

DESIGN FOR ADAPTIVE REUSE IN ENVIRONMENTALLY RESPONSIBLE INTERIORS

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KONCEPCJA ADAPTATYWNEGO PONOWNEGO WYKORZYSTANIA W ŚRODOWISKOWO ODPOWIEDZIALNYM PROJEKTOWANIU WNĘTRZ ARCHITEKTONICZNYCH

Abstract

The paper analyses the problems of interior designs calling for the need of reference to environmental stewardship, and their broad contribution to the high performance of indoor space, reduction in energy consumption, improvement in indoor environment quality characteristics, as well as effective resources management. These design objectives, as indicated in the article, may be realized through the accomplishment of products reclaim, salvage, direct reuse or adaptive reuse strategy. The fulfillment of this design strategy may involve the examination of possible formal or technical solutions to indoor environment in addition to the investigation into their redefined aesthetical and ethical values. Interior design concepts should confirm their authors' consideration of the problem of extension of product technical life span, as being one of the essential sustainable design criterion. The product in this context may be understood as the structural or complementing component of indoor environment and the interior space, considered as a spatial entity. This demand may be accomplished through the consequent incorporation of reclaimed building materials, products or their forming parts into the newly conceived space and also the modified and adapted existing spaces. The article investigates the question of possible redistribution and reintroduction of reclaimed or salvaged products and components in interior space. It also deals with the problem of revision of conventional finishing materials concept, being the technique enabling the realization of imperatives of sustainability in design through the reduction of material resources, and the influence of these procedures on redefinition of interior eco-design aesthetics.

Streszczenie

Artykuł podejmuje zagadnienia dotyczące współczesnego projektowania wnętrz architektonicznych, wymagającego podejmowania decyzji projektowych z uwzględnieniem wielowymiarowej kontekstualizacji środowiskowej, wpływającej na optymalizację sprawności przestrzeni wewnętrznej budynku, redukcję poziomu zużycia energii, udoskonalenie parametrów jakościowych środowiska wewnętrznego oraz efektywne zarządzanie surowcami materiałowymi. Wskazane cele projektowe, jak wykazano w artykule, mogą być osiągnięte poprzez realizację strategii odzyskania (*reclaim*) lub uratowania (*salvage*) materiału i produktu budowlanego przed destrukcją oraz jego ponownego bezpośredniego (*reuse*) lub adaptatywnego wykorzystania (*adaptive reuse*). Realizacja tej strategii może być przeprowadzona w oparciu o sprawdzenie możliwości rozwiązań formalnych i technicznych w kształtowaniu środowiska wewnętrznego wraz z próbą redefinicji ich wartości estetycznych i etycznych. Projekty wnętrz architektonicznych powinny potwierdzać świadomość projektantów znaczenia problemu wydłużania technicznego cyklu życia produktu, będącego zasadniczym kryterium zrównoważonego projektowania architektonicznego. Produkt w tym kontekście jest rozumiany jako strukturalny lub uzupełniający komponent środowiska wewnętrznego oraz jako przestrzenno-funkcjonalna całość. Ten postulat projektowy może być spełniony w wyniku konsekwentnej redystrybucji odzyskanych materiałów i produktów budowlanych w nowych realizacjach oraz obiektach modernizowanych. Artykuł analizuje zagadnienia formalne implementacji pozyskanych potencjalnych odpadów budowlanych w strukturę komponentów przestrzeni wewnętrznej oraz konieczność rewizji konwencjonalnych technik stosowanych w realizacji przegród wewnętrznych oraz ich okładzin wykończeniowych. Wskazuje znaczenie omawianej metody projektowej w realizacji paradygmatu zrównoważenia oraz definiowaniu pojęcia ekoestetyki.

Keywords: sustainable interior design; environmentally responsible interior design; adaptive reuse; ecological effectiveness; eco-design aesthetics

Słowa kluczowe: zrównoważone projektowanie wnętrza architektonicznego; środowiskowo odpowiedzialne projektowanie; adaptatywne wykorzystanie; ekologiczna efektywność; ekoestetyka

INTRODUCTION

The ecological effectiveness is being described by the critics of architecture and researchers as one of the three pillars, along with the economic issues and considerations related to the social equity and justice, which constitute the sustainability paradigm in architectural [Vale B., Vale R., 1996, Wines J., 2008, Edwards B. (ed.), 2001, Owen L.J., 1999] and interior design [G. Pilatowicz, 1994, S. Winchip 2011, L. Jones 2008]. The importance and complexity of this design model has been widely investigated and evaluated by researchers and academics involved in the problems of environmentally responsible interior design, since the late 90-ties of the XX century [G. Pilatowicz 1994, B. Vale, R. Vale 1996]. This design theory implies that interior designers, similarly to other professionals involved into the process of creation of sustainable built environment, including architects, engineers, or facility managers, have the moral obligation of implementation of pro-ecological and energy-efficient solutions. They should also put forward formal proposals enabling the promotion of environmental issues among users, which are designed to rise their awareness in this regard.

Critics have pointed out over last twenty years that a notifiable change took place in paying attention by designers to using resources more efficiently, in order to diminish the negative impact of human activity related to building industry, on natural environment [M. Celadyn 2016]. The sustainability, or the environmental responsibility, has become recognized as a design standard and an indispensable criterion in the interior design process. It comprises the developed design strategies being aimed at the reduction in negative impact of human activities, mainly related to the building area, on natural environment, preservation of the natural resources and economization in the use of building materials. This concerns also the optimization of parameters of built environment, especially these having direct influence on the occupants' wellbeing and their psycho-physical comfort. The broad and consequent implementation of environmental context into the interior design practice, can entail the substantial modification of conventional structure of designing team, affect the multi-dimensional process of interior space creation itself and influence the methods of creating components of indoor spaces.

1. ENVIRONMENTAL RESPONSIBILITY IN INTERIOR DESIGN

The sustainable development paradigm, as applied to the sustainable architectural design principles, imposes on the decision-making process a new perspective which is to encourage *conservation of the natural environment and reduction in energy use and consumption* [S. Walker 2006, 17].

The statement claiming that *in the ongoing process of redefining the interior design profession, it is very important that environmental concerns receive appropriate attention* [G. Pilatowicz 1994, p.140], may be seen as an indication of a specificity of interior design discipline and its compound structure. It includes the suggestion of environmental context in interior design as being essential in the creation new environmentally conscious model [M. Celadyn 2016, M. Celadyn 2017]. The effective execution of sustainability paradigm in interior design encompasses the inclusion into this integrative design decision model problems regarding the enhancement of human and environmental health, along with the fulfilment of formal, functional and aesthetic requirements. This expanded design scheme, taking into account the necessity of temporal and environmental contextualization of interior design issues, requires from designers the ability to resolve problems with the constant and simultaneous consideration of the interconnectedness of indoor and natural environments.

The questions associated with interior design contexts, enabling the redefinition of design problems, refer significantly to the methods and techniques necessary to assign the construction and specification of building materials and products, which are supposed to be employed in the creation of sustainable interior space components and in the space considered as formal and functional entity.

These subjects include such issues like: (1) evaluation of influence of building materials on the inner air quality IAQ, as being the essential factor to assure occupants comfort, and associated with the content of chemical substances present in building materials themselves, and used in the process of assembling products components; (2) level of embodied energy EE in the used building materials, related to the process of raw materials acquisition, product manufacturing

and transport to the site; (3) assessment of technical life cycle LCA of building products and objects, with considerations of the negative impacts of their installation, maintenance and ultimate demolition on natural environment. These three above-mentioned major sustainable interior design criteria, in order to be fully accomplished, require from interior designers the capability to work with the consideration of the necessity for implementation of environmentally conscious design methods, techniques and tools. The specification of appropriate interior materials and products, based on the environmental preference method EPM, materials and products certification systems, as well as on the products life cycle assessments with the priority for a closed-loop model, can allow interior designers to stimulate the conservation of nonrenewable resources, including raw materials, and the extension of their performances in interiors.

The issues related to the end-of-life phase of a building and its structural components are still insufficiently recognized [A. Thomsen et al., 2011] by interior designers and require from them to intensify efforts towards the broad implementation of an adaptive reuse concept design in the interior design decision making process.

2. CONCEPT FOR 'NO WASTE' IN INTERIOR DESIGN

B. Vale and R. Vale, analyzing the problems of contemporary architectural design, indicate that *concept of 'waste' need to be redefined until, as in the natural world, there are no wastes, only further stages in the continuous cycle of use, decay and regeneration* [1996, p. 61]. The above-mentioned concept, addressing the value of assessment of building continuous technical life cycle in architectural design, as patterned after processes present in natural ecosystems, may enable the possibility of lengthening the usage of built structures and their components in time. This design model, realized on the basis of a closed loop system, which reduces the toxic emissions and solid wastes to near zero level, may assure the minimization of products destructive impact on natural environment. It occurs at the moment of their disposal when they become obsolescent or deteriorated. The reduction in the amount of demolition wastes, as principle recognized by environmentally conscious designers, involves the process of evaluation and optimization of the full technical life cycle of products [W. McDonough 1992] as well as a review of building processes and procedures from a new perspective that includes the ecological and human health impacts of design decisions [S. Mendler 2006].

This idea, preceded by the demand *for design for deconstruction and disassembly* [C.J. Kibert 2015, p. 391] is possible through the improvement in the quality of products and finishes, the introduction of the reuse model considering the reclaim and reincorporation of building materials [S. Mendler 2006] or their parts in another functionally or formally different solutions, assuring significant savings in newly acquired and manufactured material resources. The notions of wastes and material supplies are therefore closely interconnected, as they relate to the issue of resources efficiency, substantial in sustainable design. According to many conducted surveys [A. Ali et al. 2012], the repeated processes of construction, deconstruction or demolition within the building activities, are the primary source of waste of resources. The potential building wastes are becoming therefore new valuable resources to be explored functionally and formally in the realized future objects in the course of continual products fabrication system. The replacement of conventional one-way linear building materials flow with the cyclical one, provide opportunity for the constant and systematic material resources regeneration and their further systematically planned reintroduction into the built environment.

The sustainability paradigm underlays the importance for architects and interior designers, to always consider the technical life cycle assessment of specified and implemented building materials and therefore to reduce the construction and demolition waste production [S. Winchip 2011] and thus pursue the preservation of natural resources and minimization of waste disposal in landfills (Fig. 1).

The different sustainable approaches, within the environmentally responsible strategies to the built environment, combine the design solutions and methods assuring the *preserving and reusing of existing building* [S. Winchip 2011, p. 219] as a whole, along with their retrofitting process. The methods applied to this process should be the first undertaken by designers in order to *conserve materials, land, energy and to divert wastes from landfill* [S. Winchip 2011, p. 219].

The reuse phase in the product technical life cycle, the substantial element of Cradle to Cradle design concept, and building materials certification scheme, established by McDonough and Braungart [2002], can be seen as a very promising, and at the same time a demanding design concept to be executed in the sustainable indoor environment creation process. This design framework is in fact the adaptive reuse concept [B. Plevoets, K. van Cleempoel 2013] modified and adjusted to the scale of interior environment, and the method concerning the restorative materials cycle [S.

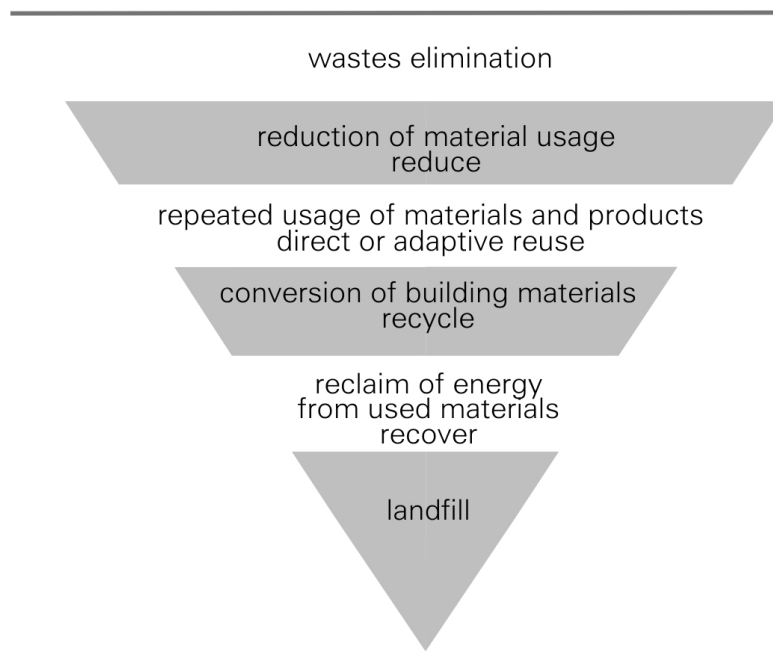


Fig. 1. Reversed “waste pyramid” representing the hierarchy of methods enabling energy-effective and ecology-efficient building construction and demolition wastes management;
source: drawing by the author

Ryc. 1. Odwrócona „piramida odpadów” ilustrująca hierarchię metod umożliwiających najbardziej racjonalne ekonomicznie i efektywne ekologicznie zarządzanie konstrukcyjnymi i porzbiórkowymi odpadami budowlanymi;
źródło: rysunek własny autorki.

van der Ryn, S. Cowan 2007] demand in an ecologically efficient architectural design. This adaptive reuse design method, regarding interiors and their components, being the important imperative of sustainability in the context of reestablishing the interconnectedness between the built and natural environments, should be carefully assessed by interior designers from initial stage of design process, including planning and programming phases.

This design method, based on the analysis of sustainable design features and materials characteristics, can be considered as a valuable, innovative and comprehensive interior design framework, with regard to the ecological, economic, as well as, societal aspects of environmental responsibility. These imperatives are supposed to address many ethical questions regarding interior design, due to the rising natural resource-awareness among designers and their clients. The waste management oriented toward the process of material recovery, which enables the conversion of potential building construction and demolition wastes into valuable resources, with the minimal energy consumption in comparison to conventional construction process, may thus respond to ethical questions regarding cost-effectiveness and ecological-efficiency of methods for objects completion.

3. REDISTRIBUTION OF RECLAIMED BUILDING PRODUCTS AND COMPONENTS

The essence of pro-ecological sustainability imperative is in line with the statement that *a building should be designed so as to minimize the use of new resources and, at the end of its useful life, to form the resources for other architecture* [B. Vale, R. Vale 1996, p. 31]. This principle corresponding with the closed-loop model, applied to the design of interior space components, places the process of interior foundation in the environmental context. The new design perspective should stimulate the influence of architects' and interior designers' modification of their working methods and encourage them to *learn to use less and to use what is available, rather than always creating specific, new components and materials that require more energy and resources, and thus have a greater detrimental impact* [S. Walker 2006, p.76] on natural environment.

The decisions made in the designing phase, apart from formal and functional aspects, should assess the effect of materials management through the building completion and especially during further use of interior space. The conscious consideration of products usage should refer to the materials physical properties, as well as to anticipation of their possible dismantling, reclaiming of elements or materials, and final reintegration of



Fig. 2. Wooden panels reclaimed from demolished buildings and incorporated as wallcovering in a new location. Restaurant and music club situated in the complex La Cité de la Mode et du Design, Paris, proj. D. Jakob, B. MacFarlane; photo by the author, 2017

Ryc. 2. Panele drewniane pozyskane z obiektów podlegających modernizacji oraz rozbiórkom i wykorzystane jako wewnętrzna okładzina wykończeniowa przegród zewnętrznych w nowej lokalizacji. Restauracja i klub muzyczny w kompleksie La Cité de la Mode et du Design, Paryż, proj. D. Jakob, B. MacFarlane; fot. autorka, 2017

recovered products with the existing building structure. Therefore, the provisions of designed objects adaptability and development of techniques of components assembling with a view to potential future modernization prove that planning focused on reuse concept introduction could form important parameter of design [B. Vale, R. Vale 1996]. As indicates Winchip *retaining and reusing buildings is a significant priority for sustainability* [2011, p. 222]. The adaptive reuse concept, emphasized on the retain and rehabilitation of reclaimed building components in indoor environment has to be considered by interior designers, as essential for conserving resources, minimizing impacts on environment, as well as reducing the construction, reconstruction or demolition waste disposed on landfills. Implementation of this design concept underlays the designers' openness toward formal explorations and the acceptance of their environmental responsibility stimulating design proposals.

The concept of remanufacturing of available reclaimed building materials, and their further redistribution, means their reincorporation into a new structure (Fig. 2) as being equal to their reintroduction into

building material technical life cycle. This relocation, executed with minimal energy consumption on reprocessing process, does assure greenery of the project through the extension of products lifespan. Artefacts, interior components, or interior as a whole, realized upon this rule, are becoming sustainable, as each of them reinvents itself with what it has within range [A. Franco 2011].

The process of regaining a new value, by reclaimed or salvaged and reinstalled building components, is accomplished through their appearance in different spatial and functional, as well as semantic and semiotic contexts (Fig. 3.). Successfully incorporated into new surroundings, the reclaimed artefacts provide the indoor space users with new reinterpretation of interior components and its entity.

The contributions of reused products to the newly defined spatial organization is possible through the practical implementation of another sustainable design strategy. The concept of design for deconstruction, supported by technical solutions improving disassembly schemes, makes these indoor interven-

tions made by architects ecologically recommended, economically justified, and offers to the occupants the sentiment of continuity and emotional identity.



Fig. 3. Bricks reclaimed from demolished walls of refurbished building and used as finishing coating of inner multilayered wall separating main auditorium from lobby. Centrum Spotkania Kultur, Lublin, proj. Stelmach i Partnerzy Biuro Architektoniczne; photo. by L. Nyka, 2017

Ryc. 3. Cegły odzyskane z części obiektu poddanego rozbiórce i ponownie wykorzystane jako warstwa strukturalna i wykończeniowa przegrody rozdzielającej audytorium od klatki schodowej. Centrum Spotkania Kultur, Lublin, proj. Stelmach i Partnerzy Biuro Architektoniczne; fot. L. Nyka, 2017

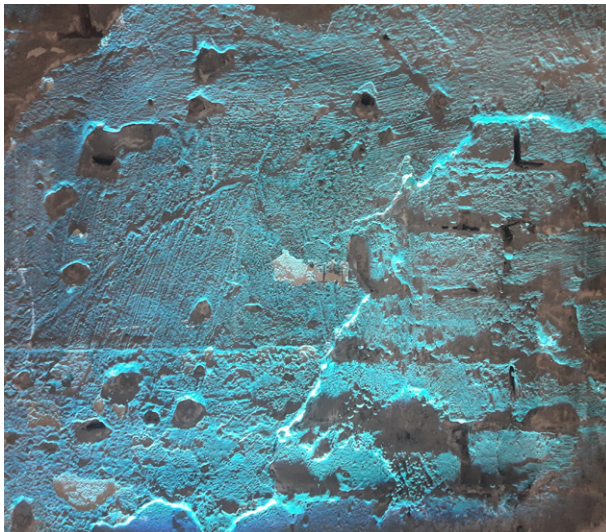


Fig. 4. Fragmentary finishes with bricks of inner side of external wall in multipurpose hall. Refurbished and adapted existing public building. Multi-purpose room. Reduta Banku Polskiego, Warsaw, Poland; Photo by M. Celadyn, 2017

Ryc. 4. Fragmentaryczne wykończenie tynkiem wewnętrznej płaszczyzny przegrody zewnętrznej wykonanej z cegły; modernizowany i adaptowany budynek użyteczności publicznej. Sala wielofunkcyjna, Reduta Banku Polskiego, Warszawa; fot. M. Celadyn, 2017

4. REDEFINITION OF AESTHETICS IN SUSTAINABLE INTERIOR DESIGN

Materials efficiency can be defined as the reduced amount of used building materials assuring the accomplishment of expected functional and formal results [M. Keeler, P. Vaidya 2016]. It can become one of the methods enabling the creation of sustainable interior design. This objective is achieved by conscious management of building materials being at designers' disposal, including these already being used in the existing objects, which as a result assure the preservation of natural resources and reduction in energy consumption.

This sustainable interior design concept may be applied mainly to construction techniques of interior space elements, (e.g. indoor space dividers made with wooden studs at wider spacing and minimal height adopted to functional requirements, exposition of partition walls inner structure through the usage of limited cladding). The dematerialization [L. Świątek 2015] indicated above as a building product model, is associated with the completion of another sustainable interior design consideration of resource-efficiency demand, assured through the product reuse concept. The latter is supposed to be more elaborated and comprehensive model based on retaining of the building substance. The reusable building materials and components, acquired from the construction site or due to refurbishment or demolition, can be thoroughly incorporated in new locations. The proposals, based on knowledgeable and informed design, that respect the resource-efficiency and examine the attributes of building materials applied, especially in the case of refurbished existing public buildings, provide many design opportunities. The research on availability of reclaimed or salvaged products, feasibility studies undertaken in predesign phases, as well as analysis of spatial and functional requirements, allow to consider broad reintroduction of building materials and products of high adaptability, physical properties or historical significance, into interior space (e.g. concrete masonry units, original wood-based frame structures, doors and panels, gypsum board, glass panels).

It is justified, then, to make assumption that products, including interiors understood as specific functionally and formally complex final solutions, manufactured or accomplished in accordance with sustainability requirements and with above-mentioned technique, may rise some cognitive and intellectual demands for the space users, and provide them with a new kind of intellectual and aesthetical experience of indoor environment.

The indoor environment elements, especially interior finishes, *produced within a more sustainable*

paradigm will be aesthetically quite different from those which we have come to regard as meritorious [S. Walker 2006, p. 76], and realized according to traditional interior design concepts. The environmental concerns drive the innovative design solutions that reach beyond the functional, as well as established and assimilated aesthetic considerations [D. Vallero, Ch. Brasier 2008] by the users. Replacement of the established aesthetic principles of perfection and completeness, with roughness and “material honesty” of reclaimed components, revealing their structure, can be influential for the attempts to include the ecological theory into the creation of environmentally responsible interiors’ aesthetics.

It is reasonable to come up with conclusion, that probably *the most green interior finish is no finish at all* [M. Keeler, P. Vaidya 2016, p. 235] exposing materials structure and treatment methods. The broadly exposed sanded wood panels, brushed concrete surfaces or bricks, partially clad with mortar on partitions or inner sides of external solid walls (Fig. 4) along with surfaces of space components intentionally left imprecisely finished, as examples of the objects minimalistic and rough treatment, may contribute to the sustainability requirements in interior design in many different aspects. The intentionally imprecisely executed interior components, as in the presented refurbished building, through the absorption of possible traces of deterioration in their appearance in the result of intensive usage, can significantly delay the need for potential costly renovation.

The interior design concept based on modification and adaptation of building construction and finishing techniques, with the introduction of adaptive reuse method along with the complex analysis of building materials properties, allows to reach different gains regarding cost effectiveness and environmental performance.

This interior design method, due to the avoidance of objects’ visible marks of premature obsolescence, may contribute to the extension of their technical life span and reduction in costly renovations and maintenance. Therefore, the ethical and environmental requirements in line with the sustainability paradigm and realized through the informed and remodeled interior design, along with the need for effective resources management, are becoming fundamentals for the eco-design aesthetics principles.

CONCLUSIONS

It is the responsibility of interior designers to explore new approaches and new decision-making processes that are more integrated, and to investigate new

ways in which to implement environmentally-conscious solutions on a more consistent basis [S. Walker 2006]. The imperatives of sustainability related to ecological effectiveness and energy cost efficiency, can be fulfilled through the support of consequently realized adaptive reuse concept, with regard to different scales of products and range of undertaken formal and spatial interventions. This method combining the minimization of material usage with reduction in maintenance costs, allows in effect to reduce the detrimental impact of built environment on the natural one, through the remanufacturing and inclusion of remodeled products into new objects. This approach highlights the comprehensive process of adjustment of existing building substance to new functional requirements through the cost-effective practices of deconstruction, reclaiming and reintroduction of building materials and products into interior components. Adaptive reuse concept thus enables designers to make meaningful contribution to postulates stated in the sustainable design paradigm. These combine economic, ecological issues, as well as societal aspects of design, which are associated with benefits of retaining architectural heritage.

Reusing buildings, finishes and furnishings must be the preferred solutions when designing interior environments [S. Winchip 2011, p. 219] in compliance with the sustainable design principle concerning effective resources management. The accomplishment of this important sustainable design criterion, being one of the essential principles of contemporary pro-ecologically oriented design guideline, can become the inspiration for the comprehensive development of interiors eco-aesthetics, recognizing their semantic layers and expressing their ethical values. This objective achieved through the innovative and experimental design decisions articulating the designers’ environmental consciousness, new dimension of the environment-oriented sensibility, as well as their abilities to assess the possible design decisions in their complexed temporal and environmental contexts.

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