings are public, and should therefore pay special attention to legislation regarding fire safety. The NBR, SANS 10400, part T has a comprehensive set of rules that should be followed. This need not be stipulated in the minimum standards since the complete version thereof is compulsory for all buildings. Special attention should be given to the width of aisle that forms part of the escape route, as well as the planning of an emergency escape. The occasional fire drill should be part of the activities of an organisation.

6.4.4.2 Staircases

Staircases need to be planned specifically for workplace environments where groups of people, often carrying items, needing more space than the width of a standard staircase. According to the NBR the minimum width for a

staircase is 750mm. Staircases during the survey measured between 1 200mm at RHO and 1 390mm at NBSC. According to the New Metric Handbook (Tutt & Adler, 1990:115) staircase widths should be as follows (fig 6.5):

Staircase and area	Staircase width
Single staircase serving gross floor area of less than 230m^2	765mm
Single staircase serving gross floor area of more than 230m^2	1 070mm
Two staircases, one floor only above ground level, gross area less than 1 860m^2	1 070mm
Two staircases, one floor only above ground level, gross area more than 1 860m^2	For every additional 280m^2 add 152mm

Fig. 6.5: Staircase widths (Tutt & Adler.1990:115)

With this information the minimum width for staircases would be suggested as 1 070mm, and used along with the other regulations as stipulated in SANS 10400 part M.

6.4.4.3 Facilities for disabled persons

The NBR provides a complete set of regulations regarding the facilities for disabled persons. Along with these regulations special attention should be given to the width of doors, or openings in the case of open plan workspaces openings. Both RHO and NBSC had a problem with the width of opening sizes at workspaces. In some cases opening sizes were 600mm or less. This does not allow for wheelchair widths. The recommended width for doors is 800mm and this should also be set for open plan workplaces. Further attention should also go to circulation routes and ramp lengths and widths. The width of these routes should leave enough space to turn the wheelchair around and the length and slope of the ramp should be according to the SANS 10400, part S.

6.4.5 Number of meeting facilities

The office building, that was studied during the survey, contained 4 office types in its office landscape, namely hive, cell, den and club. This was zoned together as required by the different departments. The functions of all the different rooms were well incorporated within the workstyle and pattern of the surveyed workplace environments. Although all these facilities were available, there were concerns from the research team about the amount of specific workspaces such as open meeting spaces and brainstorm areas. This concern was verified by the questionnaires. The users of both buildings needed more of these different types of workspaces. RHO also needed more pause spaces or a cafeteria. These informal meeting spaces serve an important function as formal meeting spaces, since a lot of interaction takes place at these areas.

The New Metric Handbook (Tutt & Adler. 1990:128) provides a guideline (fig.6.6) as to how many of these spaces should be provided.

The survey offered a positive critique to both the offices and the study, helping to improve both. Testing the offices to the minimum standards served a dual purpose. Firstly, to identify shortcomings from the proposed minimum standards, verified by the measurements and questionnaires. Secondly, the problem areas of the workplaces were identified.

	Meeting area at workplace	Meeting area serving a group of workplaces	Meeting rooms 6-8 persons	Lounge or rest areas	Meeting room 12-16 persons	Meeting room 16-20 persons	Conference room 20-28 persons	Lecture room 100-150 persons
Headquarters accommodation for engineering organisation (population 1200)	1 per 15 office staff	1 per 10 office staff	1 per 80 office staff	1 per 280 office staff	1 per 120 office staff	none	1 per 1200 office staff	1 per 1200 office staff
Manufacturing administrative organisation (population 400)	1 per 40 office staff	1 per 12 office staff	1 per 45 office staff	1 per 80 office staff	none	1 per 60 office staff	1 per 200 office staff	none
Headquarters accommodation for clerical organisation (population 1400)	1 per 18 office staff	1 per 26 office staff	1 per 55 office staff	1 per 400 office staff	1 per 280 office staff	1 per 230 office staff	1 per 1400 office staff	none
Consultancy organisation (population 80)	1 per 16 office staff	1 per 20 office staff	none	none	none	1 per 80 office staff	none	none

Fig. 6.6: Guidelines for planning number of formal and informal meeting spaces in the workplace environment. (Tutt & Adler, 1990:128).

Chapter 7

Conclusion

After conducting a survey on the discussed case studies, it is possible to improve the first round of recommended standards for greater suitability to the needs of South African open-plan offices.

The author is of opinion that any organistation needs a mix of different workspaces to accommodate the various functions and activities of the work process. Therefore, the proposed standards are divided into the suggested workspaces together with standards applicable to each workspace. Facility managers could use this information, together with the input of the employees and the work process of the company, to plan the required workplace, this process could result in an environment that will suit the specific company. This planning should be discussed in detail with the designer of the workplace in the very early stages of designing to ensure optimum use of the available space.

7.1 Recommended Minimum Standards for South African offices

7.1.1 Bill of Rights (SANS 10400, 2005:5)

Everyone has the right

a. to an environment that is not harmful to their health or well-being; and
b. to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measurements that:
    i. prevent pollution and ecological degradation
    ii. promote conservation; and
    iii. secure ecological sustainable development and use of natural resources while promoting justifiable economic and social development.

7.1.2 Minimum Standards for Workspaces

	Description	Floor Area (m^2)	Ceiling Heights	Situated	Air condition	Air Quality	Adjustments to regulations after surveys
A. 1-person space	Enclosed workspace with temporary meeting space	7 Min. length: 2 400mm (provided the desk is no longer than 1 800)	2 500mm (2 750mm when no suspended ceiling or raised floor is installed)	Preferably access to natural light Pay attention to sound insulation	Room temperature: Summer – 20ºC max Winter – 18.3ºC min	5 l/s air supply per person	Floor area: desk width varies from 750 2000mm, therfore the minimum length of spaces should adjust from 1200mm to 2400mm provided the desk is no longer that 1800mm Ceiling heights: becaus of services installed by either a suspended ceiling or a raised floor the height should be 2750mm. According to the survey results and Neufert (2000:346) the clear height after service installation should be 2500mm Room temperature: According to Weerdmeester (1994:85) acceptible temperature for seated, thinking tasks is between 18˚C and 24˚C. Results from the survey accented that 24˚C is too warm, and that the suggested temperature should be between 18,3˚C and 20˚C.
B. Silent workspace	Enclosed workspace for temporary use of 1 person	6 Min. length: 2 400mm (provided the desk is no longer than 1 800)	2 500mm (2 750mm when no suspended ceiling or raised floor is installed)	Access to natural light not necessary due to temporary use Be careful of transparency, it distracts the user	Room temperature: Summer – 20ºC max Winter – 18.3ºC min	5 l/s air supply per person	

	Description	Floor Area (m^2)	Ceiling Heights	Situated	Air condition	Air Quality	Adjustments to regulations after surveys
C. 2-person space	Enclosed workspace for 2 persons	14 Min. length: 4 800mm (provided the desk is no longer than 1 800)	2 500mm (2 750mm when no suspended ceiling or raised floor is installed)	Preferably access to natural light Pay attention to sound insulation	Room temperature: Summer – 20ºC max Winter – 18.3ºC min	5 l/s air supply per person	
D. Team space	Enclosed workspace for 3 or more persons	7 Min. length: 7 200mm (provided the desk is no longer than 1 800)	2 500mm (2 750mm when no suspended ceiling or raised floor is installed)	Preferably access to natural light Pay attention to sound insulation	Room temperature: Summer – 20ºC max Winter – 18.3ºC min	5 l/s air supply per person	
E. Open workspace	Open workspace for more than 3 persons	7 (per person) Min. length: 2 400mm (provided the desk is no longer than 1 800)	2 500mm (2 750mm when no suspended ceiling or raised floor is installed)	Preferably access to natural light Pay attention to sound insulation	Room temperature: Summer – 20ºC max Winter – 18.3ºC min	5 l/s air supply per person	
F. Half-open workspace	Half-open space for multiple persons. Half-height sides used to separate individual workspaces of groups.	7 Min. length: 2 400mm provide for each user (provided the desk is no longer than 1 800)	2 500mm (2 750mm when no suspended ceiling or raised floor is installed)	Access to natural light not necessary Pay attention to sound insulation	Room temperature: Summer – 20ºC max Winter – 18.3ºC min	5 l/s air supply per person	
G. Lounge workspace	Open workspace with 1 counter for temporary use by multiple persons	6 Min. length: 2 400mm (provided the desk is no longer than 1 800)	2 500mm (2 750mm when no suspended ceiling or raised floor is installed)	Access to natural light not necessary due to temporary use Close proximity to entrance helps to reduce traffic	Room temperature: Summer – 20ºC max Winter – 18.3ºC min	5 l/s air supply per person	

	Description	Floor Area (m^2)	Ceiling Heights	Situated	Air condition	Air Quality	Adjustments to regulations after surveys
H. Small meeting	Enclosed space for meetings between 2-4 persons	2.2 (per person)	2500mm (2 750mm when no suspended ceiling or raised floor is installed)	Access to natural light not necessary Pay attention to sound insulation	Room temperature: Summer – 20ºC max Winter – 18.3ºC min	5 l/s air supply per person	
I. Large meeting space	Enclosed space for meetings between more than 4 persons	2,2 (per person)	2 500mm (2 750mm when no suspended ceiling or raised floor is installed)	Preferably access to natural light Placed centrally for easy access of staff from other departments	Room temperature: Summer – 20ºC max Winter – 18.3ºC min	5 l/s air supply per person	
J. Brainstorming	Enclosed space for brainstorming, with whiteboards etc.	16,2 (3 per person)	2 500mm (2 750mm when no suspended ceiling or raised floor is installed)	Preferably access to natural light Not in the direct environment of workplace	Room temperature: Summer – 20ºC max Winter – 18.3ºC min	5 l/s air supply per person	
K. Open meeting space (small)	Open meeting place for short meetings between 2-4 persons	2 (per person)	2 500mm (2 750mm when no suspended ceiling or raised floor is installed)	Access to natural light not necessary Placed in the direct environment of the envisaged users	Room temperature: Summer – 20ºC max Winter – 18.3ºC min	5 l/s air supply per person	

	Description	Floor Area (m^2)	Ceiling Heights	Situated	Air condition	Air Quality	Adjustments to regulations after surveys
L. Open meeting space (large)	Open meeting space for informal meetings. Can also be used as workspace.	2 (per person)	2 500mm (2 750mm when no suspended ceiling or raised floor is installed)	Access to natural light not necessary Placed in the direct environment of the envisaged users Close proximity to entrance helps to reduce traffic	Room temperature: Summer – 20ºC max Winter – 18.3ºC min	5 l/s air supply per person	
M. Informal meeting space	Open space with table at standing height, for quick and easy meetings	1 (per person)	2 500mm (2 750mm when no suspended ceiling or raised floor is installed)	In the direct environment of pause space Due to noise, not in direct environment of workplace	Room temperature: Summer – 20ºC max Winter – 18.3ºC min	5 l/s air supply per person	
N. Print/copy space	Enclosed or half-open space for printing and copying	6 (2,1x2,4, with open centre of 90cm on side of machine	2 500mm (2 750mm when no suspended ceiling or raised floor is installed)	Access to natural light not necessary Placed in the direct environment of the envisaged users	Room temperature: Summer – 20ºC max Winter – 18.3ºC min	5 l/s air supply per person	

	Description	Floor Area (m^2)	Ceiling Heights	Situated	Air condition	Air Quality	Adjustments to regulations after surveys
O. Dynamic archive	Enclosed or open space for the storing of documents that are used regularly	L × W (storage unit) = space for furniture + ½L × W + 0.5 = aisle space Total requirement = space for furniture + aisle space	2 500mm (2 750mm when no suspended ceiling or raised floor is installed)	Access to natural light not necessary (it may even be harmful) Placed in the direct environment of the envisaged users	Room temperature: Summer – 20ºC max Winter – 18.3ºC min	5 l/s air supply per person	Floor area: due to the absence of a size for archives and the variability thereof, the first round standards was not provided with a guideline as o which archives' floor areas should be sized. The suggested formula in the last version of the recommended standards was gained from Neufert (2000:350)
P. Mailboxes	Enclosed or open space for the separation of incoming post to workers or departments	1 (per mailbox unit)	2 500mm (2 750mm when no suspended ceiling or raised floor is installed)	Access to natural light not necessary Placed in the direct environment of the envisaged users	Room temperature: Summer – 20ºC max Winter – 18.3ºC min	5 l/s air supply per person	
Q. Waiting/reception	Area for visitors to wait for their appointments after arrival	Depending on activities	2 500mm (2 750mm when no suspended ceiling or raised floor is installed)	Directly at the entrance	Room temperature: Summer – 20ºC max Winter – 18.3ºC min	5 l/s air supply per person	
R. Personal storage space	Area where workers can store their belongings before they go to their flexible workspace	0,3	2 500mm (2 750mm when no suspended ceiling or raised floor is installed)	Access to natural light not necessary Placed in the direct environment of the envisaged users	Room temperature: Summer – 20ºC max Winter – 18.3ºC min	5 l/s air supply per person	

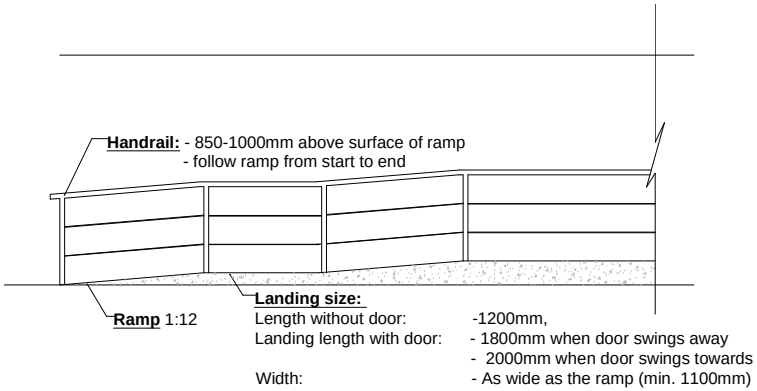
	Description	Floor Area (m^2)	Ceiling Heights	Situated	Air condition	Air Quality	Adjustments to regulations after surveys
S. Pause space	Open space close to pantry, to pause or meet informally	2 (seating and circulation included)	2 500mm (2 750mm when no suspended ceiling or raised floor is installed)	Access to natural light not necessary Close to the cafeteria	Room temperature: Summer – 20ºC max Winter – 18.3ºC min	5 l/s air supply per person	
T. Smoking area	Enclosed space for smokers <u>Important notice:</u> This space should comply with the standards as determined by South African law.	1,25 (per smoker)	2 500mm (2 750mm when no suspended ceiling or raised floor is installed)	Access to natural light not necessary Close to the cafeteria Easy access from inside the building Marked clearly	Room temperature: Summer – 20ºC max Winter – 18.3ºC min	20 l/s air supply per person	

7.1.3 Public Safety and Facilities for Universal access

	Public safety	Facilities for universal access
Entrances	Entrances that forms part of an escape route should be planned according to SANS 10400 Part T Entrances must be slip-free in all seasons.	Should be according to sizes and regulations in SANS 10400 Part S
Floors	Floors must be slip-free and level. Unevenness in floor levels is deemed dangerous.	

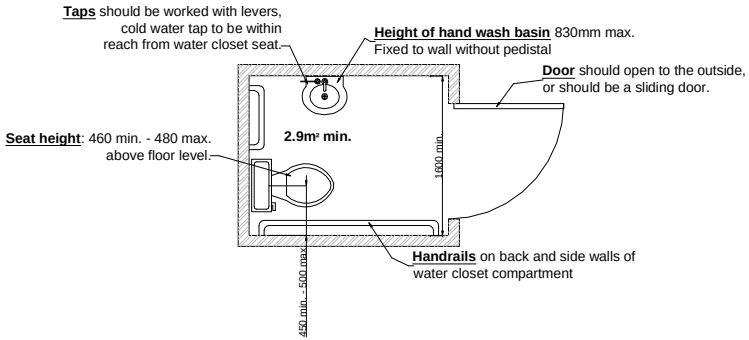
<table>
<tr><th></th><th>Public safety</th><th>Facilities for universal access</th></tr>
<tr><td>Stairways</td><td>▪ The headroom at any point on any stairway shall not be less than 2.1m, measured vertically from the pitch line, and the width of any stairway, measured to any enclosing wall or balustrade, shall not be less than 1 070 mm.

<table>
<tr><th>Staircase and area</th><th>Staircase width</th></tr>
<tr><td>Single staircase serving gross floor area of less than 230m^2</td><td>765mm</td></tr>
<tr><td>Single staircase serving gross floor area of more than 230m^2</td><td>1 070mm</td></tr>
<tr><td>Two staircases, one floor only above ground level, gross area less than 1 860m^2</td><td>1 070mm</td></tr>
<tr><td>Two staircases, one floor only above ground level, gross area more than 1 860m^2</td><td>For every additional 280m^2 add 152mm</td></tr>
</table>
▪ No door shall open onto a stairway, unless such door opens onto a landing and the width of such landing is not less than that of such door. The position of the door relative to the landing and its direction of opening must be such that it does not obstruct the flow of people on the stairway when in the fully open position.</td><td>Vertical circulation should be according to SANS 10400 Part S</td></tr>
<tr><td>Ramps</td><td>Ramps or driveways used by pedestrians, other that those provided for the use of persons in wheelchairs, shall have a gradient of not more than 1 in 8.</td><td>Ramps provided for the use of persons in wheelchairs shall be in accordance with the provisions of SANS 10400-S.



Widths of these ramps should be wide enough to allow wheelchairs to turn easily.</td></tr>
</table>

	Public safety	Facilities for universal access
Escape routes	Escape routes and emergency exits must adhere to the regulations of the SANS 10400 Part T and be free from any obstacles, sufficiently sign-posted, and have fire extinguishers. In addition, the number and dimensions of escape routes must be planned in accordance with its proposed use, its finishes, the size of the workplace area to be served, and the maximum number of building occupants. The width of escape routes must be no less than 2 000mm.	
Doors and openings	Transparent doors and walls must be constructed and finished in such a way that they pose no risk of harm or danger to the building occupants. In addition, transparent building elements should either be sufficiently signposted and screened/protected, or they should be constructed and finished in accordance with safety regulations. Door openings (with or without doors installed) to open plan workspaces should inherent the minimum sixes of door openings according to SANS 10400 Part O.	Doors provided for the use of persons in wheelchairs shall be in accordance with the provisions of SANS 10400-S: - The minimum width of an opening of a door open at 90º should be 750mm. (this include a single door and at least one side of a double door.) - The handle of such door should be of the lever type and no higher than 1200mm measured from the floor.
Balconies & mezzanine floors	In the case of any interior balcony or mezzanine floor, such balcony or floor shall be provided with a balustrade or wall not less than 1 m in height: provided that, where such balcony or floor is used for public seating in rows, such height may be reduced to not less than 800mm opposite the seating in the front row.	
Halls		**SANS 10400.2005: SS6.** Auditoria, halls and other meeting facilities – Where any building contemplated in Regulation **S1** contains one or more auditoria or halls fitted with fixed seating, floor space accessible to any person in a wheelchair shall be set aside for the accommodation of wheelchairs in such auditoria or halls, and – (a) such space shall be situated adjacent to an exit door, and shall be so arranged that a wheelchair will not obstruct any aisle or exit door; and (b) such space shall be of a size sufficient to accommodate – (i) one wheelchair, where the number of fixed seats for which the auditorium or hall is designed is not more than 50; (ii) two wheelchairs, where the number of fixed seats for which the auditorium or hall is designed is more than 50, but not more than 400; and (iii) three wheelchairs or a number of wheelchairs equal to 0,5% of the number of fixed seats for which the auditorium or hall is designed, whichever is the greater, where that number of fixed seats is greater than 400.

	Public safety	Facilities for universal access
Toilet facilities	According to SANS 10400 Part P	Toilet facilities provided for the use of persons in wheelchairs shall be in accordance with the provisions of SANS 10400-S. 

7.1.4 Lighting

1	2	3	4	5
Location/Industries	**Type of work, task or activity**	**OHS Act** Lux	**Productivity value** (min. av.) Lux	**Glare rating** (max.)
Offices	Entrance halls and reception areas	100	200	22
	Conference rooms, general offices, typing and filing	350	500	19
	Computer and business machine operation	500	500	19
	Drawing offices	500	750	16

Location/Industries	Type of work, task or activity	OHS Act Lux	Productivity value (min. av.) Lux	Glare rating (max.)
Passages and lobbies	All areas	75	150	22
Stairs, escalators and ramps	General	100	150	22
Storage	General	100	200	25

Note:

1) Special attention required in respect of colour rendering
2) Supplementary local lighting might be required.

This study was conducted to address the non- existence of standards in the planning for offices in South Africa. Through questionnaires, measuring of existing offices and the comparison of available research developed material, a set of standards was developed. This sets the table for future research in this regard.

The standards recommended in this study should be supplemented by constant research endeavours to accommodate future developments in work styles and work methods.

The executed surveys attempt to serve as a basis. However, the lack of availability of information in South Africa, is a problem. A definite attempt to improve, and refine the process needs to be made. Through discussion the recommended standards according for the different spaces in the workplace environment and the detail needed for each space, the importance of planning the office to support the activities of its users is accented. In addition, this is

a generic set of standards that should be adjusted according to the needs of the specific company. The different functions of different offices such as audit firms, lawyer practises, administration etc. need to be included, and further research should result in a refined database that has different recommendations to fit the variety of workplace environments.

Future studies/research:

- The recommended standards should be tested.
- By investigating in a second round of evaluations at other organizations, the follow-up surveys can contribute in building a database to strengthen the research outcomes.
- This will result in cross-case comparison, an effective way of testing results and development method to ensure the continued growth in workplace environments are included when planning and evaluating offices.
- These studies further the database for developers when planning the building.
- Implementation of this information during the first stages of the planning of a building reduces the changes to be done afterwards and also reduce buildings standing unused.
- Architects are used as the specialist when planning and designing offices and this information should form part of the training of student architects. Students are exposed to the advantages of knowledge in this field. This does not only improve offices, but by studying the success of buildings after occupation, it might educate planners for future projects.

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Summary of compared standards

NOPA

Category 1:

General Workspace:

Standard 1: Workspace per person

The workspace per occupant in a general clerical post should be at least 6m^2. However, if the specific task requires the use of a large number of machines, furniture, etc., the workspace should be of an adequate size to accommodate this.

Netherlands Standards for Offices

Standard 1: Measurement of individual workspace

FUNCTION	FURNITURE	MINIMUM FLOOR AREA (m^2)	OPTIMUM FLOOR AREA (m^2)
Function 1	Minimum workspace	7	9
Function 2	+ additional partitioning	9	11
Function 3	+ additional partitioning and sufficient workspace for 2 people	11	12
Function 4	+ additional partitioning and sufficient workspace for 4 people	13	14
Function 5	+ additional partitioning and sufficient workspace for 6 people	18	18
Function 6	Employees with representative responsibilities	28	28

Minimum and optimum floor area of various Dutch workspaces (relative to the functional nature and the required facilities of the activity to be accommodated)

1-person space:

Alternative Names:

- Single office, office room, cell, management room

Description:

- Enclosed workspace with temporary meeting space

SANS

Design population	
Offices Occupancy comprising offices, banks, consulting rooms and other similar usage. *(What type of offices – what does it include?)*	1 person per 15 m^2

Room area	
Any habitable room other than a kitchen, scullery or laundry	6 m^2, with no linear dimension of less than 2 m

4.2.4 Two or more spaces shall be deemed to be one room if any dividing wall or partition, including any door, erected between such spaces occupies less than 60% of the area of the separating plane. *What about open-plan offices?*

● 4.4 Floor Area

The overall plan area of any dwelling house shall be not less than 15 m^2 in the case of any temporary building, 27 m^2 in the case of permanent Category 1 buildings, or 30 m^2 in the case of any other permanent building. *How to apply to offices?*

SABS

	Use: • Concentrated single work area • Optional: small meetings *Space:* • Minimum floor area: 7 m^2 • Minimum width: 1,8 m • From a flexibility viewpoint, the same floor area as for the 2-person space would be ideal. *Recommendations:* • Cover the back of the user • The user should have a view of the entrance. *Situated:* • Preferably access to natural light • Pay attention to sound insulation (glass panels can address the problem of activities in front of the door). *Notes:* • In practice, these offices are often used by managers, for cultural reasons (status) or functional reasons (regular meetings). To get better use from this space, it could be used as a workspace by the manager, and alternately as a meeting space when the manager is out of the office. **<u>Silent workspace:</u>** *Alternative Names:* • Concentration workspace, cocoon, cell, cockpit *Description:* Enclosed workspace for the temporary use of 1 person. *Use:* • Concentrated work (max. half day) • Telephone communication without disturbances.		

	Space: • Minimum floor area: 6 m^2 • Recommended area: 10 m^2, in order to also make the space available as a standard 1-person space. *Recommendations:* • Cover the back of the user. • The user should have a view of the door. • Space smaller than 2.4 m is experienced as uncomfortable. • Too much transparency can cause distraction. *Situated:* • Doesn't have to be close to a window, due to the temporary utilisation. • Need for indirect daylight. • Prevent outside views from two sides. • Situated in quiet zone – recommended. *Notes:* • When used as an flexible workspace, the space tends to become a fixed workspace over time for e.g. managers, which leads to a shortage in available concentration workspace. • When using a small area one tends to leave the door open, which negatively affects the functionality. • The general and maximal usage of silent workspaces is high. Ensure that adequate spaces are available. **<u>2-person space:</u>** *Alternative Names:* • 2-person room, office room *Description:* Enclosed space for 2 persons. *Use:* • Semi-concentration administration work • Teamwork		

- Flexible, to be used as meeting space as well

Space:

- Minimum floor area: 14 m^2

Recommendations:

- Ensure back coverage for users.
- Both users should have a view of the window and door.
- The work method has a direct influence on the satisfaction of the co-workers in a 2-person workspace (e.g. phoning versus reading).

Situated:

- On the periphery, access to daylight and an open window.
- Closeness of printer area not a problem if sufficient soundproofing and visual privacy are provided.
- The use of glass partitioning could result in distraction from printing areas.

Notes:

- None

Team space:

Alternative Names:

- Group office, team workplace, project room

Description:

Enclosed workspace for 3 or more persons

Use:

- Semi-concentration administration work
- Team/project work
- Interdependent exchange (e.g. secretaries)

Space:

- Minimum floor area: 7 m^2 per workspace
- Recommended area: Plural of floor area of 2-person space or large meeting room.

Recommendations (divisions):

- Tables could be placed so that co-workers face one another or face away from one another. Facing one another could stimulate communication, but could also reduce privacy and induce distraction.

Situated:

- On the periphery, access to daylight and an open window.
- Closeness of printer area not a problem if sufficient soundproofing and visual privacy are provided.
- The use of glass partitioning could result in distraction from printing areas.

Notes:

- How does one separate/combine communication and concentration? It is advisable to place a communication or concentration space in the direct environment of the team space.

Open workspace:

Alternative Names:

- Office garden, open workspace, group office

Description:

- Open workspaces for multiple persons.

Use:

- Semi-concentration administration work
- Routine activities
- Team/project work
- Activities that include an introduction
- Buffer workspace (not person-bounded for use during peak hours or days)

Space:

- Minimum floor area: 7 m^2 per person

Recommendations & division:

- Tables should be placed so that co-workers face one another, or face away from one another. Facing one another could stimulate communication, but could also reduce privacy and induce distraction.

Situated:

- On the periphery, access to daylight and an open window.
- Close proximity of printer area not recommended due to noise pollution.

Notes:

- Form-giving and the placing of furniture in an open space are more important than the enclosing of a workspace.
- Due to the dependence of the content of the work on the occupation of the workspace, it is recommended that silent workspaces and meeting spaces are placed in the direct environment of a team space.
- Regulations regarding telephone usage, computer noise and meetings in the workspace are recommended.

Half-open workspace:

Alternative Names:

- Cubicles

Description:

- Half-open space for multiple persons. Half-height partitioning is used to separate workspaces.

Use:

- Activities that require internal communication or relatively no concentration
- Additional workspace that is not person-bounded for use during peak hours or days

Space:

- Recommended floor area: minimum 7 m^2 per workspace

Recommendations & division:

- Tables could be placed so that co-workers face one another, or face away from

	one another. Facing towards one another could stimulate communication, but could also reduce privacy and induce distraction. • Half-height partitioning can be placed between co-workers to create cubicles – multiple 1-person workspaces within one space. Such a workspace remains suitable for semi-concentration work. *Situated:* • On the periphery, access to daylight and an open window. • Closeness of printer area not a problem if sufficient soundproofing and visual privacy are provided. • The use of glass partitioning could result in distraction from printing areas. *Notes:* • The use of half-height partitioning to reduce noise is only effective if partitions have a height of 1.4 m or more. The half-height partition does provide visual privacy. • Due to the dependence of the content of the work on the occupation of the workspace, it is recommended that silent workspaces and meeting spaces are placed in the direct environment of a team space • Regulations regarding telephone usage, computer noise and meetings in the workspace are recommended. **<u>Lounge Workspace:</u>** *Alternative Names:* • Club, café, buffer space, coupé *Description:* Open workspace with one worktop for temporary use by multiple persons *Use:* • Laptop work • Reading • Informal meeting • Teamwork, administration work • Team/project work • Additional workspace that is not person-bounded for use during peak hours or days		

	Space: • Minimum floor area: 6 m^2 per workspace *Recommendations & division:* • Settings are usually around a table . Lounge furniture can also be used in a variety of standards, i.e. from adjustable chairs to standard chairs and tables. *Situated:* • Doesn't have to be on the periphery, due to the temporary utilisation • Close proximity of printer area not recommended due to noise pollution • Placement in the vicinity of the entrance is recommended to reduce traffic in the environment of the other workspaces. *Notes:* • When high quality is given to the space, it becomes popular. • The users sit further apart when using benches – therefore it often seems as if two spaces are occupied, while only one is being used. • The lounge space is not intended as a permanent workspace as the seats cannot be adjusted, and users therefore need to stand and sit often. **Small meeting space:** *Alternative Names:* Small meeting room, meeting room, consulting room. *Description:* • Enclosed space for meetings between 2 to 4 persons. Used for small meetings or confidential conversations. The use of the space is free, and helps reduce the noise caused by meeting conversations. *Use:* • Small meetings • Confidential conversations (optional) • Presentations (optional) • Project work (optional)		

Space:

- Minimum floor area: 2,2 m^2 per person
- Recommendation: space should be the same size as a 1-person space or silent workspace, in order to create greater spatial flexibility.

Recommendations & division:

- Note that there is only one partitioning to project on.
- Ensure that all users can see and hear one another.

Situated:

- Doesn't need to be on the periphery; however, measurements that are too small can result in a stuffy space.
- Directly in the neighbourhood of the envisaged users (e.g. in the department). Especially important in open workspaces, it supports meetings in the envisaged space.

Notes:

- Fully glazed spaces in the middle of the floor offer little visual privacy. This can result in too many distractions (people passing by) and a sense of being put on display (problem with confidentiality). Installing sandblasted glass up to eye height can solve this problem. However, creating a space for confidential conversations could result in a negative space due to intrusion by the conversation of the surrounding staff.
- Set specific regulations about booking the space in advance.
- Note the leakage of sound to surrounding spaces, especially if this space is also used for confidential meetings.
- Provide adequate space with variety in location, form and size.

Large meeting space:

Alternative Names:

- Meeting room, meeting space

Description:

- Enclosed space for meetings between more than four people; planned meetings.

	Use: • Meetings • Brainstorming sessions/workshops • Presentations • Project work (optional) • Educational/instructions (optional) *Space:* • Minimum floor area: 2,2 m^2 per person • Recommendation: space should be the same size as a 2-person space or team workspace in order to create greater spatial flexibility. *Recommendations & division:* • Note that there is only one partitioning to project on. • Ensure that all users can see and hear one another. • Provide sufficient space for alternative meetings, e.g. workshops, project work or courses. *Situated:* • On the periphery (daylight and view), especially when space is also used for the reception of external personnel. • Not in the direct neighbourhood of open workspaces, in order to prevent distraction from “after-meeting” conversations. • Close to a set of stairs or lift to make it easily accessible for external personnel and staff from other departments. *Notes:* • Fully glazed spaces in the middle of the floor offer little visual privacy. This can result in too many distractions (people passing by), and a sense of being put on display (problem with confidentiality). Installing sandblasted glass up to eye height can solve this. • Provide an efficient reservation system. • Space should make provision for varying lighting for presentations.		

Brainstorming space:

Alternative Names:

- Creative space, workshop space, Xlerationroom, (when provided with computers for digital brainstorming sessions)

Description:

- Enclosed space for brainstorming activities. Flexible division, with special inventory such as whiteboards, flip-overs and PCs.

Use:

- Meetings
- Brainstorming sessions/workshops
- Presentations
- Project work (optional)
- Educational/instructions (optional)

Space:

- Minimum floor area: 16 m^2, recommended: 3m^2/person
- Recommendation: space should be the same size as a meeting space in order to create greater spatial flexibility.

Recommendations & division:

- Space should be designed to force people out of their standard meeting pattern.
- Note that there is only one partitioning to project on.
- Ensure that all users can see and hear one another.
- Provide sufficient space for alternative meetings, e.g. workshops, project work or courses.

Situated:

- On the periphery (daylight and view), especially when space is also used for brainstorming with external personnel.
- Not in the direct neighbourhood of open workspaces, in order to prevent distraction from “after-meeting” conversations.
- Close to a set of stairs or lift to make it easy accessible for external personnel and staff from other departments.

Notes:

- Fully glazed spaces in the middle of the floor offer little visual privacy. This can result in too many distractions (people passing by), and a sense of being put on display (problem with confidentiality). Installing sandblasted glass up to eye height can solve this problem.
- Provide an efficient reservation system.
- Space should make provision for varying lighting for presentations.

Open meeting space (small):

Alternative Names:

- Meeting place

Description:

- Open space for short, informal meetings between 2 to 4 persons.

Use:

- Small meetings
- Laptop work (optional)

Space:

- Minimum floor area: 2 m^2 per person

Recommendations & division:

- Provide privacy by placing the space in a corner next to a wall, and/or inserting half-height cabinets.

Situated:

- Not on the periphery
- Directly in the neighbourhood of the envisaged users, e.g. a department
- Should preferably not be situated between open workspaces, due to noise distraction. This could work when only the surrounding users utilise the space.
- In the neighbourhood of the cafeteria, where co-workers meet informally

.

Notes:

- Often located in the middle zone of combination or room offices.
- Do not place directly in a walkway, as the lack of privacy would prevent proper use of the space.
- Used as a waiting area for visitors.

Open meeting space (large):

Alternative Names:

- Root table, reading table, worktable.

Description:

- Open space for informal meetings, with the second function of utilisation for working.

Use:

- Meetings (informal)
- Laptop work (optional)
- Reading
- Buffer workplace for use during peak hours or days

Space:

- Minimum floor area: $2m^2$ per person

Recommendations & division:

- Provide privacy by placing the space in a corner next to a wall, and/or inserting half-height cabinets.

Situated:

- Not on the periphery.
- Directly in the neighbourhood of the envisaged users, e.g. a department.
- Should preferably not be situated between open workspaces, due to noise distraction. This could work only if the surrounding users utilise the space.
- In the neighbourhood of the cafeteria, where co-workers meet informally
- The cafeteria can also be used for this purpose outside lunchtime.

	Notes: - Often located in the middle zone of combination or room offices. - Do not place directly in a walkway – the lack of privacy would prevent proper use of the space. - Used as a lunch area or for special events, e.g. birthdays. - Provide efficient regulations for property and maintenance. **<u>Informal meeting space:</u>** *Alternative Names:* - Meeting point, bar *Description:* - Open space with tables at standing height for quick and easy meetings. *Use:* - Small meetings - Informal meetings - Drinking coffee - Waiting area *Space:* - Minimum floor area: 1 m^2/person *Recommendations & division:* - Arranged tables at standing height, or café seats. *Situated:* - Directly in the neighbourhood of the cafeteria or other place where co-workers meet informally. - Should preferably not be situated between open workspaces, due to noise distraction. *Notes:* • Too much space for informal meeting defeats the purpose. Provide a limited number of spaces in places focused on shared functions, e.g. cafeteria, print/copy space, etc.		

Print/copy space:

Alternative Names:

- Repro space, service space, printer cage

Description:

Enclosed or half-open space for copying and printing

Use:

- Copying
- Printing
- Shredding waste paper and occasionally other office supplies
- Small meetings, people meeting while waiting to copy or print

Space:

- Minimum floor area: 6 m^2 (2,10 m x 2.40 m) with a free middle section of 900 mm, with a copier on the one side and a workbench on the other.
- Total floor area to be determined by the number of copiers/printers, storage possibilities, container for recycled paper and a table/workbench.

Recommendations & division:

- Arranged in such a way that apparatus can easily be served and maintained.
- Often part of a facility unit with office equipment and recycling facilities.

Situated:

- Not on the periphery
- Directly in the neighbourhood of the envisaged users, e.g. a department
- Should preferably not be situated between open workspaces, due to noise distraction. This can work when only if the surrounding users utilise the space.
- In the neighbourhood of the cafeteria, where co-workers meet informally

Notes:

- Provide clear regulations regarding management of the space, e.g. replacing paper, storage, etc.
- Number of print/copy spaces depends on the printing system of the organisation.
- Note the heat production of printing/copy machines.
- Note the generation of dangerous waste – keep this in mind when placing different types of equipment together in one space.
- The labour law contains regulations for maximum noise pollution levels in such a space.

Dynamic archive:

Alternative Names:

- Archive, departmental archive

Description:

Enclosed or open space for the storage of documents that are used often.

Use:

- Placing of archive cabinets, filing cabinets, and other storage equipment
- Archiving, storage and consultation of documentation
- Archiving responsibilities (optional)

Space:

- Average floor area: 1m² per standard archive cabinet
- Total floor area: Determined by the number of archive cabinets, as well as the type of cabinets used. Shelves take up less space than drawers that need to open, and the same applies to cabinets with sliding or hinged doors.
- Minimum service area in front of a cabinet: 900 mm

Recommendations & Division:

- Arranged in such a way that easy access to storage cabinets is facilitated and signage on cabinets is clearly visible.

	Situated: - Not on the periphery. - Directly in the neighbourhood of the envisaged users, e.g. a department. - Can be situated in a circulation route, as long as it is not a main circulation route. *Notes:* - The discussion on archive space is closely linked to the office work method/concept. A flexible work method makes use of digital storage, and only partial use of archives. - Is provision made per person or per department? It is important to indicate how space is provided, and why. - Take note of high floor load where larger-size cabinets are used. - Investigate the option of a confidential archive, or one that is located in the circulation route of a department. - For formal archives (mostly central, not dynamic), the law on archives should be taken into account. - Archive cabinets can be used to divide open workspaces. This will only work if the archive is utilised solely by users close by. **Postboxes:** *Alternative Names:* - Post, post room *Description:* - Enclosed or open space for the sorting of mail to co-workers or departments *Use:* - Sorting and distribution of incoming mail - Storage of documentation *Space:* - Average floor area 1m^2 per standard cabinet - Total floor area: Determined by the number of archive cabinets, as well as the type of cabinets used. Shelves take up less space than drawers that need to open, and the same applies to cabinets with sliding or hinged doors.		

	Recommendations & Division: - Placed in such a way that users can reach their mailboxes without effort. *Situated:* - Not on the periphery. - Directly in the neighbourhood of the envisaged users, e.g. a department, and the entrance to the department. - Can be situated in a circulation route, as long as it is not a main circulation route. *Notes:* - Can be combined with lockers where co-workers store their personal belongings. - Is the mail confidential, and should it be in an enclosed area? - The need for a postbox area depends on the way mail is distributed: paperless or by the secretary? **Waiting/reception space:** *Alternative Names:* - Lounge, lobby, reception *Description:* - Space where visitors are received and wait for their appointments. This space can be located in a circulation route. *Use:* - Receiving of guests - Security - Informal meeting - Specific gathering - Information to guests *Space:* - Space depends on the facilitated functions and the desired image. *Recommendations or division:* - Spacious seating, information boards, and computer screen. *Situated:* - Directly at the entrance		

Notes:

- Space used to provide first impressions of the organisation's function.

Personal storage space:

Alternative Names:

- Lockers, garage

Description:

- Space for employees to store their personal belongings before they proceed to the flexible workspace.

Use:

- Storage of personal belongings.

Space:

- Average floor area: 0,3m^2 per standard storage box.
- Total floor area: depends on number of co-workers and type of cabinets used.

Recommendations & Division:

- Placed to provide easy access to personal boxes.

Situated:

- Not on the periphery.
- Directly in the neighbourhood of the envisaged users, e.g. a department, and the entrance to the department.
- Can be situated in a circulation route, as long as it is not a main circulation route.

Notes:

- Important to use space efficiently in order to prevent placement of suitcases to claim workspace.
- Garage/storage box should be of adequate size to accommodate items, but not so large that it becomes a personal "dump".

Standard 2: Width of the main passage

The main passage inside the general working space should be at least 1.2 m wide.

Standard 3: Ceiling height

The ceiling height of any general working space should be about 2.6 m, so as to permit the use of raised-floor systems.

1	2
Room or space	**Minimum height**
Bedroom /Office?	2,4 m over a floor area of at least 6 m², with a clear height of at least 1,8 m at any point more than 0,75 m from the edge of the floor space.
Any other habitable room in a dwelling house or a dwelling unit	2,4 m over a minimum of 70% of the floor area, and not less than 2,1 m over the remaining floor area.
All habitable rooms other than those listed above	2,4 m
Passage or entrance hall	2,1 m
Bathroom, shower-room, laundry or room containing a WC pan	2,1 m over any area where a person would normally be in a standing position.
Open mezzanine floor with an area not exceeding 25% of the area of the floor immediately below it	2,1 m above and below the mezzanine floor

Heights of rooms or areas

Standard 4: Layout consideration The layout of the general working space should be based on the concept of office planning, and should therefore retain an overall balance.			
Standard 5: Break area (rest area) There should be an area near the general working space where occupants can freshen up, rest or take a break from general workplace activities. The general working space should be decorated with artworks, plants (greenery), etc., and created in such a way that occupants can occasionally take their minds off their work.	**Pantry:** *Alternative Names:* Coffee corner, restaurant, coffee machine, club *Description:* Enclosed, open or half-open space where employees can enjoy refreshments *Use:* - Obtaining refreshments - Consuming refreshments (optional) - Informal meeting (optional) - Collecting plastic (optional) *Space:* - Minimum floor area: 1.5 m^2 per machine and 1m^2 per user. - Total floor area: depending on the type and number of pieces of equipment. *Recommendations & Division:* - Equipment should be easily accessible and maintained. - Advisable to combine with a meeting place, a workbench or reading table. *Situated:* - Not on the periphery. - In the neighbourhood of a meeting space or staircase/lift. - Combination with similar facilities helps to create natural meeting places for co-workers. - Not in the neighbourhood of open workspaces or other spaces where distraction due to noise or traffic can become a problem.		

	Notes: - The standard of the pantries can vary from standard coffee machine to full espresso bar, with microwave oven, etc. - The number of pantries depends on the type of equipment and the length of walklines. - Average floor area: minimum 1 pantry per 600 to 700 m^2 floor area - Note the maintenance of the space. **<u>Pause space:</u>** *Alternative Names:* - Meeting space, break-out *Description:* - Open space close to pantry, for pausing or informal meetings *Use:* - Consuming of refreshments and informal meetings. *Space:* - Minimum floor area: 2 m^2 per seat, including table and circulation routes. *Recommendations & Division:* - Advisable to combine with meeting space, workbench or reading table. - Also provide tables with chairs and standing-height tables. - Computer or base station should be available. *Situated:* - Not on the periphery. - In the neighbourhood of the pantry, meeting space or staircase/lift. - Combination with similar facilities helps to create natural meeting places for co-workers. - Not in the neighbourhood of open workspaces or other spaces where distraction due to noise or traffic could become a problem.		

Notes:

- The standard of the pause space can vary from standard chair and table to full espresso bar.
- The space may be provided with newspapers and magazines.
- Space may be combined with a waiting/reception area or a workbench/reading table.

Smoking area:

Alternative Names:

- Smokers' cage, smoke cabinet

Description:

- Enclosed space for smokers.

Use:

- Smoking, in combination with coffee/pause
- Informal meeting

Space:

- 1,25 m^2 per smoker
- Total floor area: depending on inventory (or lack thereof)

Recommendations & Division:

- Standing-height tables, meeting tables, ashtrays

Situated:

- Close to cafeteria/pantry
- Easily accessible from the inside of the building

Notes:

- The space should be enclosed, and may not cause problems to any surrounding spaces, e.g. it may not be part of the cafeteria.
- The door should be self-closing.
- White walls discolour easily, and carpets trap the smoke and are hard to clean.

	- Defining a smokers' area may lead to grouping – the cafeteria being situated close by could encourage integration. - Employers who do not comply with this regulation can be fined € 300 for the first offence, and € 2.400 for repeat offences. - Such spaces are often referred to as the most sociable space.		
Category 2: **Light / Lighting System** **Standard 6: Lighting environment** • The brightness of the general workspace should be suitable for standard visibility of work. • This includes a minimum of 750 LUX for general overhead lighting, and 1500 LUX for task lighting.	**Standard 5: Natural light/view to outside** The function of this criterion is to provide sufficient and comfortable levels of natural light (daylight) to the workplace environment, and to ensure that all occupants have access to a view over external elements (distant views, nature, sky, moving elements). Glazing should also permit neutral light to penetrate the workplace, and as such clear glazing is preferred. Important factors in this regard are the following: ● Daylight factor on the work surface > 3% ● Daylight factor in the middle of any office/workspace > 0.9% ● Total area of all daylight openings/windows ≥ 5% of office/workspace floor area **Standard 6: Artificial light** The function of this criterion is to provide sufficient and comfortable levels of artificial light to the workplace environment. The types of artificial light in workplaces include indirect artificial light (also known as *ambient lighting*) and direct artificial light (also known as *task lighting*). Important factors in this regard are the following: ● Illumination strength - on the work surface (horizontal) > 400 lux - on visual screens and monitors (vertical) < 200 lux ● Light fittings must have a downlighting angle of no less than 40 deg., and a lateral illumination value of less than 200 cd/m^2 ● Colour spectrum index of emitted light > 90	**O2 Special provision of natural lighting** Any habitable room in any dwelling house or dwelling unit, or any bedroom in any building used for residential or institutional occupancy shall, notwithstanding the provision of artificial lighting, be provided with at least one opening for natural light in accordance with Subregulation **O1 (1)**.	**SABS 0114-1: Artificial lighting of interiors** 4.1.1 (p3) For a person to be able to move around in a building and to perform tasks safely and efficiently, it is important that both the total environment and the task be illuminated adequately and to acceptable standards. 4.1.5 f) (p4) Correlating both natural and artificial lighting throughout the building, in order to prevent excessive differences in illuminances between adjacent areas and thereby reduce the risk of accidents. 4.1.5 g) (p4) Installing emergency lighting systems where necessary. 4.4 Visual capability (p6) The average age of the worker should be taken into account when the required levels for specific tasks are being determined. The physiological capabilities of the human eye deteriorate with age. This reduces the worker's speed of perception and tolerance of glare, and also increases the time needed for adaptation. As a result, there is a measurable reduction in visual sensitivity, particularly for vision in low-brightness environments. The illuminance levels and glare ratios in this part of SABS 0114 are based on an average adult worker age, but if older persons are generally employed, lighting levels should be increased by 15% to 20% and glare factors reduced. 5.2.3 (p7) The illuminance on each horizontal work plane within a room should be reasonable uniform, and it is recommended that the uniformity ratio of minimum average illuminance (E min to E ave) should not exceed 0,75:1. The uniformity ratio between the average illuminance on each work plane and the average illuminance in adjacent floor areas should not exceed 5:1.

			5.4.1 (p8) When the task luminance appropriate to an activity has been determined, the luminance of the other parts of the room should be planned to afford visual comfort and to stimulate general interest. Recommended ratios for average luminance of the task to luminance of the background and the visual surroundings are as follows: - 3:1 (max) between task and background - 5:1 (max) between task and more remote, darker surfaces (visual surroundings); and - 1:5 (max) between task and more remote lighter surfaces (visual surroundings) (for example, the sky viewed through windows and walls and above rooftops) 5.4.2 (p8) In general, the task should be brighter than the background, but the relationship is less critical at low and medium task luminance levels (below 100cd/m²). 5.4.5 (p8) …It is important, particularly in buildings where exacting work is undertaken, to provide "visual rest centres". Attention can not be concentrated on the task all the time, and the luminance pattern of the general surroundings should be arranged in such a way that, when the eyes are rested by looking up from the work, they view areas free of patches of very high luminance or strong colour. 7.1.2 (p10) …Good lighting requires that the degree of glare be limited to a value acceptable to the majority of the people who use the particular building.

8.3.2 (p17) Lamp colour rendering groups

Table 2 (a)

1	2	3	4	5
Colour rendering group	Colour rendering index range	Colour appear-ance	Examples of use: Preferred	Examples of use: Acceptable
1B	$90>R_a\geq80$	Warm Inter-mediate	Houses, hostels, restaurant, shops, offices, schools, hospitals	
2	$80>R_a\geq60$	Warm Inter-mediate Cold	Industrial work	Offices, schools

9.2.1 (p20) The distribution of illuminance should be regarded as complementary to the distribution of luminance in the interior. It should take into account the following aspects:

a) Luminance of the task and luminance of its immediate surroundings

b) Luminance of ceilings, walls and floors; and

c) Avoidance of glare by limiting the luminance of luminaires and windows

9.2.4 (p21) Reflectance and illuminance

9.2.4.1 In working interiors, in order to reduce the contrast between luminaires and the surrounding ceiling, the ceiling reflectance should be as high as possible (at least 0,6),

			especially if recessed luminaires are used. 9.2.4.2 In working interiors, the reflectance of the walls should preferably lie between 0, 3 and 0, 7… 9.2.4.3 The reflectance of the floor cavity should lie between 0, 1 and 0, 3… 10.2.6 (p24) Lighting for circulation … At night, it is desirable to light entrance halls and lobbies in such a way that the illuminance is reduced towards the exit, and that no bright luminaires are in the line of sight of people leaving the building. It is also desirable, for safety reasons, to illuminate the area beyond the exit. Any entrance steps to the building should be well lit by correctly screened luminaires. 10.2.7 (p24) Providing for emergencies (safety) …In buildings where large numbers of people gather, emergency lighting should be provided to ensure safe exit from the building in the event of a power supply failure. Particular attention should be paid to the placement of emergency lighting units on stairways and in exit areas. Adequate emergency lighting should also be provided in first aid stations, so that activities can continue without interruption. 11.4 (p27) Recommendations on lighting 11.4.1 In rooms where all workstations include a VDU (visual display unit), an illuminance of 500 lux on the source document seems to be a reasonable value. 11.4.2 To ensure that there are no reflections on the VDUs it is essential that a luminance of 200cd/m^2 not be exceeded at the angle of either 50˚ or 60˚, as the case may be. 12.2 (p31) Day lighting …The heat gains through windows might require cooling of the interior during the warm season, but might reduce heating costs during the cold season. However, heat losses through the window during the cold season can

			offset the savings, and can increase heating costs. The use of daylight as an illuminant cab saves energy used for electric lighting, but this should be balanced against the energy required to compensate for the heat gains and losses through the glazing… 12.2.4 Heat gains and losses Means to avoid excessive heat soar are as follows: a) Appropriate orientation of glazing b) Reduction of areas of glazing c) Use of external blinds, screens or louvres; and d) Use of heat-reflecting or heat-absorbing glass or coated glass Some benefit can also be obtained by the use of certain types of reflecting curtains, fitted inside the windows. 16.4 (p57) Safety versus productivity 16.4.1 The following is an extract from the regulations of the Occupational Health and Safety Act, 1993: (1) Every employer shall cause every workplace in his undertaking to be lighted in accordance with the illuminance values specified in the Schedule to these regulations. Provided that where specialized lighting is necessary for the performance of any particular type of work, irrespective of whether that type of work is listed in the Schedule or not, the employer of those employees who perform such work shall ensure that such specialized lighting is available to and is used by such employees. (3) With respect to the lighting to be provided in terms of Subregulation (1), the employers shall ensure that – (a) The average illuminance at any

floor level in a workplace within five metres of a task is not less than one fifth of the average illuminance on that task.

(b) Glare in any workplace is reduced to a level that does not impair vision.

(d) Luminaires and lamps are kept clean and, when defective, are replaced or repaired forthwith.

16.4.2 In any inhabited environment, safe conditions are essential. It is therefore important to design lighting installations to compensate for human limitations. Any factor that aids visual performance increases the probability that a person will detect a potential accident hazard and act to avoid it.

…The lighting levels listed in the OHS Act, 1993, are the absolute minimum legal average light levels that may exist in a workplace. If, at any time, the average falls below the OHS Act minimum for any reason, i.e. failed lamps, dirty lenses or covers, or circuit failure, then the employer, in terms of the Act, is guilty of an offence. To ensure that these values are exceeded at all times, higher initial values have to be provided for, as required by the service and maintenance conditions that exist on site.

Table 8 (p72)

1	2	3	4	5
Location/ Industries	**Type of work, task or activity**	**OHS Act safety** Lux	**Produc-tivity value** (min. av.) Lux	**Glare rating** (Max.)
Offices	Entrance halls and reception areas	100	200	22
	Conference rooms,	300	500	19

	general offices, typing and filing			
	Computer and business machine operation	500	500	19
	Drawing offices	500	750	16
Passages and lobbies	All areas	75	150	22
Stairs, escalators and ramps	General	100	150	22
Storage	General	100	200	25

Note:

1) Special attention required in respect of colour rendering
2) Supplementary local lighting might be required

Standard 7: Glare prevention measures Glare prevention measures should be implemented in the general working space to create a lighting environment that is accommodating with regard to occupant requirements.			
Category 3: **Noise Countermeasures**	**Standard 7: Internal noise** The function of this criterion is to ensure acceptable noise levels in the workplace. The following are lists of acceptable noise levels with regard to the overall workplace		

Standard 8: Background noise

The background noise in the general working space should be limited to about 45 dB (A).

environment and workplace installations (Fig. 5) and acceptable noise levels with regard to workplace machines (Fig. 6).

	MAXIMUM BACKGROUND NOISE (OVERALL WORKPLACE ENVIRONMENT)	MAXIMUM BACKGROUND NOISE (INSTALLATIONS)
Enclosed offices	L_{Aeq} = 40 dB (A)	L_{Aeq} = 35dB(A)
Meeting rooms	L_{Aeq} = 35dB(A)	L_{Aeq} = 30dB(A)
Open-plan offices/office landscape	L_{Aeq} = 45dB(A)	L_{Aeq} = 40dB(A)

Background noise levels in workplaces

	MAXIMUM NOISE FROM PRINTERS/COPIERS
Low volume (less than 5000 copies per month)	L = 65 dB (A)
Medium volume (5000 to 50 000 copies per month)	L = 73 dB (A)
High volume (more than 50 000 copies per month)	L = 81 dB (A)

Maximum acceptable noise levels from office machines

Standard 8: External noise

The function of this criterion is to prevent excessive noise levels from exterior disturbances from becoming a problem for the indoor workplace environment through irritation, disturbance of work, lack of concentration, and a negative influence on workplace communication. With regard to the building skin, occupant control over the opening of windows is preferable. However, when external noise exceeds a limit of 60 dB (A), opening window sections should not be used in order to prevent external noise from becoming a disturbance to the workplace occupants.

Category 4: Air/Air-Conditioning

Standard 3: Thermal comfort

The function of this criterion is to provide a comfortable indoor working climate with special attention to low or high temperature, draught due to both mechanical and natural ventilation, dry air, and control over temperature, sun screening and window frames. The following is a list of some factors deemed important with regard to this criterion:

1	2	3	
Occu-pancy	**Mini-mum requi-rements, l/s**	**Mini-mum requi-rement, l/s**	**Remark**

Standard 9: Air quality

Temperature/humidity should be accommodating to occupants.

There should be an adequate amount of ventilation.

Measures should be in place to counteract smoking-related problems.

- The maximum indoor air velocity to be maintained:
  - in summer: 0.25 m/s
  - in winter: 0.15 m/s
- Room temperature:
  - in summer: 24ºC maximum
  - in winter: 20ºC minimum
- During summer, the room temperature may not go more than 5ºC below the outside temperature.
- The temperature difference between the various spaces/rooms within the workplace may not be no more than 3ºC in summer.
- Vertical temperature gradient to be < 3 K/m.
- Surface temperature of the floor to be between 19 and 26ºC.
- Where the temperature exceeds any of the minimum or maximum levels, the duration of such excess may be no longer than 150 hours (GTO) with regard to PMV (Predicted Mean Vote) > +0.5. The PMV includes such relative factors as moisture, air temperature, radiation temperature, and air velocity. Dutch building performance research in this respect has showed that a factor of 150 GTO can be effectively addressed through opening windows, thus giving the occupants some level of control over the indoor climate. However, where such occupant control is not possible or available, a stricter GTO factor of maximum 100 GTO should apply.

Standard 4: Air quality

The function of this criterion is to provide good indoor air quality in the workplace that will not harm or compromise occupant health in any way. The following is a list of some factors deemed important with regard to this criterion:

- Ozone emission of printers/copiers: < 0.04 mg/m^3
- Recirculation of workplace air through mechanical ventilation during working hours should be kept to a minimum.
- Minimum filter quality of mechanical ventilation:
  - without recirculation: EU7
  - with recirculation: EU8/9
- The recommended ventilation supply of fresh air to workplaces:
  - 60 m^3/h per person (non-smoking)
  - 80 m^3/h per person (smoking)

In both instances, the factors apply to workplaces where there are no emissions

	Smo-king	**Filtered non-smo-king**	
Offices			Air supply required per person
General	7,5	5,0	Air supply required per person
Meeting and waiting spaces	7,5	5,0	Air supply required per person
Confer-ence and board rooms	10,0	5,0	Air supply required per person
Smoking rooms	20,0	-	Air supply required per person

Air quality

e) in the case of any motor-repair garage, photographic darkroom, working area in a commercial dry-cleaning establishment, private or central kitchen in a hotel, motel, resort, dormitory and similar facilities, or any wash-room or room containing a WC pan or urinal located in an office-type occupancy or intended for use by the public, the extract ventilation quantity shall exceed the supply air quantity to ensure negative pressure in the area concerned.

	from workplace materials and machines. According to the Bouwbesluit, the minimum factor is 36m^3/h per person. ● The recommended ventilation supply of fresh air to meeting rooms: - 20m^3/m^2/h ● The recommended factors for moisture in workplaces where additional moisture is provided must be between 30 and 70%. Additional moisture must be supplied if the relative RV is lower than 30%.		
Standard 10: Management of operation The air-conditioning system should be operated so as to allow for individual occupant control for optimum comfort.			
Category 5: **Floors** **Standard 11: Safety considerations** All passageways should be free from any obstructions to those using them.	**Standard 9: Safety** The function of this criterion is to prevent accidents in the building/workplace. Safety considerations include, but are not limited to, entrances, emergency escape routes and walkways, floors, doors, and stairs. Criteria corresponding to these elements are the following: ● Entrances must be slip-free in all seasons. ● Floors must be slip-free and level. Unevenness in floors levels is deemed dangerous. ● Escape routes and emergency exits must comply with the regulations of the Arbobesluit (Art. 3.6 t/m 3.19), and be free of any obstacles, sufficiently signposted, and have fire extinguishers. In addition, the number and dimensions of escape routes must be planned in accordance with their proposed use, finishes, the size of the workplace area to be served, and the maximum number of building occupants. The width of escape routes must be no less than 1.2m. ● Transparent doors and walls must be constructed and finished in such a way that they pose no risk of harm or danger to the building occupants. In addition, transparent building elements should be both sufficiently signposted and screened/protected, or they should be constructed and finished in accordance with safety regulations.	**Public Safety** ● **4.2 Change in level** **4.2.2** The edge of any balcony, bridge, flat roof or similar place more than 1 m above the adjacent ground or floor level shall be provided with a balustrade or parapet wall not less than 1 m in height, unless unauthorised access of persons thereto has been excluded by a physical barrier, properly erected and maintained. **4.2.3** In the case of any interior balcony or any mezzanine floor, such balcony or floor shall be provided with a balustrade or wall not less than 1 m in height: provided that, where such balcony or floor is used for public seating in rows, such height may be reduced to not less than 800 mm opposite the seating in the front row. 4.22 Any balustrade or wall provided as protection at any change in level in any	

		occupancy classified E2, E3, H1, H2, H3 or H4 shall not have any opening that permits the passage of a 100 mm diameter ball: provided that such protection in any occupancy not being an occupancy classified E2, E3, H1, H2, H3 or H4, shall consist of at least a handrail and one other rail midway between such handrail and the floor. ● **4.3 Ramps** b) ramps or driveways used by pedestrians other than those provided for the use of persons in wheelchairs, shall have a gradient of not more than 1 in 8; c) ramps provided for the use of persons in wheelchairs shall be in accordance with the provisions of SANS 10400-S; and d) ramps designed for use by both vehicles and pedestrians shall have a walkway not less than 1.2 m wide, which shall be provided with a kerb not less than 150 mm high.	
Standard 12: Spatial comfort The hardness of the floor should be made more accommodating to the feet by laying carpets, etc. Measures should be implemented to counteract static-related problems.			
Category 6: **Measures for OA (Office Automation) Machines**			

Standard 13: Occupant health In order to protect the health of the occupants, VDT work measures should be implemented. Measures to counteract excessive noise should be implemented. Each space should be suitably air-conditioned by taking into account the differences in released heat, etc.			
Standard 14: Electric wiring plans A sound knowledge of the existing state of all electric wiring is important. In addition, the wiring should be planned with enough flexibility and in such a way so that it can accommodate any future changes in the space layout and requirements for electrical capacity. Information-based security measures should be implemented.			
Standard 15: Desks Desks include access holes for telephone and OA machine cables and wires. The desk should be large enough to facilitate and accommodate the nature of the activity it is intended for.	**Standard 2: Partitioning and furniture** The function of this criterion is to provide the infrastructure to physically support the workplace activities. Elements to be considered include chairs, desks, office tables, bureaus, storage space, consultation space, foot rests, and other supporting furniture elements. *Workspace design* gives special attention to aspects such as ergonomic design, the prevention of reflection from the colour or type of material used in partitioning, and the ease of access to all workspace elements. Considerations with regard to *furniture* are aimed specifically at user requirements (relative to the furniture requirements, as dictated by the functional nature of the activity). See also Fig. 4.		

Standard 16: Chairs Chairs should be stable and have an easily adjustable seat.			
Standard 17: Storage furniture The drawers and doors of the storage furniture should be resistant to vibration of impact to ensure they stay intact and properly shut. Storage furniture should also be resistant to the effects of earthquakes.			
Category 7: **Facility Management** **Standard 18: Facility Management** **a) Strategy** Offices are subjected to constant change. Periodical surveys should be conducted to investigate and determine occupant satisfaction with the workplace.			
Standard 18: Facility Management **b) Cost management** Proper records should be kept of the costs of running the office. Purchase of office equipment and products should be planned in advance.			
Standard 18: Facility Management **c) Operations management / maintenance cost** An office operation management manual defining all regulations with regard to maintenance issues should be			

kept.			
Category 8: **Social Welfare Environment** **Standard 19: Female users/ occupants** The office environment should accommodate any special requirements with regard to female workers.			
Standard 20: Elderly and physically handicapped users/occupants The office environment should be accommodating with regard to elderly and handicapped workers.			**Facilities for Disabled Persons** **SS6.** Auditoria and Halls. – Where any building contemplated in regulation **S1** contains one or more auditoria or halls fitted with fixed seating, floor space accessible to any person in a wheelchair shall be set aside for the accommodation of wheelchairs in such auditoria or halls, and – (a) such space shall be situated adjacent to an exit door and shall be so arranged that any wheelchair will not obstruct any aisle or exit door; and (b) such space shall be of a size sufficient to accommodate – (i) one wheelchair, where the number of fixed seats for which the auditorium or hall is designed, is not more than 50; (ii) two wheelchairs, where the number of fixed seats for which the auditoria or hall is designed, is more than 50 but not more than 400; and three wheelchairs or a number of wheelchairs equal to 0,5% of the number of fixed seats for which the auditorium or hall is designed, whichever is the greater, where that number of fixed seats is greater than 400.

Category 9: Environmental Safety **Standard 21: Energy conservation and recycling** **a) Energy conservation** Energy conservation rules with regard to the air-conditioning system, lighting, OA machines, etc., should be formulated and implemented. **Standard 21: Energy conservation and recycling** **b) Recycling** Paper, cans, bottles, etc. must be sorted for collection.			
Category 10: Filing **Standard 22: Filing system/ regulations** Guidelines for filing should be drawn up and implemented.			
	Standard 10: Cleaning The function of this criterion is to keep the workplace clean and tidy. Elements included in this process are floor coverings, furniture, sanitary fittings, windows, curtains and blinds, ceiling and wall finishes, ventilation grills, windowsills, and all other workplace fittings and installations. Healthy building management processes and the frequency with which they are carried out, must be co-ordinated with the following aspects:		

	● The material, type of finish, and type of workplace elements ● The function of the workplace/workspace ● The use of the workplace/workspace ● The degree of cleaning required ● The required quality level The following recommendations are also made with regard to workplace fit-out: ● Sufficient provision of closed cabinets ● No loose-lying elements such as cables on the floor ● No ledges, upstands, windowsills, or any other elements or places that can not be easily reached ● A smooth floor finish In the Netherlands, specific Acceptable Quality Levels (AQL) are determined for various types of spaces, depending on their use and function. An AQL factor of 7 would therefore mean that no more than 7% of all inspected elements may be rated as reflecting an insufficient level of cleanliness. According to the VSR-KMS (Vereniging Schoonmaak Research – Kwaliteitsmeetsysteem) an acceptable AQL for workplaces is a factor of ≤ 7, while sanitary spaces require a factor of ≤ 4.		
	Standard 11: Complaints system Complaints management is essential to the healthy management of buildings. The help desk is central to facility management in dealing with all complaints. Effective complaints management should at least adhere to the following conditions: ● Workplace-related complaints are received and registered ● Where possible, the source of the complaint is dealt with in an effective way, with report-back on all actions and results. ● Where improvement of the complaints situation is not possible, the source of such complaint is eliminated. ● Throughout the process of complaints management, careful and complaint-orientated communication is essential. Complaints should be addressed with the necessary (specialised) knowledge. "*Always take complaints seriously, but not necessarily literally*". In Fig. 7, a process scheme for complaints management is indicated. Where the process results are uncertain, great urgency exists for resolution of the complaint, or where the process takes longer than one week, it is important that the ongoing process be periodically monitored. The latter is not reflected in the diagram.		

		• **Bill of Rights:** Everyone has the right a. to an environment that is not harmful to their health or well-being; and b. to have this environment protected, for the benefit of present and future generations, through reasonable legislative and other measurements that i. prevent pollution and ecological degradation; ii. promote conservation; and iii. secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.	
		Part M: Stairways **4.2.1** The headroom at any point on any stairway shall not be less than 2.1 m, measured vertically from the pitch line, and the width of any stairway, measured to any enclosing wall or balustrade, shall not be less than 750 mm. **4.2.4** No door shall open onto a stairway, unless such door opens onto a landing and the width of such landing is not less than that of such door. The position of the door relative to the landing and its direction of opening must be such that it does not obstruct the flow of people on the stairway when in the fully open position.	

Addendum B
Results of measured office spaces

RHO Phase 1, Bloemfontein

<table>
<tr><th>RHO Phase 1, Bloemfontei</th><th></th><th>Description</th><th>Recommended Floor Area (m²) Min. Length: 1200mm</th><th>Building Climate</th><th>Measured Floor Area</th><th>Measured Ceiling Heights</th><th>Measured Light Quality (Lux)</th></tr>
<tr>
<td></td>
<td>A.1-person space</td>
<td>Enclosed workspace with temporary meeting space
 
Measured: A1
A2
A3</td>
<td>7

Min. Length: 1200mm</td>
<td>Room temperature: Summer – 24deg.C max Winter – 20deg.C min</td>
<td>
<table>
<tr><th></th><th>1</th><th>2</th><th>3</th></tr>
<tr><td>General:</td><td>16.92m²</td><td>17.46m²</td><td>21.86m²</td></tr>
<tr><td>Covered:</td><td>2.24m²</td><td>1.47m²</td><td>2.82m²</td></tr>
<tr><td>Secondary circulation:</td><td>14.68m²</td><td>15.99m²</td><td>19.04m²</td></tr>
<tr><td>Door openings:</td><td>800mm</td><td>805mm</td><td>800mm</td></tr>
<tr><td>Minimum Length:</td><td>3440mm</td><td>3600mm</td><td>4320mm</td></tr>
</table>
</td>
<td>
<table>
<tr><td>1</td><td>2500mm</td></tr>
<tr><td>2</td><td>2470mm</td></tr>
<tr><td>3</td><td>2480mm</td></tr>
</table>
</td>
<td>
<table>
<tr><th>1</th><th>Window uncovered</th><th>Window covered</th><th>No window</th></tr>
<tr><td>Computer area:</td><td>355</td><td>289</td><td>-</td></tr>
<tr><td>Work surface:</td><td>310</td><td>255</td><td>-</td></tr>
<tr><td>Meeting:</td><td>-</td><td>-</td><td>-</td></tr>
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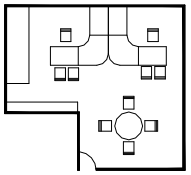
<table>
<tr><th>2</th><th>Window uncovered</th><th>Window covered</th><th>No window</th></tr>
<tr><td>Computer area:</td><td>411</td><td>313</td><td>-</td></tr>
<tr><td>Work surface:</td><td>358</td><td>278</td><td>-</td></tr>
<tr><td>Meeting:</td><td>-</td><td>-</td><td>-</td></tr>
</table>
<table>
<tr><th>3</th><th>Window uncovered</th><th>Window covered</th><th>No window</th></tr>
<tr><td>Computer area:</td><td>354</td><td>327</td><td>-</td></tr>
<tr><td>Work surface:</td><td>398</td><td>305</td><td>-</td></tr>
<tr><td>Meeting:</td><td>-</td><td>-</td><td>-</td></tr>
</table>
</td>
</tr>
<tr>
<td></td>
<td>B. Silent Workspace</td>
<td>Enclosed workspace for temporary use of 1 person</td>
<td>6</td>
<td>Room temperature: Summer – 24deg.C max Winter – 20deg.C min</td>
<td>Not available in this building</td>
<td>Not available in this building</td>
<td>Not available in this building</td>
</tr>
</table>

C. 2-persons space

Enclosed workspace for 2 persons

Measured: C1



14

Room temperature: Summer – 24deg.C max Winter – 20deg.C min

	1	2	3
General:	47.72m²	Not available in this building	Not available in this building
Each:	23.86m²		
Covered:	8.53m²		
Secondary circulation:	39.19m²		
Door openings:	800mm		
Minimum Length:	7120mm		

1	2475mm
2	Not available in this building
3	Not available in this building

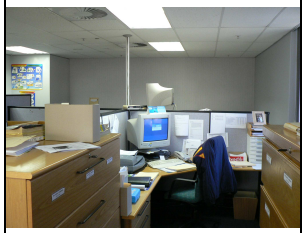
1	Window uncovered		Window covered	
Computer area:	**1**	**2**	**1**	**2**
	619	319	368	195
Work surface:	26	391	79	265
Meeting:	469		325	

2	Window uncovered	Window covered	No window
Computer area:	Not available in this building		
Work surface:			
Meeting:			

3	Window uncovered	Window covered	No window
Computer area:	Not available in this building		
Work surface:			
Meeting:			

D. Team space

Enclosed workspace for 3 or more persons



Measured: D1
D2

7

Room temperature: Summer – 24deg.C max Winter – 20deg.C min

	1	2	3
General:	Not availabl e in this building	43.30m²	66.94m²
Each:		10.83m²	11.17m²
Covered:		8.96m²	15.89m²
Secondary circulation:		34.34m²	51.05m²
Door openings:		800mm	800mm
Minimum Length:		5460mm	5635mm

1	Not available in this building
2	2500mm
3	2500mm

1	Window uncovered				Window covered			
Computer area:	Not available in this building							
2	Window uncovered							
Computer area:	**1**	**2**	**3**	**4**				
	530	237	289	-				
	Window covered							
	1	**2**	**3**	**4**				
	426	227	284	-				
Work surface:	Window uncovered							
	1	**2**	**3**	**4**				
	514	309	296	409				
	Window covered							
	1	**2**	**3**	**4**				
	477	290	290	385				
Meeting:	Windows uncovered		606					
	Windows covered		476					

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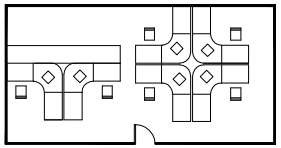
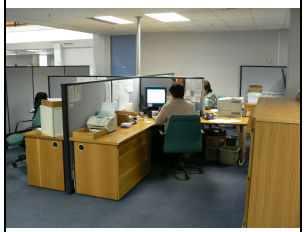
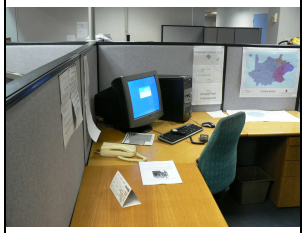
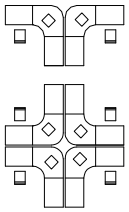
<td> 
D2: Team space</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>
<table>
<tr><td>3</td><td colspan="6">Window uncovered</td></tr>
<tr><td>Computer area:</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td></td><td>485</td><td>458</td><td>451</td><td>-</td><td>226</td><td>413</td></tr>
<tr><td></td><td colspan="6">Window covered</td></tr>
<tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td></td><td>420</td><td>391</td><td>420</td><td>-</td><td>265</td><td>355</td></tr>
<tr><td>Work surface:</td><td colspan="6">Window uncovered</td></tr>
<tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td></td><td>386</td><td>469</td><td>425</td><td>560</td><td>285</td><td>363</td></tr>
<tr><td></td><td colspan="6">Window covered</td></tr>
<tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td></td><td>415</td><td>423</td><td>400</td><td>472</td><td>280</td><td>268</td></tr>
<tr><td>Meeting:</td><td colspan="3">Windows uncovered</td><td colspan="3">-</td></tr>
<tr><td></td><td colspan="3">Windows covered</td><td colspan="3">-</td></tr>
</table>
</td>
</tr>
<tr>
<td></td>
<td>E. Open workspace</td>
<td>Open workspace for more than 3 persons
 
Measured: E1</td>
<td>7
(per person)</td>
<td>Room temperature:
Summer – 24deg.C max
Winter – 20deg.C min</td>
<td>
<table>
<tr><th></th><th>1</th><th>2</th><th>3</th></tr>
<tr><td>General:</td><td>Not available in this building</td><td>19.40m²</td><td>Not available in this building</td></tr>
<tr><td>Each:</td><td></td><td>4.85m²</td><td></td></tr>
<tr><td>Covered:</td><td></td><td>14.24m²</td><td></td></tr>
<tr><td>Covered each:</td><td></td><td>3.56m²</td><td></td></tr>
<tr><td>Secondary circulation:</td><td></td><td>5.16m²</td><td></td></tr>
<tr><td>Door openings:</td><td></td><td>-</td><td></td></tr>
<tr><td>Minimum Length:</td><td></td><td>-</td><td></td></tr>
</table>
</td>
<td>
<table>
<tr><td>1</td><td>Not available in this building</td></tr>
<tr><td>2</td><td>2470mm</td></tr>
<tr><td>3</td><td>Not available in this building</td></tr>
</table>
</td>
<td>
<table>
<tr><td>1</td><td colspan="4">No window</td></tr>
<tr><td>Computer area:</td><td colspan="4">Not available in this building</td></tr>
<tr><td>Work surface:</td><td colspan="4"></td></tr>
<tr><td>Meeting:</td><td colspan="4"></td></tr>
</table>
<table>
<tr><td>2</td><td colspan="4">No window</td></tr>
<tr><td>Computer area:</td><td colspan="4">Window uncovered</td></tr>
<tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td></tr>
<tr><td></td><td>312</td><td>518</td><td>-</td><td>-</td></tr>
<tr><td></td><td colspan="4">Window covered</td></tr>
<tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td></tr>
<tr><td></td><td>265</td><td>425</td><td>-</td><td>-</td></tr>
<tr><td>Work surface:</td><td colspan="4">Window uncovered</td></tr>
<tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td></tr>
<tr><td></td><td>352</td><td>515</td><td>448</td><td>312</td></tr>
<tr><td></td><td colspan="4">Window covered</td></tr>
<tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td></tr>
<tr><td></td><td>259</td><td>415</td><td>341</td><td>265</td></tr>
<tr><td>Meeting:</td><td colspan="4">-</td></tr>
</table>
<table>
<tr><td>3</td><td colspan="4">No window</td></tr>
<tr><td>Computer area:</td><td colspan="4">Not available in this building</td></tr>
<tr><td>Work surface:</td><td colspan="4"></td></tr>
<tr><td>Meeting:</td><td colspan="4"></td></tr>
</table>
</td>
</tr>
</table>

F. Half open workspace

Half open space for multiple persons. Half height sides used to separate individual workspaces of groups



Measured: F1
F2
F3



D2: Team Space

7

Room temperature: Summer – 24deg.C max Winter – 20deg.C min

	1	2	3
General:	30.62m²	45.49m²	41.56m²
Each:	7.66m²	7.58m²	6.93m²
Covered:	8.96m²	13.44m²	13.44m²
Secondary circulation:	21.66m²	32.05m²	28.12m²
Door openings:	-	-	-
Minimum Length:	-	-	-

1	2500mm
2	2500mm
3	2500mm

1	No window
Computer area:	**1** 163 | **2** 204 | **3** 265 | **4** 424
Work surface:	No window **1** 202 | **2** 227 | **3** 243 | **4** 390
Meeting:	-

2	No window
Computer area:	**1** 200 | **2** 514 | **3** - | **4** 206 | **5** 228 | **6** 258
Work surface:	No window **1** 262 | **2** 367 | **3** 212 | **4** 155 | **5** 412 | **6** 339
Meeting:	-

3	Window uncovered
Computer area:	**1** 366 | **2** 217 | **3** 582 | **4** 665 | **5** 340 | **6** 272 Window covered **1** 352 | **2** 172 | **3** 578 | **4** 484 | **5** 230 | **6** 239
Work surface:	Window uncovered **1** 475 | **2** 380 | **3** 447 | **4** 1800 | **5** 3370 | **6** 468 Window covered **1** 470 | **2** 267 | **3** 436 | **4** 300 | **5** 295 | **6** 404
Meeting:	-

G. Lounge workspace

Open workspace with 1 counter for multiple persons temporary use

Measured: G1

6

Room temperature: Summer – 24deg.C max Winter – 20deg.C min

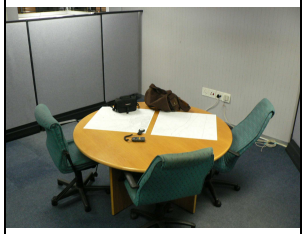
	1	2	3
General:	33.75m²	Not available in this building	Not available in this building
Each:	6.75m²		
Covered:	11.84m²		
Secondary circulation:	21.91m²		
Door openings:	-		
Minimum Length:	-		

1	2600mm
2	Not available in this building
3	Not available in this building

1	Window uncovered
Computer area:	**1** 127 | **2** - | **3** - | **4** - | **5** - | **6** - Window covered **1** 58 | **2** - | **3** - | **4** - | **5** - | **6** -
Work surface:	Window uncovered **1** 127 | **2** 335 | **3** 248 | **4** 249 | **5** 206 Window covered **1** 58 | **2** 294 | **3** 174 | **4** 108 | **5** 58
Meeting:	-

2	Window uncovered	Window covered	No window
Computer area:	Not available in this building		

3	Window uncovered	Window covered	No window
Computer area:	Not available in this building		
Work surface:			
Meeting:			

	H. Small meeting space	E enclosed space for use of meetings of 2-4 persons  Measured: H1 H2 H3	2,2 (per person)	Room temperature: Summer – 24deg.C max Winter – 20deg.C min			

	1	2	3
General:	26.40m²	23.51m²	39.19m²
Each:	6.6m²	5.88m²	9.80m²
Covered:	3.37m²	3.37m²	5.47m²
Secondary circulation:	23.03m²	20.14m²	33.72m²
Door openings:	800mm	800mm	800mm
Minimum Length:	3300mm	4600mm	6020mm

1	2490mm
2	2475mm
3	2505mm

1	Window uncovered	Window covered	No window
Computer area:	354	340	-
Work surface:	472	447	-
Meeting:	681	613	-

2	Window uncovered	Window covered	No window
Computer area:	533	375	-
Work surface:	658	333	-
Meeting:	704	501	-

3	Window uncovered	Window covered	No window
Computer area:	255	200	-
Work surface:	321	219	-
Meeting:	658	418	-

I. Large meeting space

Enclosed space for the use of meetings of more than 4 persons

Measured: I1
I2
I3

2,2
(per person)

Room temperature:
Summer – 24deg.C max
Winter – 20deg.C min

	1	2	3
General:	105.77m²	26.92m²	21.40m²
Each:	4.07m²	3.37m²	1.95m²
Covered:	34.00m²	4.58m²	16.00m²
Secondary circulation:	7 1.77m²	22.34m²	5.4m²
Door openings:	1500mm 1500mm 1500mm	800mm 800mm	500mm
Minimum Length:	8530mm	3500mm	4350mm

1	2505mm
2	2490mm
3	2510mm

1	Window uncovered	Window covered	No window
Computer area:	-	-	-
Work surface:	-	-	-
Meeting:	139	105	-

2	Window uncovered	Window covered	No window
Computer area:	-	-	-
Work surface:	-	-	-
Meeting:	275	241	-

3	Window uncovered	Window covered	No window
Compute r area:	-	-	-
Work surface:	-	-	-
Meeting:	553	490	-

J. Brainstorm space

Enclosed space for brain storming with white boards etc.

Measured: J1
J2
J3

16,2
(3,2 per person)

Room temperature:
Summer – 24deg.C max
Winter – 20deg.C min

	1	2	3
General:	13.12m²	24.50m²	18.75m²
Each:	2.19m²	2.04m²	4.69m²
Covered:	1.13m²	3.84m²	1.74m²
Secondary circulation:	11.99m²	20.66m²	17.01m²
Door openings:	800mm	805mm	720mm
Minimum Length:	3280mm	4880mm	4300mm

1	2520mm
2	2470mm
3	2500mm

1	Window uncovered	Window covered	No window
Computer area:	-	-	-
Work surface:	-	-	-
Meeting:	288	252	-

2	Window uncovered	Window covered	No window
Computer area:	-	-	-
Work surface:	-	-	-
Meeting:	378	296	-

3	Window uncovered	Window covered	No window
Compute r area:	-	-	-
Work surface:	-	-	-
Meeting:	-	-	352

K. Open meeting space (small)

Open meeting place for short meetings between 2-4 persons

Measured: K1
K2

2
(per person)

Room temperature:
Summer – 24deg.C max
Winter – 20deg.C min

	1	2	3
General:	-	4.71m²	12.39m²
Each:	-	1.18m²	2.07m²
Covered:	-	1.54m²	1.54m²
Secondary circulation:	-	3.17m²	10.85m²
Door openings:	-	-	-
Minimum Length:	-	2020mm	2420mm

1	-
2	2480mm
3	2490mm

1	Window uncovered	Window covered	No window
Computer area:	-	-	-
-Work surface:	-	-	-
Meeting:	-	-	-

2	Window uncovered	Window covered	No window
Computer area:	-	-	-
Work surface:	-	-	-
Meeting:	-	-	221

3	Window uncovered	Window covered	No window
Compute r area:	-	-	-
Work surface:	-	-	-
Meeting:	-	-	661

L. Open Meeting space (large)

Open meeting space for informal meetings. Can also be used as workspace

Measured: L1
L2
L3

2
(per person)

Room temperature:
Summer – 24deg.C max
Winter – 20deg.C min

	1	2	3
General:	25.16m²	23.32m²	6.93m²
Each:	5.03m²	2.47m²	1.39m²
Covered:	6.24m²	3.37m²	4.66m²
Secondary circulation:	18.92m²	8.95m²	2.26m²
Door openings:	-	-	1180mm
Minimum Length:	4900mm	2420mm	1725mm

1	2500mm
2	2505mm
3	2500mm

1	Window uncovered	Window covered	No window
Computer area:	-	-	289
Work surface:	-	-	187
Meeting:	-	-	187

2	Window uncovered	Window covered	No window
Computer area:	-	-	121
Work surface:	-	-	139
Meeting:	-	-	228

3	Window uncovered	Window covered	No window
Compute r area:	200	166	-
Work surface:	422	357	-
Meeting:	211	252	-

M. Informal meeting space

Open space with table on standing height or coaches for quick and easy meetings

Measured: M1
M2
M3

1
(per person)

Room temperature:
Summer – 24deg.C max
Winter – 20deg.C min

	1	2	3
General:	7.03m²	8.44m²	32.90m²
Each:	1.76m²	2.11m²	4.70m²
Covered:	5.00m²	5.00m²	5.47m²
Secondary circulation:	2.03m²	3.44m²	27.44m²
Door openings:	-	-	-
Minimum Length:	-	-	-

1	2500mm
2	2470mm
3	2500mm

1	Window uncovered	Window covered	No window
Computer area:	-	-	-
Work surface:	-	-	-
Meeting:	-	-	130

2	Window uncovered	Window covered	No window
Computer area:	-	-	-
Work surface:	-	-	-
Meeting:	-	-	222

3	Window uncovered	Window covered	No window
Compute r area:	-	-	-
Work surface:	-	-	-
Meeting:	247	164	-

N. Print/copy space

Enclosed or half open space for printing and copying

Measured: N1
N2
N3

6
(2,1x2,4 with open centre of 90cm on side of machine

Room temperature:
Summer – 24deg.C max
Winter – 20deg.C min

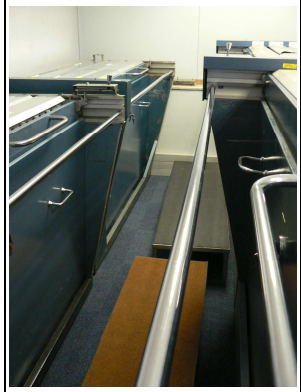
	1	2	3
General:	5.80m²	13.77m²	3.78m²
Covered:	2.69m²	3.31m²	1.40m²
Secondary circulation:	3.11m²	10.46m²	2.38m²
Door openings:	800mm	1800mm	-
Minimum Length:	1510mm	3130mm	-

1	2520mm
2	2470mm
3	2500mm

1	Window uncovered	Window covered	No window
Computer area:	-	-	-
Work surface:	-	-	193
Meeting:	-	-	-

2	Window uncovered	Window covered	No window
Computer area:	-	-	-
Work surface:	-	-	223
Meeting:	-	-	-

3	Window uncovered	Window covered	No window
Compute r area:	-	-	-
Work surface:	-	-	147
Meeting:	-	-	-

	O. Dynamic archive	Enclosed or open space for the storing of documents that are used regularly  Measured: O1	1 (per archive unit)	Room temperature: Summer – 24deg.C max Winter – 20deg.C min	**General:** 19.61m²; **Covered:** 11.98m²; **Secondary circulation:** 7.63m²; **Door openings:** 800mm; **Minimum Length:** 3800mm	**1** 2515mm **2** - **3** -	**1**: Computer area: - / - / -; Work surface: - / - / 317; Meeting: - / - / - **2**: Computer area: - / - / -; Work surface: - / - / -; Meeting: - / - / - **3**: Computer area: - / - / -; Work surface: - / - / -; Meeting: - / - / -
	P. Post boxes	Enclosed or open space for the separation of incoming post to workers or departments	1 (per post box unit)	Room temperature: Summer – 24deg.C max Winter – 20deg.C min	Not available in this building	Not available in this building	
	Q. Waiting reception space	Area for visitors to be arrive and wait for their appointments  Measured: Q1	Depending on activities	Room temperature: Summer – 24deg.C max Winter – 20deg.C min	**General:** 335.71m²; **Covered:** 10.69m²; **Secondary circulation:** 325.02m²; **Door openings:** -; **Minimum Length:** -	**1** atrium	**1**: Computer area: - / - / -; Work surface: 112 / - / -; Meeting: - / - / -

R. Personal storage space

Area where workers can store their belongings before they go to their flexible workspace

0,3

Room temperature:
Summer – 24deg.C max
Winter – 20deg.C min

	1	2	3
General:	**Not available in this building**		
Each:			
Covered:			
Secondary circulation:			
Door openings:			
Minimum Length:			

1	**Not available in this building**
2	
3	

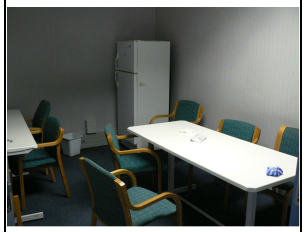
1	Window uncovered	Window covered	No window
Computer area:	**Not available in this building**		
Work surface:			
Meeting:			

2	Window uncovered	Window covered	No window
Computer area:	**Not available in this building**		
Work surface:			
Meeting:			

3	Window uncovered	Window covered	No window
Compute r area:	**Not available in this building**		
Work surface:			
Meeting:			

S. Pause space

Open space close to pantry to pause or meet informally



Measured: S1
S2
S3

2
(seating and circulation included)

Room temperature:
Summer – 24deg.C max
Winter – 20deg.C min

	1	2	3
General:	22.86m²	4.89m²	14.58m²
Each:	2.29m²	1.22m²	1.82m²
Covered:	7.86m²	1.4m²	1.67m²
Secondary circulation:	15.00m²	3.49m²	12.91m²
Door openings:	800mm 800mm 800mm	-	800mm
Minimum Length:	3140mm	2020mm	3070mm

1	2490mm
2	2505mm
3	2490mm

1	Window uncovered	Window covered	No window
Computer area:	-	-	-
Work surface:	-	-	518
Meeting:	-	-	186

2	Window uncovered	Window covered	No window
Computer area:	-	-	-
Work surface:	-	-	-
Meeting:	-	-	272

							3 / Window uncovered / Window covered / No window Computer area: - / - / - Work surface: - / - / - Meeting: - / - / 425
	T. Smoking area	Enclosed space for smokers	1,25 (per smoker)	Room temperature: Summer – 24deg.C max Winter – 20deg.C min	**General:** Not available in this building **Each:** **Covered:** **Secondary circulation:** **Door openings:** **Minimum Length:**	**1** Not available in this building **2** **3**	**1** / Window uncovered / Window covered / No window Computer area: Not available in this building Work surface: Meeting: **2** / Window uncovered / Window covered / No window Computer area: Work surface: Meeting: **3** / Window uncovered / Window covered / No window Computer area: Work surface: Meeting:

NBSC Centurion

<table>
<tr><th>NBSC Centurion</th><th></th><th>Description</th><th>Recommended Floor Area (m^2)
Min. Length: 1200mm</th><th>Air condition</th><th>Measured Floor Area</th><th>Measured Ceiling Heights</th><th>Measured Light Quality (Lux)</th></tr>
<tr>
<td></td>
<td>A. 1-person space</td>
<td>Enclosed workspace with temporary meeting space

Measured: A1
A2
A3</td>
<td>7</td>
<td>Room temperature:
Summer – 24deg.C max
Winter – 20deg.C min</td>
<td>
<table>
<tr><th></th><th>A1</th><th>A2</th><th>A3</th></tr>
<tr><td>General:</td><td>16.60m^2</td><td>16.80 m^2</td><td>16.34 m^2</td></tr>
<tr><td>Covered:</td><td>4.59 m^2</td><td>3,25 m^2</td><td>3.25 m^2</td></tr>
<tr><td>Secondary circulation:</td><td>12.01 m^2</td><td>1355 m^2</td><td>13.09 m^2</td></tr>
<tr><td>Door openings:</td><td>798mm</td><td>800mm</td><td>800mm</td></tr>
<tr><td>Minimum Length:</td><td>3490mm</td><td>3530mm</td><td>3300mm</td></tr>
</table>
</td>
<td>
<table>
<tr><td>A1</td><td>2620mm</td></tr>
<tr><td>A2</td><td>2650mm</td></tr>
<tr><td>A3</td><td>2625mm</td></tr>
</table>
</td>
<td>
<table>
<tr><th>A1</th><th>Window uncovered</th><th>Window covered</th><th>No window</th></tr>
<tr><td>Computer area:</td><td>547</td><td>359</td><td>-</td></tr>
<tr><td>Work surface:</td><td>462</td><td>383</td><td>-</td></tr>
<tr><td>Meeting:</td><td>422</td><td>313</td><td>-</td></tr>
</table>
<table>
<tr><th>A2</th><th>Window uncovered</th><th>Window covered</th><th>No window</th></tr>
<tr><td>Computer area:</td><td>1304</td><td>370</td><td>-</td></tr>
<tr><td>Work surface:</td><td>907</td><td>390</td><td>-</td></tr>
<tr><td>Meeting:</td><td>792</td><td>388</td><td>-</td></tr>
</table>
<table>
<tr><th>A3</th><th>Window uncovered</th><th>Window covered</th><th>No window</th></tr>
<tr><td>Computer area:</td><td>-</td><td>-</td><td>366</td></tr>
<tr><td>Work surface:</td><td>-</td><td>-</td><td>462</td></tr>
<tr><td>Meeting:</td><td>-</td><td>-</td><td>430</td></tr>
</table>
</td>
</tr>
<tr>
<td></td>
<td>B. Silent Workspace</td>
<td>Enclosed workspace for temporary use of 1 person

Measured: B1
B2
B3</td>
<td>6</td>
<td>Room temperature:
Summer – 24deg.C max
Winter – 20deg.C min</td>
<td>
<table>
<tr><th></th><th>B1</th><th>B2</th><th>B3</th></tr>
<tr><td>General:</td><td>11.29m^2</td><td>11.04m^2</td><td>12.14m^2</td></tr>
<tr><td>Covered:</td><td>2.12 m^2</td><td>2.12m^2</td><td>2.12m^2</td></tr>
<tr><td>Secondary circulation:</td><td>9.17 m^2</td><td>8.92m^2</td><td>10.02m^2</td></tr>
<tr><td>Door openings:</td><td>1090mm</td><td>1100mm</td><td>1340mm</td></tr>
<tr><td>Minimum Length:</td><td>3170mm</td><td>3000mm</td><td>3400mm</td></tr>
</table>
</td>
<td>
<table>
<tr><td>B1</td><td>2635mm</td></tr>
<tr><td>B2</td><td>2630mm</td></tr>
<tr><td>B3</td><td>2630mm</td></tr>
</table>
</td>
<td>
<table>
<tr><th>B1</th><th>Window uncovered</th><th>Window covered</th><th>No window</th></tr>
<tr><td>Computer area:</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Work surface:</td><td>-</td><td>-</td><td>182</td></tr>
<tr><td>Meeting:</td><td>-</td><td>-</td><td>-</td></tr>
</table>
<table>
<tr><th>B2</th><th>Window uncovered</th><th>Window covered</th><th>No window</th></tr>
<tr><td>Computer area:</td><td>-</td><td>-</td><td>88</td></tr>
<tr><td>Work surface:</td><td>-</td><td>-</td><td>117</td></tr>
<tr><td>Meeting:</td><td>-</td><td>-</td><td>-</td></tr>
</table>
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</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>
<table>
<tr><th>B3</th><th>Window uncovered</th><th>Window covered</th><th>No window</th></tr>
<tr><td>Computer area:</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Work surface:</td><td>-</td><td>-</td><td>107</td></tr>
<tr><td>Meeting:</td><td>-</td><td>-</td><td>-</td></tr>
</table>
</td>
</tr>
<tr>
<td></td>
<td>C. 2-persons space</td>
<td>Enclosed workspace for 2 persons</td>
<td>14</td>
<td>Room temperature:
Summer – 24deg.C max
Winter – 20deg.C min</td>
<td colspan="2">Not available in this building</td>
<td>Not available in this building</td>
</tr>
<tr>
<td></td>
<td>D. Team space</td>
<td>Enclosed workspace for 3 or more persons

Measured: D1
D2
D3</td>
<td>7</td>
<td>Room temperature:
Summer – 24deg.C max
Winter – 20deg.C min</td>
<td>
<table>
<tr><th></th><th>D1</th><th>D2</th><th>D3</th></tr>
<tr><td>General:</td><td>26.60m²</td><td>39.06m²</td><td>18.59m²</td></tr>
<tr><td>Each:</td><td>2.96m²</td><td>3.00m²</td><td>3.72m²</td></tr>
<tr><td>Covered:</td><td>3.00m²</td><td>8.65m²</td><td>3.00m²</td></tr>
<tr><td>Secondary circulation:</td><td>23.60 m²</td><td>30.41m²</td><td>15.59m²</td></tr>
<tr><td>Door openings:</td><td>870mm</td><td>800mm</td><td>820mm</td></tr>
<tr><td>Minimum Length:</td><td>4880mm</td><td>5350mm</td><td>3500mm</td></tr>
</table>
</td>
<td>
<table>
<tr><td>D1</td><td>2630mm</td></tr>
<tr><td>D2</td><td>2560mm</td></tr>
<tr><td>D3</td><td>2640mm</td></tr>
</table>
</td>
<td>
<table>
<tr><th>D1</th><th>Window uncovered</th><th>Window covered</th><th>No window</th></tr>
<tr><td>Computer area:</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Work surface:</td><td>-</td><td>-</td><td>235</td></tr>
<tr><td>Meeting:</td><td>-</td><td>-</td><td>-</td></tr>
</table>

<table>
<tr><th>D2</th><th>Window uncovered</th><th>Window covered</th><th>No window</th></tr>
<tr><td>Computer area:</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Work surface:</td><td>415</td><td>323</td><td>-</td></tr>
<tr><td>Meeting:</td><td>-</td><td>-</td><td>-</td></tr>
</table>

<table>
<tr><th>D3</th><th>Window uncovered</th><th>Window covered</th><th>No window</th></tr>
<tr><td>Computer area:</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Work surface:</td><td>-</td><td>-</td><td>386</td></tr>
<tr><td>Meeting:</td><td>-</td><td>-</td><td>-</td></tr>
</table>
</td>
</tr>
</table>

E. Open workspace

Open workspace for more than 3 persons

Measured: E1
E2
E3

7
(per person)

Room temperature:
Summer – 24deg.C max
Winter – 20deg.C min

	E1	E2	E3
General:	17.86m²	16.81m²	17.12m²
Each:	3.24m²	3.24m²	3.24m²
Covered:	8.96m²	5.76m²	5.76m²
Covered each:	1.44m²	1.44m²	1.44m²
Secondary circulation:	4.90m²	3.85m²	5.58m²
Door openings:	1360mm	1360mm	1155mm
Minimum Length:	-	-	-

E1	atrium
E2	2630mm
E3	2630mm

E1	No window			
Computer area:	**1**	**2**	**3**	**4**
	565	600	628	777
Work surface:	405	724	490	690
Meeting:	-			

E2	No window			
Computer area:	**1**	**2**	**3**	**4**
	-	133	207	253
Work surface:	124	133	189	186
Meeting:	-			

E3	No window			
Computer area:	**1**	**2**	**3**	**4**
	203	222	161	144
Work surface:	214	182	147	133
Meeting:	-			

F. Half open workspace

Half open space for multiple persons. Half height sides used to separate individual workspaces of groups

Measured: F1
F2
F3

7

Room temperature:
Summer – 24deg.C max
Winter – 20deg.C min

	F1	F2	F3
General:	25.8m²	28.24m²	17.11m²
Each:	6.45m²	4.68m² & 4.76m²	6.52m²
Covered:	7.20m²	8.64m²	5.76m²
Secondary circulation:	5.94m²	4.29m²	4.30m²
Door openings:	1080mm	-	1180mm
Minimum Length:	-	-	-

F1	2640mm
F2	2650mm
F3	mm

F1	No window				
Computer area:	**1**	**2**	**3**	**4**	**5**
	131	99	251	235	229
Work surface:	138	94	211	195	232
Meeting:	-				

F2	Window uncovered		
Computer area:	**1**	**2**	**3**
	274	344	1630
	4	**5**	**6**
	672	384	301
	Window covered		
	1	**2**	**3**
	180	204	264
	4	**5**	**6**
	291	300	207
Work surface:	Window uncovered		
	1	**2**	**3**
	370	344	855
	4	**5**	**6**
	493	419	369
	Window covered		
	1	**2**	**3**
	186	220	223
	4	**5**	**6**
	295	357	316
Meeting:	-		

							F3 No window Computer area: 1: 972, 2: 989, 3: 818, 4: 770 Work surface: 1: 908, 2: 1070, 3: 735, 4: 630 Meeting: -
	G. Lounge workspace	Open workspace with 1 counter for multiple persons temporary use Measured: G1 G2 G3	6	Room temperature: Summer – 24deg.C max Winter – 20deg.C min	**General:** G1: 6.48m², G2: 6.48m², G3: 6.48m² **Each:** G1: 3.24m², G2: 3.24m², G3: 3.24m² **Covered:** G1: 2.88m², G2: 2.88m², G3: 2.88m² **Secondary circulation:** G1: -, G2: -, G3: - **Door openings:** G1: -, G2: -, G3: - **Minimum Length:** G1: -, G2: -, G3: -	**G1** 2635mm **G2** 2600mm **G3** mm	**G1**: Computer area: Window uncovered: -, Window covered: -, No window: -; Work surface: Window uncovered: -, Window covered: -, No window: 11; Meeting: Window uncovered: -, Window covered: -, No window: - **G2**: Computer area: Window uncovered: -, Window covered: -, No window: -; Work surface: Window uncovered: -, Window covered: -, No window: 76; Meeting: Window uncovered: -, Window covered: -, No window: - **G3**: Computer area: Window uncovered: -, Window covered: -, No window: -; Work surface: Window uncovered: -, Window covered: -, No window: 116; Meeting: Window uncovered: -, Window covered: -, No window: -
	H. Small meeting space	Enclosed space for use of meetings of 2-4 persons Measured: H1	2,2 (per person)	Room temperature: Summer – 24deg.C max Winter – 20deg.C min	**General:** H1: 5.78m², H2: **Not available in this building**, H3: **Not available in this building** **Each:** H1: 1.45m² **Covered:** H1: 1.13m² **Secondary circulation:** H1: 4.65m² **Door openings:** H1: - **Minimum Length:** H1: 1700mm	**H1** 2630mm **H2** **Not available in this building** **H3** **Not available in this building**	**H1**: Computer area: Window uncovered: -, Window covered: -, No window: -; Work surface: Window uncovered: -, Window covered: -, No window: -; Meeting: Window uncovered: -, Window covered: -, No window: 298 **H2**: Computer area: Window uncovered: **Not available in this building**, Window covered: , No window: ; Work surface: Window uncovered: , Window covered: , No window: ; Meeting: Window uncovered: , Window covered: , No window:

							H3 / Window uncovered / Window covered / No window Computer area: **Not available in this building** Work surface: Meeting:
	I. Large meeting space	Enclosed space for the use of meetings of more than 4 persons Measured: I1 I2 I3	2,2 (per person)	Room temperature: Summer – 24deg.C max Winter – 20deg.C min	**I1**: General: 18.3m²; Each: 3.05m²; Covered: m²; Secondary circulation: m²; Door openings: 1430mm; Minimum Length: 3885mm **I2**: General: 15.79m²; Each: 1.97m²; Covered: m²; Secondary circulation: m²; Door openings: 800mm; Minimum Length: 3540mm **I3**: General: 16.59m²; Each: 2.07m²; Covered: m²; Secondary circulation: m²; Door openings: 870mm; Minimum Length: 3530mm	**I1** 2650mm **I2** 2670mm **I3** 2680mm	**I1**: Computer area: -; Work surface: -; Meeting: 603 (Window uncovered / Window covered / No window) **I2**: Computer area: -; Work surface: -; Meeting: - / - / 252 **I3**: Computer area: -; Work surface: -; Meeting: - / - / 937
	J. Brainstorm space	Enclosed space for brain storming with white boards etc. Measured: J1 J2 J3	16,2 (3,2 per person)	Room temperature: Summer – 24deg.C max Winter – 20deg.C min	**J1**: General: 37.20m²; Each: 3.1m²; Covered: 7m²; Secondary circulation: 30.20m²; Door openings: 1400mm & 890mm; Minimum Length: 5330mm **J2**: General: 11.66m²; Each: 3.89m²; Covered: 2.12m²; Secondary circulation: 9.54m²; Door openings: 1150mm; Minimum Length: 3240mm **J3**: General: 9.98m²; Each: 3.33m²; Covered: 1.44m²; Secondary circulation: 8.45m²; Door openings: 955mm; Minimum Length: 2755mm	**J1** 2780mm **J2** 2620mm **J3** 2620mm	**J1**: Computer area: -; Work surface: -; Meeting: 1240 (Window uncovered / Window covered / No window) **J2**: Computer area: -; Work surface: -; Meeting: - / - / 315 Work surface: - / - / 360 Meeting: - / - / -

							J3 | Window uncovered | Window covered | No window Computer area: - - 124 Work surface: - - 138 Meeting: - - -
	K. Open meeting space (small)	Open meeting place for short meetings between 2-4 persons Measured: K1 K2 K3	2 (per person)	Room temperature: Summer – 24deg.C max Winter – 20deg.C min	**K1** | **K2** | **K3** **General:** 2.74m² | 2.94m² | 2.4m² **Each:** 1.37m² | 1.47m² | 0.6m² **Covered:** 0.92m² | 0.28m² | 1.48m² **Secondary circulation:** 1.82m² | 2.66m² | 1.54m² **Door openings:** - | - | - **Minimum Length:** - | - | -	**K1** 2620mm **K2** 2620mm **K3** 2620mm	**K1** | Window uncovered | Window covered | No window Computer area: - - - Work surface: - - - Meeting: - - 390 **K2** | Window uncovered | Window covered | No window Computer area: - - - Work surface: - - - Meeting: - - 504 **K3** | Window uncovered | Window covered | No window Computer area: - - - Work surface: - - - Meeting: - - 130
	L. Open Meeting space (large)	Open meeting space for informal meetings. Can also be used as workspace Measured: L1 L2	2 (per person)	Room temperature: Summer – 24deg.C max Winter – 20deg.C min	**L1** | **L2** | **L3** **General:** 13.05m² | 18.02m² | **Not available in this building** **Each:** 2.18m² | 3.00m² | **Covered:** 8.04m² | m² | **Secondary circulation:** 5.01m² | m² | **Door openings:** - | 870mm | **Minimum Length:** - | 3400mm |	**L1** 2680mm **L2** 2660mm **L3** **Not available in this building**	**L1** | Window uncovered | Window covered | No window Computer area: - - - Work surface: - - - Meeting: - - 243 **L2** | Window uncovered | Window covered | No window Computer area: - - - Work surface: - - - Meeting: - - 389

							L3 | Window uncovered | Window covered | No window Computer area: **Not available in this building** Work surface: Meeting:
	M. Informal meeting space	Open space with table on standing height for quick and easy meetings Measured: M1 M2 M3	1 (per person)	Room temperature: Summer – 24deg.C max Winter – 20deg.C min	**M1** | **M2** | **M3** **General:** 40.95m² | 28.16m² | 13.05m² **Each:** 10.24m² | 5.63m² | 2.61m² **Covered:** 5m² | 6m² | 6m² **Secondary circulation:** 35.95m² | 22.16m² | 7.05m² **Door openings:** - | - | - **Minimum Length:** 5250mm | 3300mm | 3000mm	**M1** 2620mm **M2** 267028. mm **M3** 2680mm	**M1** | Window uncovered | Window covered | No window Computer area: - | - | - Work surface: - | - | - Meeting: - | - | 290 **M2** | Window uncovered | Window covered | No window Computer area: - | - | - Work surface: - | - | - Meeting: - | - | 374 **M3** | Window uncovered | Window covered | No window Computer area: - | - | - Work surface: - | - | - Meeting: - | - | 460
	N. Print/copy space	Enclosed or half open space for printing and copying Measured: N1 N2 N3	6 (2,1x2,4 with open centre of 90cm on side of machine	Room temperature: Summer – 24deg.C max Winter – 20deg.C min	**N1** | **N2** | **N3** **General:** 28.97m² | 8.27m² | 3.90m² **Each:** - | - | - **Covered:** 2.4m² | 2m² | 2.10m² **Secondary circulation:** 26.57m² | 6.27m² | 1.8m² **Door openings:** - | - | - **Minimum Length:** - | - | -	**N1** 2625mm **N2** 2630mm **N3** 2650mm	**N1** | Window uncovered | Window covered | No window Computer area: - | - | - Work surface: - | - | 100 Meeting: - | - | - **N2** | Window uncovered | Window covered | No window Computer area: - | - | - Work surface: - | - | 176 Meeting: - | - | -

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<td>
<table>
<tr><th>N3</th><th>Window uncovered</th><th>Window covered</th><th>No window</th></tr>
<tr><td>Computer area:</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Work surface:</td><td>-</td><td>-</td><td>145</td></tr>
<tr><td>Meeting:</td><td>-</td><td>-</td><td>-</td></tr>
</table>
</td>
</tr>
<tr>
<td></td>
<td>O. Dynamic archive</td>
<td>Enclosed or open space for the storing of documents that are used regularly

Measured: O1
O2
O3</td>
<td>1
(per archive unit)</td>
<td>Room temperature:
Summer – 24deg.C max
Winter – 20deg.C min</td>
<td>
<table>
<tr><th></th><th>O1</th><th>O2</th><th>O3</th></tr>
<tr><td>General:</td><td>12.13m^2</td><td>7.97m^2</td><td>16.35m^2</td></tr>
<tr><td>Each:</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Covered:</td><td>1.04m^2</td><td>2.23m^2</td><td>3.73m^2</td></tr>
<tr><td>Secondary circulation:</td><td>11.09m^2</td><td>7.74m^2</td><td>12.62m^2</td></tr>
<tr><td>Door openings:</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Minimum Length:</td><td>-</td><td>-</td><td>-</td></tr>
</table>
</td>
<td>
<table>
<tr><td>O1</td><td>Atrium</td></tr>
<tr><td>O2</td><td>2635mm</td></tr>
<tr><td>O3</td><td>2635mm</td></tr>
</table>
</td>
<td>
<table>
<tr><th>O1</th><th>Window uncovered</th><th>Window covered</th><th>No window</th></tr>
<tr><td>Computer area:</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Work surface:</td><td>-</td><td>-</td><td>668</td></tr>
<tr><td>Meeting:</td><td>-</td><td>-</td><td>-</td></tr>
</table>
<table>
<tr><th>O2</th><th>Window uncovered</th><th>Window covered</th><th>No window</th></tr>
<tr><td>Computer area:</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Work surface:</td><td>-</td><td>-</td><td>210</td></tr>
<tr><td>Meeting:</td><td>-</td><td>-</td><td>-</td></tr>
</table>
<table>
<tr><th>O3</th><th>Window uncovered</th><th>Window covered</th><th>No window</th></tr>
<tr><td>Computer area:</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Work surface:</td><td>-</td><td>-</td><td>210</td></tr>
<tr><td>Meeting:</td><td>-</td><td>-</td><td>-</td></tr>
</table>
</td>
</tr>
<tr>
<td></td>
<td>P. Post boxes</td>
<td>Enclosed or open space for the separation of incoming post to workers or departments</td>
<td>1
(per post box unit)</td>
<td>Room temperature:
Summer – 24deg.C max
Winter – 20deg.C min</td>
<td colspan="3">Not available in this building.</td>
</tr>
</table>

	Q. Waiting reception space	Area for visitors to be arrive and wait for their appointments Measured: Q1	Depending on activities	Room temperature: Summer – 24deg.C max Winter – 20deg.C min	<table><tr><th></th><th>Q1</th></tr><tr><td>**General:**</td><td>21.27m²</td></tr><tr><td>**Each:**</td><td>-</td></tr><tr><td>**Covered:**</td><td>8.66m²</td></tr><tr><td>**Secondary circulation:**</td><td>12.59m²</td></tr><tr><td>**Door openings:**</td><td>-</td></tr><tr><td>**Minimum Length:**</td><td>-</td></tr></table>	<table><tr><td>**Q1**</td><td>atrium</td></tr></table>	<table><tr><th>Q1</th><th>Window uncovered</th><th>Window covered</th><th>No window</th></tr><tr><td>Computer area:</td><td></td><td></td><td></td></tr><tr><td>Work surface:</td><td></td><td></td><td></td></tr><tr><td>Meeting:</td><td></td><td></td><td></td></tr></table>
	R. Personal storage space	Area where workers can store their belongings before they go to their flexible workspace	0,3	Room temperature: Summer – 24deg.C max Winter – 20deg.C min	**Not available in this building**		
	S. Pause space	Open space close to pantry to pause or meet informally Measured: S1 S2 S3	2 (seating and circulation included)	Room temperature: Summer – 24deg.C max Winter – 20deg.C min	<table><tr><th></th><th>S1</th><th>S2</th><th>S3</th></tr><tr><td>**General:**</td><td>37.41m²</td><td>37.11m²</td><td>38.68m²</td></tr><tr><td>**Each:**</td><td>1.56m²</td><td>1.86m²</td><td>1.93m²</td></tr><tr><td>**Covered:**</td><td>4.91m²</td><td>4.61m²</td><td>4.56m²</td></tr><tr><td>**Secondary circulation:**</td><td>32.50m²</td><td>32.50m²</td><td>34.12m²</td></tr><tr><td>**Door openings:**</td><td>1300mm</td><td>1285mm</td><td>1280mm</td></tr><tr><td>**Minimum Length:**</td><td>4040mm</td><td>4010mm</td><td>3950mm</td></tr></table>	<table><tr><td>**S1**</td><td>2930mm</td></tr><tr><td>**S2**</td><td>2910mm</td></tr><tr><td>**S3**</td><td>2890mm</td></tr></table>	<table><tr><th>S1</th><th>Window uncovered</th><th>Window covered</th><th>No window</th></tr><tr><td>Computer area:</td><td>-</td><td>-</td><td>-</td></tr><tr><td>Work surface:</td><td>-</td><td>-</td><td>-</td></tr><tr><td>Meeting:</td><td>-</td><td>-</td><td>354</td></tr></table> <table><tr><th>S2</th><th>Window uncovered</th><th>Window covered</th><th>No window</th></tr><tr><td>Computer area:</td><td>-</td><td>-</td><td>-</td></tr><tr><td>Work surface:</td><td>-</td><td>-</td><td>-</td></tr><tr><td>Meeting:</td><td>-</td><td>-</td><td>458</td></tr></table> <table><tr><th>S3</th><th>Window uncovered</th><th>Window covered</th><th>No window</th></tr><tr><td>Computer area:</td><td></td><td></td><td></td></tr><tr><td>Work surface:</td><td></td><td></td><td></td></tr><tr><td>Meeting:</td><td></td><td></td><td></td></tr></table>
	T. Smoking area	Enclosed space for smokers	1,25 (per smoker)	Room temperature: Summer – 24deg.C max Winter – 20deg.C min	**Not available in this building**		

For office use only

Telkom NBSC (Midrand) Workplace Survey - Questionnaire

The Department of Architecture is currently undertaking a research project that focuses on the nature and quality of the relationship between people and the built environment. The purpose of this questionaire is firstly, to provide you with an opportunity to give feedback regarding the office space use of NBSC, and secondly to determine the extend to which this working environment supports individual work performance behavior.

We appreciate your cooperation, and want to thank you in advance for your time and attention in this regard. Please do not hesitate to ask any member of the research team if you have any questions. Please be assured that all information provided in response to our questions will be treated with the strictest confidence.

Please return your questionaire to Mr. Phillip Mongalo before 14:00 on Tuesday,18 July 2006.

Thank you.

Regarding the answering of questions:
Please answer multiple choice questions by marking the appropriate box with a cross (x).

I. General Details

What is your gender?

- ☐ Male
- ☐ Female

What is your age?

- ☐ < 21 years old
- ☐ 21 - 30 years old
- ☐ 31 - 40 years old
- ☐ 41 - 50 years old
- ☐ 51 - 60 years old
- ☐ > 61 years old

What is your level of education?

- ☐ Primary education
- ☐ Secondary education
- ☐ Senior secondary vocational education
- ☐ Higher professional education
- ☐ University education
- ☐ Other, namely…

Do you have a managerial position?

- ☐ Yes
- ☐ No

What is your position?

- ☐ *Advisor*
- ☐ *Policy official*
- ☐ *Consultant*
- ☐ *Project assistant*
- ☐ *Project manager*
- ☐ *Project coordinator*
- ☐ *Secretarial and/or administrative employee*
- ☐ *Other, namely…*

_____

In which department do you work?

- ☐ *Network Infrastruture Provisioning* (NIP)
- ☐ *Occupation, Safety, Health Environment*
- ☐ *Corporate Accounts*
- ☐ *Human Resource*
- ☐ *Employee Relations*
- ☐ *Debitors Control*
- ☐ *Telkom Direct (CSB)*
- ☐ *Legal Services*
- ☐ *Sales*
- ☐ *Netplan*
- ☐ *Radio Site Engineering*
- ☐ *Investigations*
- ☐ *Pay Phones*
- ☐ *Capital Work In Progress*
- ☐ *Resolution Centre*
- ☐ *Information Technology (IT)*
- ☐ *Centre For Learning (CFL)*
- ☐ *Geographic Information Systems (GIS)*
- ☐ *Regional Network Engineering (RNE)*
- ☐ *Network Field Operations (NFO)*
- ☐ *Quality Assurance*
- ☐ *Credit Management*
- ☐ *Asset Finance*
- ☐ *Public Policy*

How long have you worked in this organisation? . . . . year(s)

How many hours a week do you work? 0 . . . . hours

When are you usually in the office?

	Morning	Afternoon	
Monday	☐	☐	
Tuesday	☐	☐	
Wednesday	☐	☐	☐ Occasionally
Thursday	☐	☐	
Friday	☐	☐	

How many hours per week do you work at home on average? . . . . hours per week

How many hours per week would you prefer to work at home? . . . . hours per week

What is the distance between your home and work? . . . . km in . . . . hours

How would you characterise your organisation?
(Please place a cross in the box that is closest to your opinion on a scale from left to right.)

hierarchical	☐☐☐☐☐☐☐	flat
open	☐☐☐☐☐☐☐	closed
centralised	☐☐☐☐☐☐☐	decentralised
formal	☐☐☐☐☐☐☐	informal
static	☐☐☐☐☐☐☐	dynamic
traditional	☐☐☐☐☐☐☐	progressive
top-down	☐☐☐☐☐☐☐	bottom-up
representative	☐☐☐☐☐☐☐	casual
monitors attendance	☐☐☐☐☐☐☐	monitors output
checks time	☐☐☐☐☐☐☐	checks quality
local	☐☐☐☐☐☐☐	international

II. Method of Working

What percentage of your time is spent on the following tasks each week and what is your favourite workplace?
(Please ensure that the total adds up to 100%; options for a favourite place are listed in box below)

Activity	**Percentage per week** (total 100%)	**Favourite workplace** (see box below)
Desk work (working on the computer, writing, reading, etc.)	. . . .	. . . .
Phoning	. . . .	. . . .
Formal consultation	. . . .	. . . .
Informal consultation	. . . .	. . . .
Filing, copying, faxing, etc.	. . . .	. . . .
Other, namely	. . . .	. . . .

Options for favourite workplaces:

1 *Single-person workplace*	5 *Open workplace*	9 *Telephone area*	13 *Company restaurant*
2 *Workplace for two or more people*	6 *Library*	10 *Coffee bar*	14 *At home*
3 *Reception*	7 *Team area*	11 *Living-room table*	15 *En route/ travelling*
4 *Lounge*	8 *Patio*	12 *Meeting room*	16 *Elsewhere, namely…*

What percentage of your working time actually requires you to concentrate while working?

. . . . %

On average, what percentage of your working time is spent in the following locations?
(Please ensure that the total adds up to 100%)

Inside the building	. . . . %
En route, travelling	. . . . %
At home	. . . . %
At another location (e.g. at customers)	. . . . %

Specify the top-three workplaces where you work the most (see box above with favourite workplaces):

1). ☐
2). ☐
3). ☐

How many different workplaces do you use every week on average?
. . . . workplaces

How free are you to personally decide about:

Working hours (when you work)	no freedom at all	☐☐☐☐☐	complete freedom
Workplace (where you work)	no freedom at all	☐☐☐☐☐	complete freedom
Method of working (way in which your work)	no freedom at all	☐☐☐☐☐	complete freedom
Working at home	no freedom at all	☐☐☐☐☐	complete freedom

Which four aspects below are the most decisive for your job satisfaction?

- ☐ work content
- ☐ career prospects (including promotion opportunities)
- ☐ salary and fringe benefits (car, thirteenth month's salary, bonus, etc.)
- ☐ physical work environment
- ☐ supervision (guidance as given to the organisation)
- ☐ colleagues
- ☐ (permanent) appointment or job security
- ☐ corporate policy
- ☐ other, namely...

_____

III. Satisfaction with the Organisation

How do you feel about the following organisational aspects?	very dissatisfied	dissatisfied	neutral	satisfied	very satisfied	n/a
Organisation as a whole (structure, culture, mission)	☐	☐	☐	☐	☐	
Management style	☐	☐	☐	☐	☐	
Team spirit	☐	☐	☐	☐	☐	
Colleagues	☐	☐	☐	☐	☐	
Career prospects	☐	☐	☐	☐	☐	
Salary and fringe benefits	☐	☐	☐	☐	☐	
Information facilities	☐	☐	☐	☐	☐	
Permanent appointment or job security	☐	☐	☐	☐	☐	
Freedom in working hours	☐	☐	☐	☐	☐	
Freedom in choosing your workplace	☐	☐	☐	☐	☐	
Freedom in the manner in which you work	☐	☐	☐	☐	☐	
Freedom to work at home	☐	☐	☐	☐	☐	
Agreements about smoking	☐	☐	☐	☐	☐	☐
Agreements about music	☐	☐	☐	☐	☐	☐
Agreements about eating	☐	☐	☐	☐	☐	☐

Please give a report mark for your overall assessment of the organisation:
(1 = very poor, 10 = excellent) ☐

Space for explanatory remarks on the organisation

IV. Satisfaction with Work

How do you rate the following aspects relating to the work process?	very dissatisfied	dissatisfied	neutral	satisfied	very satisfied
Content of work	☐	☐	☐	☐	☐
Complexity of work	☐	☐	☐	☐	☐
Pressure of work	☐	☐	☐	☐	☐
Formal consultation	☐	☐	☐	☐	☐
Informal consultation	☐	☐	☐	☐	☐
Ability to concentrate while working	☐	☐	☐	☐	☐
Paper-free way of working	☐	☐	☐	☐	☐
Wireless working	☐	☐	☐	☐	☐
Wireless communication (mobile phone)	☐	☐	☐	☐	☐
Clean-desk rule (keep workplace tidy and remove items when finished)	☐	☐	☐	☐	☐
How do you rate the following aspects relating to accessibility?					
Telephonic accessibility (colleagues, external parties)	☐	☐	☐	☐	☐
Telephonic accessibility (you)	☐	☐	☐	☐	☐
Electronic accessibility (e-mail)	☐	☐	☐	☐	☐
Physical accessibility (traceability)	☐	☐	☐	☐	☐

Please provide a report mark for your overall assessment of the work process:
(1 = very poor, 10 = excellent) ☐

Space for explanatory remarks on your work

V. Satisfaction with Facilities

	very dissatisfied	dissatisfied	neutral	satisfied	very satisfied	n/a
How do you rate functional aspects of the accommodation?						
Areas for formal consultation	☐	☐	☐	☐	☐	
Areas for informal consultation	☐	☐	☐	☐	☐	
Office layout	☐	☐	☐	☐	☐	
Alternating use of various workplaces	☐	☐	☐	☐	☐	
Orientation in the office	☐	☐	☐	☐	☐	
How do you rate the following psychological factors?						
Cannot be heard by others	☐	☐	☐	☐	☐	
Cannot be seen	☐	☐	☐	☐	☐	
Cannot be disturbed by noises	☐	☐	☐	☐	☐	
Sharing workplaces	☐	☐	☐	☐	☐	
Not having an 'own place'	☐	☐	☐	☐	☐	
No distinction in workplaces acccording to status	☐	☐	☐	☐	☐	
Space for personal attributes (photos, calendar, etc.)	☐	☐	☐	☐	☐	
Degree of openness and transparency	☐	☐	☐	☐	☐	
How do you rate aesthetic aspects?						
Use of materials (glass, wood, metal, etc.) in furnishings	☐	☐	☐	☐	☐	
Use of colours in interior	☐	☐	☐	☐	☐	
Decor (art, plants, etc.) used in furnishings	☐	☐	☐	☐	☐	
View from workplaces	☐	☐	☐	☐	☐	
Architecture as a whole	☐	☐	☐	☐	☐	
How do you rate ergonomic aspects?						
Size of workplaces	☐	☐	☐	☐	☐	
Worktop surface area	☐	☐	☐	☐	☐	
Position of monitor, keyboard and mouse	☐	☐	☐	☐	☐	
Comfort level of desk	☐	☐	☐	☐	☐	
Adjustability of desk	☐	☐	☐	☐	☐	
Comfort level of office chair	☐	☐	☐	☐	☐	
Adjustability of office chair	☐	☐	☐	☐	☐	
Ergonomic aids such as a laptop stand	☐	☐	☐	☐	☐	
Workplace layout (arrangement of furniture)	☐	☐	☐	☐	☐	
Adaptability of workplace to specific tasks	☐	☐	☐	☐	☐	
How do you rate technical aspects?						
Temperature	☐	☐	☐	☐	☐	
Ventilation	☐	☐	☐	☐	☐	
Air quality	☐	☐	☐	☐	☐	
Ability to personally control the climate	☐	☐	☐	☐	☐	
Access of daylight	☐	☐	☐	☐	☐	
The ability to personally control the amount of daylight	☐	☐	☐	☐	☐	
Worktop lighting	☐	☐	☐	☐	☐	
The ability to personally control the amount of artificial light	☐	☐	☐	☐	☐	
Reflection on your monitor	☐	☐	☐	☐	☐	
Acoustics	☐	☐	☐	☐	☐	
Distraction due to noise from air-conditioning systems	☐	☐	☐	☐	☐	
How do you rate the filing system?						
Filing method	☐	☐	☐	☐	☐	☐
User-friendliness of filing system	☐	☐	☐	☐	☐	☐
Retrievability of documentation	☐	☐	☐	☐	☐	☐
Amount of common filing space	☐	☐	☐	☐	☐	☐
Amount of personal filing space	☐	☐	☐	☐	☐	☐
Accessibility of documentation (trade journals, reference works, etc.)	☐	☐	☐	☐	☐	☐
Distance to filing area	☐	☐	☐	☐	☐	☐

	very dissatisfied	dissatisfied	neutral	satisfied	very satisfied	n/a
How do you rate IT facilities?						
Computers	☐	☐	☐	☐	☐	☐
Laptops	☐	☐	☐	☐	☐	☐
Ease of use of phone	☐	☐	☐	☐	☐	☐
Copier/printer/fax machine (service area)	☐	☐	☐	☐	☐	☐
Distance to copier/printer/fax machine	☐	☐	☐	☐	☐	☐
Software	☐	☐	☐	☐	☐	☐
Network (stability, speed)	☐	☐	☐	☐	☐	☐
Assistance with hardware and software problems	☐	☐	☐	☐	☐	☐
Assistance with introduction of new software	☐	☐	☐	☐	☐	☐
How do you rate services?						
Reception	☐	☐	☐	☐	☐	☐
Mail delivery (internal)	☐	☐	☐	☐	☐	☐
Opening hours of building	☐	☐	☐	☐	☐	☐
Helpdesk (including assistance during introduction of new tools)	☐	☐	☐	☐	☐	☐
Lunch area and catering facilities	☐	☐	☐	☐	☐	☐
Coffee and tea machines	☐	☐	☐	☐	☐	☐
Cleaning	☐	☐	☐	☐	☐	☐
Separation and processing of waste	☐	☐	☐	☐	☐	☐
Security and monitoring	☐	☐	☐	☐	☐	☐
Reservation of rooms for meetings	☐	☐	☐	☐	☐	☐
Reservation of rooms for project groups	☐	☐	☐	☐	☐	☐
Provision of presentation aids	☐	☐	☐	☐	☐	☐
Provision of facilities outside the office (e.g. home office)	☐	☐	☐	☐	☐	☐

	fully disagree	disagree	neutral	agree	fully agree
To what extent do you agree with the following statements?					
When I arrive at the office I usually find the workplace that I really want	☐	☐	☐	☐	☐
When I arrive at the office I always find a workplace	☐	☐	☐	☐	☐
When nearly all workplaces are occupied, working conditions are not enjoyable	☐	☐	☐	☐	☐
I can handle information in a confidential manner in the workplace	☐	☐	☐	☐	☐
I miss my own workplace	☐	☐	☐	☐	☐
I know how to adjust my chair and desk	☐	☐	☐	☐	☐
Whenever I change workplace I adjust the furniture	☐	☐	☐	☐	☐
I can assume a comfortable position for all my activites	☐	☐	☐	☐	☐
The workplaces are sufficiently clean and tidy	☐	☐	☐	☐	☐
The furnishings in the building are inspirational	☐	☐	☐	☐	☐
I enjoy the degree of openness and transparency in the new building	☐	☐	☐	☐	☐

Please give a report mark for your overall assessment of facilities:
(1 = very poor, 10 = excellent) ☐

Space for explanatory remarks on the facilities

VI. Experienced Labour Productivity

	very negative	negative	neutral	positive	very positive
How well does the work environment support your productivity with regard to?					
Activities that require concentration	☐	☐	☐	☐	☐
Communication with colleagues	☐	☐	☐	☐	☐
Communication with managers	☐	☐	☐	☐	☐
Communication with external parties	☐	☐	☐	☐	☐
How well does the work environment support the following activities?					
Office work (computer work, writing, reading, etc.)	☐	☐	☐	☐	☐
Phoning	☐	☐	☐	☐	☐
Formal consultation	☐	☐	☐	☐	☐
Informal consultation	☐	☐	☐	☐	☐
Filing	☐	☐	☐	☐	☐
Copying, printing, faxing, etc.	☐	☐	☐	☐	☐

What percentage of your time can you work productively? … … … %

What percentage of your time are you unproductive due to too much distraction? … … … %

How much more productive would you be if your working conditions were to change? … … … %

	fully disagree	disagree	neutral	agree	fully agree
To what extent do you agree with the following statements?					
Sharing workplaces ties in well with our work processes	☐	☐	☐	☐	☐
Alternating the use of workplaces ties in well with our work processes	☐	☐	☐	☐	☐
An open and transparent office ties in well with our work processes	☐	☐	☐	☐	☐
An innovative office ties in well with our work processes	☐	☐	☐	☐	☐
A central filing system is a good solution for our organisation	☐	☐	☐	☐	☐
A digital filing system is a good solution for our organisation	☐	☐	☐	☐	☐
Our office stimulates the delivery of high-quality work	☐	☐	☐	☐	☐
An innovative office fits in well with our organisation	☐	☐	☐	☐	☐
More knowledge and experience is exchanged compared to the past	☐	☐	☐	☐	☐
Our work environment stimulates communication with colleagues	☐	☐	☐	☐	☐
Our work environment stimulates my productivity	☐	☐	☐	☐	☐
It annoys me that many tours are organised for external parties	☐	☐	☐	☐	☐
I feel more responsible than I did before	☐	☐	☐	☐	☐
I feel more freedom in all my actions than I did before	☐	☐	☐	☐	☐
I miss my own workplace	☐	☐	☐	☐	☐
Our building is a pleasant place to work in	☐	☐	☐	☐	☐

Please provide a report mark for the extent to which the work environment supports your productivity: (1 = very poor, 10 = excellent) ☐

Space for explanatory remarks on labour productivity

VII. Implementation Process

	fully disagree	disagree	neutral	agree	fully agree
I was adequately informed about the objectives of the current work environment	☐	☐	☐	☐	☐
I was adequately informed about the extent to which objectives have been met	☐	☐	☐	☐	☐
I think it is important to be informed about the process	☐	☐	☐	☐	☐
I was adequately informed during the process	☐	☐	☐	☐	☐
I think it is important to be involved in the implementation process	☐	☐	☐	☐	☐
Enough opportunities existed to contribute personal ideas and suggestions during the process	☐	☐	☐	☐	☐
Enough consideration was given to my contribution	☐	☐	☐	☐	☐
Enough opportunities exist to contribute personal ideas about improvements during the utilisation phase	☐	☐	☐	☐	☐
Adequate supervision is provided to ensure that the concept is used properly	☐	☐	☐	☐	☐
Accommodation-related problems are responded to adequately	☐	☐	☐	☐	☐

	yes	somewhat	no	n/a
Have you personally been involved in the development of the concept (workgroup, user group or in another way)?	☐	☐	☐	☐

Please provide a report mark for your overall assessment of the process:
(1 = very poor, 10 = excellent) ☐

Space for explanatory remarks on the implementation process

VIII. To conclude

To what extent do you agree with the following statements?

	fully disagree	disagree	neutral	agree	fully agree
Our work environment contributes to my general wellbeing	☐	☐	☐	☐	☐
Our work environment offers a pleasant atmosphere	☐	☐	☐	☐	☐
I can work here in safety	☐	☐	☐	☐	☐
The work environment has no negative effect on my health	☐	☐	☐	☐	☐
When I am sick, this is not accommodation-related	☐	☐	☐	☐	☐
I am proud of our work environment	☐	☐	☐	☐	☐
Our work environment is appealing to customers and visitors	☐	☐	☐	☐	☐
Our work environment helps recruit applicants	☐	☐	☐	☐	☐
Our work environment has a positive effect on our organisation's image	☐	☐	☐	☐	☐
Our work environment is an excellent showpiece for our organisation	☐	☐	☐	☐	☐
Our work environment frequently attracts the media's attention	☐	☐	☐	☐	☐

How do you rate working in the new situation in comparison with the old one?

☐ better ☐ same ☐ worse ☐ n/a

Would you want to go back to a traditional concept?

☐ yes ☐ no ☐ n/a

If so, why?

Indicate the three most negative aspects of the current accommodation:
(method of working, the work environment and utilisation)

Indicate the three most positive aspects of the current accommodation:
(method of working, the work environment and utilisation)

Do you have any other comments about the study or accommodation-related aspects that were not or inadequately discussed?

Thank you very much for your cooperation!

Please return your questionaire to Mr. Phillip Mongalo before 14:00, Tuesday 18 July 2006