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Changes and the principle of assessment of readiness for changes in the life cycle of buildings

Dmitry A. Khrustalev
Moscow Institute of Architecture (State Academy) (MARKHI); Moscow, Russian Federation

ABSTRACT

Introduction. The subject of this study is volumetric and spatial elements of a building and their locations. Practical significance of the study is to accelerate decision making in the selection of properties for further practical work of arrangement. The purpose of the study is to find the possibility of comprehensive evaluation of architectural solutions for hypothetical changes, such as functional purpose. Scientific novelty: the possibility of simplifying prospective changes at the design stage is considered.
Materials and methods. The spectrum of changes to buildings over time is described – from operational needs, through renovations to major renovations. The basis of the work is rich in frequent changes material on buildings for research and risky innovation. A range of changes, statistically frequently occurring in civil engineering buildings, is presented. Empirical and theoretical research methods have been used in an integrated way.
Results. A list of the techniques is given which the architect can use to facilitate possible future changes in a building or premises, related to a change of activity, a change of tenant or owner. The characteristics of the parties involved in considering each of the features of the property are described. Two simplified examples are used to assess the architectural solutions affecting the possibility of future changes. An assessment package for determining a building's readiness for prospective change, using office-type ordinal diagrams, is given.
Conclusions. The appraisal apparatus can be used to compare properties that are to be converted (due to sale or rent). The application of the presented appraisal apparatus will require the creation of a mathematical formula that takes into account the significant database for each of the properties. The result of the appraisal is a summary in numerical form and a diagram reflecting the architectural solution, showing the building's readiness for future changes.

KEYWORDS: building life cycle, change, redundancy, architectural and spatial technique, architectural evaluation, change of activity, perspective, property rental and sale, spatial readiness

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Corresponding author: Dmitry A. Khrustalev, promgettista@yandex.ru.

Изменения и принцип оценки готовности к изменениям в жизненном цикле зданий

Дмитрий Александрович Хрусталев
Московский архитектурный институт (государственная академия) (МАРХИ); г. Москва, Россия

АННОТАЦИЯ

Введение. Предмет исследования — объемно-пространственные элементы здания и их места размещения. Практическая значимость исследования — ускорение принятия решения при выборе объектов недвижимости для дальнейшей практической работы по обустройству. Цель исследования — найти возможность комплексной оценки архитектурных решений для гипотетических изменений, таких как функциональное назначение. Научная новизна: рассматривается возможность упростить перспективные изменения на этапе проектирования.
Материалы и методы. Описан спектр изменений в зданиях с течением времени — от эксплуатационных необходимостей, перепланировок до капитального ремонта. Основанием работы является богатый на частые изменения материал по зданиям для научно-исследовательской и рисковой инновационной деятельности. Приведены разные по масштабу изменения, сравнительно часто встречающиеся в зданиях гражданского назначения. Использованы комплексно эмпирические и теоретические методы исследования.
Результаты. Перечислены приемы, используя которые архитектор может упростить возможные в будущем изменения в здании или помещении, связанном с перепрофилированием деятельности, со сменой арендатора или владельца. Описаны характеристики сторон рассмотрения каждой из особенностей объекта недвижимости. На двух упрощенных примерах проведена оценка архитектурных решений, влияющих на возможность перспективных изменений. Приводится оценочный комплекс по определению готовности здания к перспективным изменениям с применением ординарных диаграмм офисного типа.
Выводы. Оценочный аппарат может быть использован для сравнения объектов недвижимости, которым предстоит перепрофилирование (в связи с продажей или сдачей в аренду). Для применения представленного аппарата оценки

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потребуется создание математической формулы, учитывающей значительную по объему базу данных для каждого из объектов. Результат оценки — краткая запись в числовой форме и диаграмма, отражающая архитектурное решение, наглядно демонстрирующая степень готовности здания к изменениям.

КЛЮЧЕВЫЕ СЛОВА: жизненный цикл здания, изменения, резервирование, архитектурно-пространственный прием, смена деятельности, перспектива, аренда и продажа недвижимости, пространственная готовность

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Автор, ответственный за переписку: Дмитрий Александрович Хрусталев, promgettista@yandex.ru.

INTRODUCTION

Buildings undergo changes depending on their functional profile. It is an unfeasible task to foresee the possibility of any change. Statistically, it isn't even necessary [1]. Still, it is very desirable to be able to carry out alterations as easily as possible. Moreover, it is a resource-saving undertaking to understand the complexities of the possibility of making any changes before construction work starts and even before renting / buying a property.

MATERIALS AND METHODS

Scale of change over the life cycle of buildings

According to a sustainable architecture paradigm, buildings in every phase of their life cycle have to be efficient and environmentally friendly. New construction has the advantage in this respect over renovation since all modern spatial and structural design possibilities are open. There is also the possibility of choosing almost any material both in the finish and within any structure. The conditions of reconstruction have their solutions on all these points, but they are naturally limited due to the existing spatial dimensions and structural solutions. On the whole, the presence of a building limits a creativity scope [2]. At this stage the idea arises — "it'd be easier and better if there were no *this*, or *that*...". Thinking about it, in terms of the life cycle of a building, every alteration after commissioning is a resconstruction to a greater or lesser extent [3].

The number of such changes may be small. This is typical for buildings with a single, unchanging activity profile, such as apartment buildings, kindergartens, or public bathing facilities. There is no reason to change much there, if everything is working as it should. And yet, virtually every building element has a lifetime [4]. For example, wooden structures require regular maintenance, such as impregnation or painting. Glazing needs to be cleaned fairly often and replaced frequently, especially when there is a mechanical impact. These small actions little by little extend the life of a building. These little measures make small, nevertheless positive, impacts on the life cycle (Fig. 1).

Significant changes to the building are other — extensions, additions, replacement of worn-out structural elements. These tasks require structural strength surveys. The structural fatigue parameter is calculated[1] and the degree of building deterioration is determined[2]. At some point, the combination of these values can lead to a hard decision to overhaul or even to a demolition. Obviously, these tasks have a very serious impact on the life of a building. They are a Milestone in the life cycle of a building.

Considering that sustainability and efficiency must be a constant priority in a building [5], whatever the stage of its lifecycle, the following tasks are worth

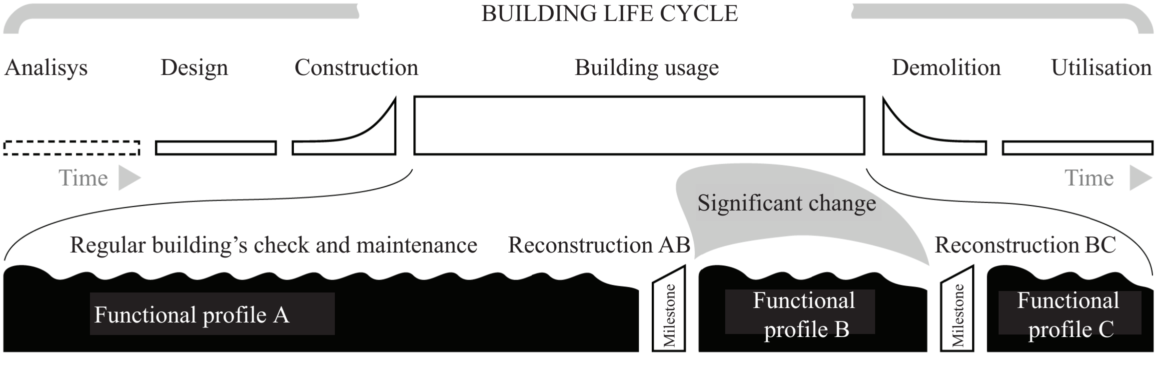

Fig. 1. Full building life cycle scheme (upper part) and usage detailing (lower part). Black zones expose the main building's functionality periods. Milestones abstractly show rare significant changes made within building in correspondence to profile changes (A to B and D to C). The waves at the top of the ordinal use phases reflect the need for operation and periodic maintenance

[1] GOST 31937–2011. Buildings and constructions. Rules for inspection and monitoring of technical condition. Interstate standard. Appendix C. Moscow, 2014; 59.

[2] VSN 53–86 (r). Rules for estimation of physical wear of residential buildings. Part. 1.1. Moscow, Preiskurantizdat publ., 1988; 54.

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noting. Both at the design and operating phase it is desirable to:

• simplify and minimize small changes, if it is not possible to eliminate them altogether;

• to postpone major changes by lengthening the effective operating phase;

• have solutions that will make it as easy as possible to correct problem areas, wherever they may be, and to carry out the update as quickly as possible.

So, regardless of the type of building, its location, its size and the time characteristics of the building's life cycle Milestones, the challenge for the designers arises: to simplify the operation of the building services and to allow the possibilities for future building's changes.

An analogy, in crude terms, is possible with man and his education. If one expects a person will have to work only in one profile, then it is enough to take a course and adhere to the healthy lifestyle. The employee will be able to cope quite well, with only occasional use of hairdressers and dentists. But this calculation has its limits — job profile and health [6]. If one imagines in advance that both are impermanent quantities, the concept of education must be changed. A person has to prepare for more universal tasks than those described in the profile. And at the moment when the situation changes, man will quite easily be able to slightly change his usual circle of duties (to become not a baker, but a cook, to switch from a locksmith's position to a carpenter's one). It is certainly not a question of going from being a turner to being a surgeon. But the idea of a hypothetical change in a job profile, as time passes, is intrinsic to people. And it is naturally enriched by thinking about it holistically, taking age and health into account. The principle of greater job certainty with a more versatile education is reflected in people's willingness to get the higher education. The analogy with human education is shown to illustrate a basic idea about the building. This thought is as follows (again, paired with the example-analogue):

• at the design stage: to lay down the possibility of changing the functional profile (in childhood, assume a spectrum of professions, not just one position);

• at the construction stage: to use solutions with more advanced characteristics than minimally necessary [7] (study at a university that is slightly more expensive than taking cheap courses in the same profile);

• in the functioning phase: regular monitoring the condition of the main and secondary structural elements [8] (keep your health up to date and have regular medical check-ups);

• at the stage of necessity (a Milestone in the life cycle) to react to any change in the functional profile: to be able to make changes without significant impact on the environment [9] (to move from one position to another without retraining and without sessions with a psychotherapist).

Considering these tasks, the building will be in demand longer, the life cycle will not be with a single sine wave period (according to Fig. 1), but with several ones. And overall, the building will be closer to the principles of sustainable development [10] (and the person in this example will work longer and have a more interesting life).

Obviously, it is unlikely to raise a universal worker who would be good at both medical profile and locksmithing. There may be exceptions, but one can't count on it. This means that the building cannot be expected to be radically changed in the shortest possible time and at the lowest possible cost. However, it is still possible to talk about feasible measures to change the operating profile. The simpler these changes are, the more economical they are and the better for the life of the building.

It is impossible to use eternal materials and perfect spatial solutions at building construction though there are some techniques for life span calculation of basic constructions[3]. Although the stone is more durable than wood, it is ridiculous to advocate its use everywhere. It should be more expensive, more complicated and in some cases simply absurd, such as the use of a stone door. Almost any material has a limited resource, and yet there is a chemical and physical possibility to extend this resource (impregnating of timber surfaces, replacing glass). Here comes the point of possibility, the accessibility of this maintenance operation. The best solution would be to have access to everything: from outside of the building to the place, within the building and to any of the structure plies. Is it possible? Obviously not. Moreover, a number of processes taking place in the building may block the possibility of carrying out maintenance operations, e.g. an hours-long surgery or a gala reception will not allow for simultaneous inspection and impregnation of the structure. It should also be stated that not all solutions are suitable in buildings of historical and cultural value [11].

And at a time (the Milestone for a building) when some changes need to be made, some of them are relatively simple, others are economically unaffordable [12]. Simple changes, such as replacing a door and process equipment, or removing a partition, are feasible and do not require much. For this example — a passageway, a lift or a ladder, the ability to secure the dismantling area is necessary. If the complexity of the change grows, the number of requirements increases. An example to that, the need for a drainage ladder entails, in addition to protecting the work area, a change in the floor structure and possibly in the structural design of the building (if the slab must be lowered locally), and an obligatory connection to the drainage piping system. If the task is more difficult, such as wid-

[3] Methodical guide for assigning the service life of concrete and reinforced concrete structures taking into account the impact of the operating environment on their life cycle. Moscow, 2019; 122.

ening a flight of stairs wedged between walls, a large part of the building will have to be demolished and rebuilt. This is a very serious operation, akin to organ transplantation in the case of a human being. Such a Milestone is remembered for a lifetime, and it is unlikely that any of us would dream of encountering it intentionally. Nevertheless, if it is required for building work processes, it has to be done. Computer programmes undoubtedly help to optimize decision-making processes [13], but in general, they are extremely costly operations. The considerations described above lead us to think about the economic feasibility of certain changes. Replacing a door and extending a flight of stairs by moving a wall are changes of the different scales. The only thing they have in common is that they need to be justified by the certainty of continued suitability. These tactical measures, whatever their scale, should be consistent with the strategic plans for the efficient operation of the building as a whole. In Slovakia, the mill building has undergone a very significant renovation and is now a residential one. The positive effect of this change on the life of the building has been calculated [14]. It is undoubtedly one of the few Milestones in the life of the building.

The scale of changes varies. Already at the beginning of the 20th century, technology emerged to move buildings entirely[4], since these buildings were needed as volumes and functional units, although, not in their original places. Expensive relocations are also Milestones, and very large ones, indeed. But they are still unique. Far more often we have to deal with ordinary changes, such as a leaky pipe, a broken part, a replacement of a piece of equipment with a more suitable one, the installation of a new engineering system (for example, a "smart home"[5] or central vacuum system[6]). Fifty years ago, such systems were not invented, but now, some users think about their installation even in old buildings. Occasionally, economic calculations show that the tactical costs of change are outweighed by the strategic benefits. That's when changes are made to the building (Fig. 2).

So, it's impossible to foresee everything in advance, and we have to live with it. But how can we simplify or at least predict problems, reduce time and economic costs, and lengthen time intervals between milestones? In the digital world this is dealt with by detailed risk and accidental loss prevention [15], in real construction this problem is still relevant.

To answer this question, the author has used a set of empirical and theoretical research methods over several years. Numerous sources of information have been studied, mainly for buildings with a frequently changing functional profile (R&D buildings for innovations). Their analysis and comparison of the information is presented in a monograph back in 2012[7, 8]. The observation of public and residential buildings shows similar problems, the frequency and scale of change differs in their case. Analogy and abstraction, also as working methods, have already been presented in the article.

RESULTS OF A RESEARCH

Architectural techniques

There are few of techniques in the architect's scope to help with this task.

Technique 1. Understanding that not everything is going to work the way it is supposed to work now.

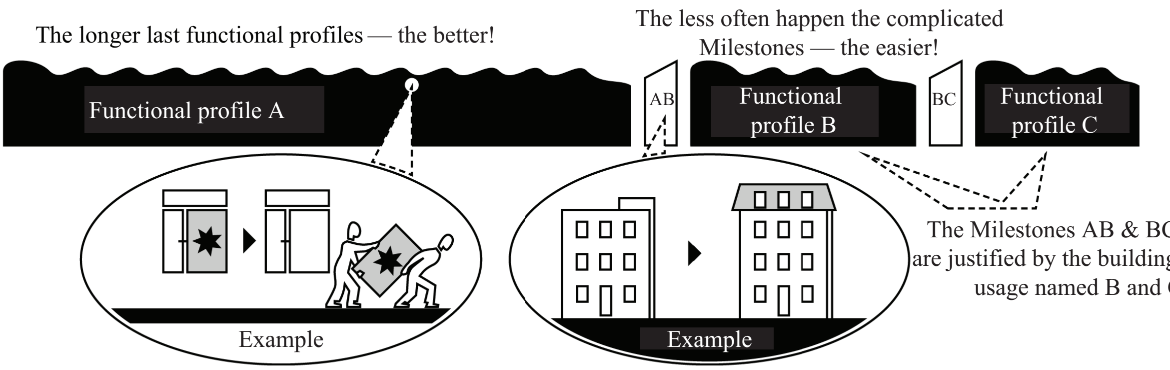

Fig. 2. Examples of the scale of changes in buildings are shown. The feasibility in Milestones, as well as in small changes, depends on the subsequent use phases, their duration and usefulness

[4] Ostrovsky I.S. *Method of buildings moving*. USSR Patent No. 54365, class 37e.12 on application No. 184967 of January 20, 1936. URL: https://patentdb.ru/image/101359 (accessed April 12, 2023). (rus.).

[5] O'Brien J. *Top 10 Smart home appliances in 2022*. URL: https://houseintegrals.com/top-10-smart-home-appliances-in-2022 (accessed January 9, 2023).

[6] Salvatore Buda. *Built-in vacuum system*. Patent WO 1998032363 A2 dated July 30, 1998 in the class A47L5/38. URL: https://patentimages.storage.googleapis.com/5a/63/a4/859f3c8f9291c3/WO1998032363A2.pdf (accessed April 16, 2023).

[7] Dianova-Klokova I.V., Metanyev D.A., Khrustalev D.A. Innovative research and production complexes. *Issues of architectural design*. Moscow, Published by URSS (Lenand LLC), 2012; 186.

[8] Dianova-Klokova I.V., Metanyev D.A., Khrustalev D.A. Architectural design of innovative R&D complexes. *Global practice review*. Moscow, Published by URSS (Lenand LLC), 2012; 367.

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This approach leads to the idea of designing for possible changes.

Always at the design stage the architect and client service draw up an adequate design brief. It is intended to reflect the demands of the day, the objectives of the first sine waves (Functional profile A, according to Fig. 1 and 2). The architect has to assume that there will also be next phase — Functional profile B, and a Milestone AB. For example, such a change with space transformation in the Athens apartment is described in 2017 [16]. Or another example, from the author's experience: making it possible to install a drainage ladder at the design stage is much easier than carrying out a major renovation when forced to do so by numerous leaks and the associated hassles from the insurance companies. Installing a revision hatch, and arranging a small margin of space to allow repairs to the equipment being installed, is a lot easier than breaking in neatly finished surfaces. A good example of this Technique 1 — pipes embedded within the walls of mid-20th century USSR's residential buildings. They were deteriorated over time (clogged or rusted over 50 years of operation) and during the repair of buildings, renovation designers had to exclude these pipes from work and make duplicates, already in the space of premises. As a result, we see both overspending of steel and multiple repairs. In general, the conclusion was a return to a simpler, more utilitarian solution of placing pipes with the possibility of replacing them[9].

The Technique 1 actively operates with the features: Repairability and Accessibility, passively used the feature: Aesthetics.

Technique 2. The use of redundant solutions in areas where further changes are impossible or difficult.

This includes the use of stronger structural solutions [17], from the quality of the materials used and the spatial design of the building to taking into account seismic stability requirements [18]. Also, redundant spaces are very suitable for the possibility of new utility ducts and pipelines. Geometric redundancy would show benefits if the stairwells were large enough to accommodate a lift within their boundaries — such a solution would greatly simplify the elevator placement. An external lift in originally lift-free residential buildings is a good solution, but its use by people in wheelchairs is not feasible. Space saving on common areas is still relevant today. Though, caring for people with mobility impairments[10] has become much more important in Russia[11] and abroad in the last 25–30 years [19] and were adopted at legislative level.

This Technique 2 actively operates with the features: Reliability and Redundancy.

Technique 3. Use of repairable solutions with accessibility.

Numerous wiring accidents when trying to hang a shelf on the wall unequivocally show that concealed solutions are only good as long as there are no other problems. Repairing an electrical installation which is embedded in the floor structure is considerably more difficult than if it is wired in a duct in the baseboard area. There are intermediate solutions — running the wiring under the ceiling and only running it down to the points of use as required. If we'll switch away from structural engineering and concentrate solely on architectural solutions — the use of modular furniture, mobile partitions, localization of technical services in corridors and dedicated floors — these architectural solutions maximize maintenance and repair capabilities [20].

This Technique 3 actively operates with the features: Repairability and Accessibility, passively used the feature: Reliability.

Technique 4. Identify critical areas where changes are undesirable and keep them unchanged where possible.

The example of an inspection hatch is the simplest possible. It is placed in the equipment area precisely to enable inspections and work specified in the technical regulations to be carried out. If this manhole does not exist, the problem would have been noted in Technique 1. But if there is one, the following peculiarity is observed: the presence of a hatch implies that there is also a work area by this hatch. And the less interference there is with this work area, the easier it is. So, if there is an access hatch in the office floor, the option of placing a partition over it is the most unreasonable solution; the option of placing furniture obstructing it is also a problem (the minor one), as an employee needs to move furniture and slow down some office processes; also in the passage area, the presence of the hatch can prevent people from doing their job. The best option is to provide a hatch with a working area in an uncluttered area that is rarely used; this might be a dead-end part or an extension of the aisle between workstations [21].

This Technique 4 actively operates with the features: Redundancy and Usability, passively used the feature: Aesthetics.

Each of these examples shows that there are solutions. And these solutions vary in terms of convenience, efficiency, economics, and complexity. If considered holistically, any of these problems can be evaluated according to the following indicators.

Decision evaluation

Consider the main categories for proposed evaluating solutions in the Table 1.

[9] Code of Regulations 510.1325800.2022. Heat Supply Stations and Internal Heat Supply Systems, Ministry of Construction of Russia. Part. 16.5. 2022.

[10] Code of Regulations 59.13330.2020. Accessibility of Buildings and Structures for Low Mobility Groups of Population. Revised edition of SNiP 35-01–2001. Moscow, Ministry of Construction of Russia, 2020; 69.

[11] Federal Law No. 52-FZ. About sanitary and epidemiological well-being of population. Issued March 30, 1999.

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Vestnik MGSU • Monthly Journal on Construction and Architecture • Volume 18. Issue 8, 2023

Table 1. Main categories for evaluation

Category	Description	Comment
Reliability	Durability of the solution	The decision itself
Redundancy	The ability to accommodate an additional task in perspective	
Repairability	The ability to be recovered from failure or damage	
Accessibility	The possibility of unhindered use	Considering the decision and the surroundings
Usability	Livability of the solution	
Aesthetics	The organicity of the solution	

For a rough estimate, it is sufficient to use figures corresponding to these likely (or already implemented) solutions:

1. Extremely difficult or unique solution.
2. Problematic solution.
3. A difficult but possible solution.
4. The solution is not difficult.
5. Excellent solution, with no difficulties.

Unrealistic solutions are out of the field. Since this text deals with relatively frequent changes and their solutions, so unreal (and even unique) ones, as moving the whole building, are left out of the brackets. It is most convenient to use the estimator in the format of a Radar-type diagram (Fig. 3) combined with a Line Chart [22].

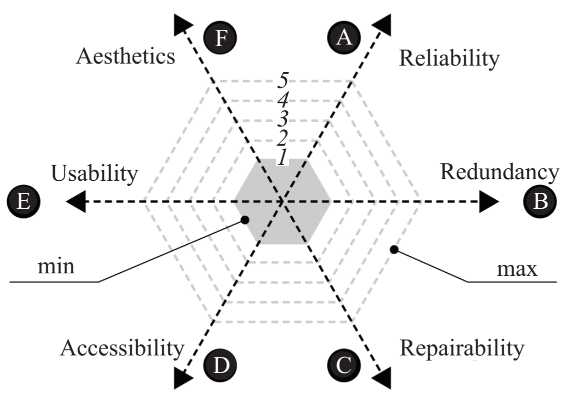

Fig. 3. Main evaluation diagram

The smaller the figure, the greater the complexity of the corresponding vector of consideration. As the result, the bigger and more correct the star (or figure) is, the better or easier is the solution in general.

Case study 1

A hatch in the floor of an office building. The diagram in Fig. 4 represent abstract options for the location of the hatch in the room (as a continuation of Technique 4).

1. Category A "Reliability". The reliability of the solution does not depend on the manhole location in general, but there is no engineering preference data — all options get the same score ("Ared"="Ablu"="Amag"= ="Agre"=4).

2. Category B "Redundancy". The explanation is identical, with the description in category A, ("Bred"= ="Bblu"="Bmag"="Bgre"=4).

3. Category C "Repairability". With the presence of a wall, repairability is poor ("Cred"=2), if the hatch is obstructed by furniture, the solution is not too difficult ("Cblu"=4). The best options are Magenta and Green, they are the most repairable and get the highest rating of 5.

4. Category D "Accessibility". Under a wall accessibility is poor ("Dred"=2), if the hatch is obstructed by furniture – the solution is not too difficult ("Dblu"=3). The best options are again Magenta and Green. They have direct access for repairs, their grade is 5.

5. Category E "Convenience". Ease of use of the part of the hatch out of the wall is questionable, or difficult, the index "Ered" take equal to 2. If the hatch is obstruct-

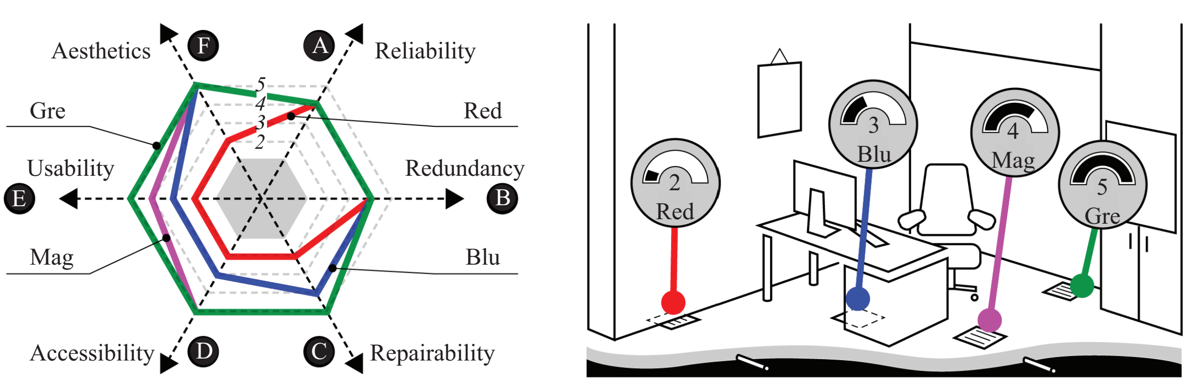

Fig. 4. Evaluation diagram for the solution with a hatch in the office space. The red line shows the variant with the hatch under the partition. The blue line is the solution in the furniture area. Magenta line — hatch in the free access, but on the passageway. Green line — hatch in a dead end

ed by furniture — the solution is not very convenient, because one has to move the furniture (“Eblu”=3), and in the Magenta option a worker will block the passage for office employees (“Emag”=4). The best option is Green, it is the most comfortable to renovate, since it does not disturb anyone, it gets the highest grade (“Egre”=5).

6. Category F “Aesthetics”. Without the hatch or with its part showing from under the wall, the aesthetics are perfect until the wall and floor are opened, at that time the score surely drops dramatically (“Fred”=2). If the hatch is obstructed by furniture, the solution is almost aesthetically perfect (“Fblu”=5). Both options, Magenta and Green, are also optimal (“Fmag”=“Fgre”=5), if the hatch design is chosen appropriately.

Result: In the Fig. 4 diagram it is shown a noticeable difference between the shapes of different colours. The Green figure is clearly larger and more harmonious than the others. Each of the solutions gain a score: Red — 2, Blue — 3, Magenta — 4, Green — 5. It is obvious from the numbers and the line diagrams that the Green option is preferable.

Case study 2

The presence of a technical shaft in the laboratory room is taken, as it is in an example — in University of Newcastle (Australia) [23]. The diagram in Fig. 5 represents the Red option with no shaft; with a shaft arranged for the current technological task (Blue option) and a slightly larger one, with a reserved space “just in case” (Green option).

1. Category A “Reliability”. Reliability of solutions for all options is generally close, there is no evidence of a preference in terms of engineering. And yet, the compact Blue option is more complex in terms of design, and this reduces its reliability score (“Ared”=“Agre”=4; “Ablu”=3).

2. Category B “Redundancy”. The stockpile in the absence of a shaft is colossal (“Bred”=5). By convention, the Blue option’s shaft has no stockpile (“Bblu”=2). The shaft of the Green option is more spacious (“Bgre”=4).

3. Category C “Repairability”. Repairing something in the absence of a shaft is very easy (“Cred”=5). In the presence of a tight shaft, on the contrary, difficult (“Cblu”=2). The Green option with a dense shaft is repairable and gets the highest rating — 5.

4. Category D “Accessibility”. Without the shaft, accessibility is ideal, as is the category Repairability (“Dred”=5). The Blue option has everything arranged tightly inside the shaft. Its accessibility is low (“Dblu”=2). The Green task, though limitations within the shaft, has a potential, its accessibility rate is medium (“Dgre”=4).

5. Category E “Convenience”. The convenience of using the laboratory, with various communications interfering everywhere, is not at a high level. Thus, we take the “Ered” indicator to be 2. The compact shaft is the most convenient, but only at the moment of ordinal work, and in the maintenance mode it loses slightly (“Eblu”=4). The best option is Green, it is the most convenient to repair and gets the highest rating (“Egre”=5).

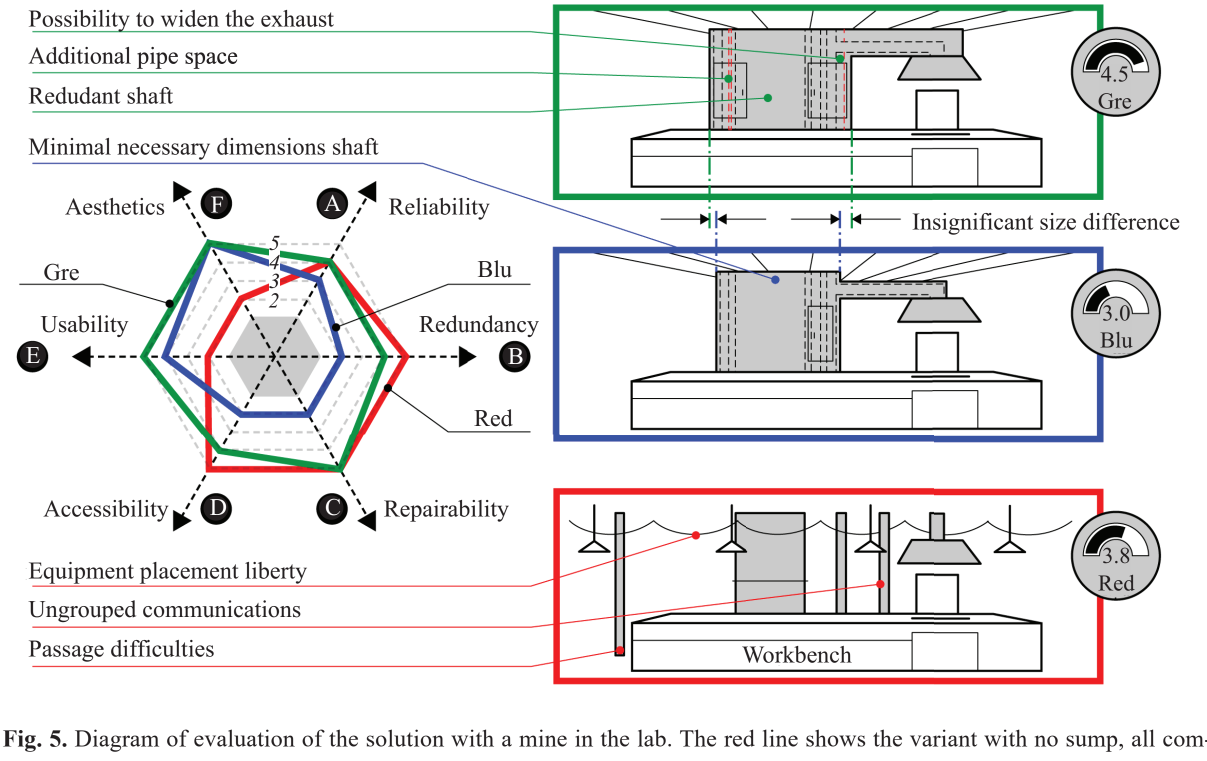

Fig. 5. Diagram of evaluation of the solution with a mine in the lab. The red line shows the variant with no sump, all communications being freely placed. The blue line is solution with compact shaft. The green line is with a shaft, calculated with reserve for changes

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Vestnik MGSU • Monthly Journal on Construction and Architecture • Volume 18. Issue 8, 2023

6. Category F "Aesthetics". Without the shaft, the aesthetics with free-standing engineering are more than questionable ("Fred"=2). Both options with shafts are almost identical in terms of aesthetics, and receive the highest score ("Fblu"="Fgre"=5).

The result is in the Diagram (see Fig. 5). The difference between the shapes is noticeable and the green figure is again bigger than the others. It is also better balanced. Results calculation is as follows:

- Green variant: (4+4+5+4+5+5)/6 = 27/6 = = 4.5 points;
- Blue variant: (3+2+2+2+4+5)/6 = 18/6 = = 3.0 points;
- Red variant: (4+5+5+5+2+2)/6 = 23/6 = = ~3.8 points.

From the figures and the line diagrams in this example we can see that the Green option is preferable in terms of operation and future changes.

The way shown is very clear. Here it represents one of the many points of the room only, but it gets the point across. What is it good for? An example of its usage can be applied for analyzing real estate for renting or buying purposes. Not every person working in these fields can easily read drawings, much less find vulnerabilities in the layout of the premises [24]. It is clearer to see a figure and a diagram defining the simplicity of possible changes.

CONCLUSION AND DISCUSSION

Sooner or later, buildings (or parts of a building) need changes to better suit the tasks relevant at the time. An architect can't predict all of these changes. But it is quite possible to realize that just now accepted solutions will have to be modified in a future. Moreover, it is possible to evaluate the already made decisions in order to inform people who are not very familiar with the drawings and the essence of architectural and planning decisions. The presented article shows the principle of evaluation using simplified examples. For a more detailed estimation apparatus, some mathematical formulas with data sets should be used.

The continuation of the work so far can be seen as a comprehensive consideration of the problems from the perspective of each of the parties involved in the building's changes. These parties are at least as follows: the building owner, the user of the space (e.g. office tenant), the maintenance employee and the contractor. The compilation of classification signs of implementation problems in the respective points, maintainability of materials and the measures of solution versatility are also important. All in all, the evaluation apparatus, produces a very simple output — a figure or a digit. That is the goal. But for the transparency of the solution and the fairness of the evaluation, the formulas for working with this data set must be carefully and worked out in details. An analogy is appropriate here with the television set that almost everyone has at home: the user only needs to watch a movie (a reference to the digital building score), no matter how sophisticated the unit itself and its media player are (a reference to mathematical formulas involving a number of parameters on building attributes). The television has become a familiar part of our everyday life, and it is possible that the readiness assessment will be used in the not-too-distant future for buying or renting property.

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Bionotes: **Dmitry A. Khrustalev** — Candidate of Architecture, Associate Professor of the Department of Industrial Architecture; **Moscow Institute of Architecture (State Academy) (MARKHI)**; bldg. 2, 11 Rozhdestvenka st., Moscow, 107031, Russian Federation; ID RSCI: 1047601, ORCID: 0000-0002-0515-0927, ResearcherID: HTN-1958-2023; promgettista@yandex.ru.

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Об авторе: **Дмитрий Александрович Хрусталев** — кандидат архитектуры, доцент кафедры архитектуры промышленных сооружений; **Московский архитектурный институт (государственная академия) (МАРХИ)**; 107031, г. Москва, ул. Рождественка, д. 11, стр. 2; РИНЦ ID: 1047601, ORCID: 0000-0002-0515-0927, ResearcherID: HTN-1958-2023; promgettista@yandex.ru.

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