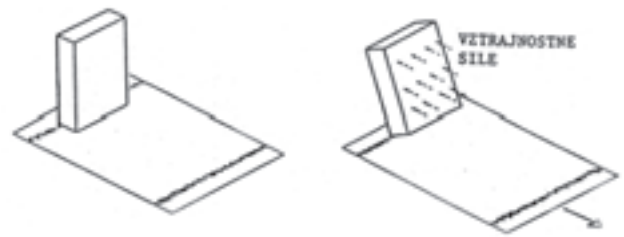
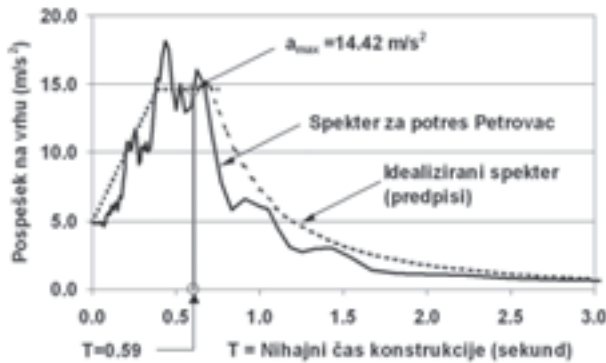


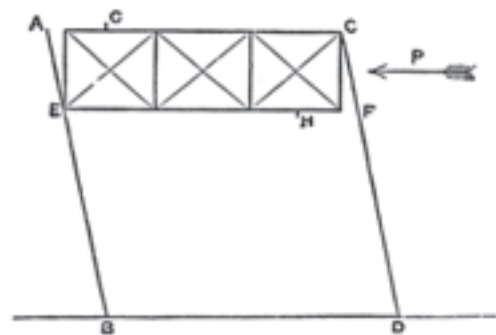
Slika 1: Osnovni pojmi seizmologije: hipocenter, epicenter, epicentralna distanca, plasti tal, potresni valovi, prelomnica, akcelerogram, pospešek tal ... [Lagorio, 1990].
Basic terms of seismology: hypocentre, epicentre, epicentre distance, ground layers, earthquake waves, fault, acceleration graph, ground acceleration.



Slika 2: Ponazoritev efekta vztrajnostnih sil (simulacija učinka potresnega sunka) [Aničič et al, 1990].
Illustration of the effect of persistency forces (simulated effect of an earthquake surge).



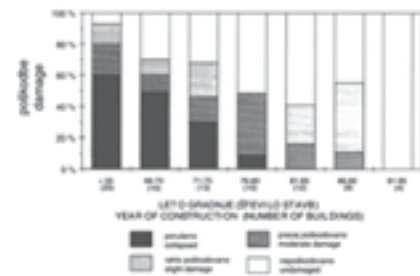
Slika 3: Spekter odziva za potres Petrovac (5% dušenje) in "zglajeni" idealizirani spekter podobne oblike kot se upošteva v predpisih (projektni spekter).
Spectre of response for the Petrovac earthquake (5% muffling) and a "chamfered", idealised spectre of similar form, as is used in regulations (project spectre).



Slika 4: Skica s sredine 19. stol., ki kaže na takratne pomisleke o zadostni horizontalni togosti konstrukcije Kristalne palače.
Sketch from the mid 19th century, which shows the present second thoughts about sufficient horizontal rigidity of the Crystal Palace's structure.



Slika 5: Primer lokalnega porušnega mehanizma: nenaden padec togosti in pojav plastičnih členkov v stebrih ene izmed etaž [Fischinger et al, 1997].
Example of a local collapse mechanism: sudden loss of rigidity and emergence of plastic joints in one of the floor's columns.



Slika 6: Poškodovanost stavb v središču Kobeja ob potresu leta 1995 v odvisnosti od leta njihove gradnje. [Fischinger, 1999].
Damage to buildings in central Kobe after the earthquake in 1995 in relation to year of construction.

povzetek

Raziskava se loteva široke problematike zasnove konstrukcij v arhitekturi in izhaja iz predpostavke, da sta za izdelavo v potresnem smislu odporne konstrukcije potrebna konstruktor in arhitekt. Naloga obširno povzema rezultate raziskav zadnjih let in se sistematično loteva poglavij kot so: razlage osnovnih pojmov potresnega inženirstva, pristop arhitekta, pristop gradbenika, problemi pri njenem sodelovanju, zgodovinsko ozadje ipd. V raziskavi je zbranih večina predpisov in pravil, ki jih mora arhitekt upoštevati pri zasnovi potresno odporne stavbe in ki izhajajo iz novih standardov Eurocode 8, tokrat v celoti.

Problematika je obravnavana na nivoju idejnega projekta, kjer mora biti arhitekt čimbolj samozadosten ter na nivoju projekta za PGD/PZI, kjer mora sodelovati z gradbeniki. V tem primeru mora arhitekt v osnovi poznati zahteve tehničnih strok in obvladati načine za njihovo vključevanje v končni projekt.

doseženi cilji, namen in rezultati

Projektiranje je zaradi vključevanja množice različnih strokovnjakov, investitorja in izvajalcev kompleksen proces, ki pogosto zahteva iteracijski pristop. Ob vsakem neujemanju zahtev je potrebno usklajevati začetno zasnovo, kar vodi do podaljševanja rokov, konfliktov med strokami, neuskkljenih projektov in tudi do nekvalitetnih objektov.

Na dobro zasnovo konstrukcije je potrebno praviloma misliti že v prvih fazah zasnove konstrukcije, ki je v največji meri odvisna od arhitekta. Pravila v predpisih in standardih večinoma nastopajo v obliki priporočil, katerih izpolnjevanje je tako prepuščeno presoji in izkušnjam projektantov. Nekatera načela so podana le kot opisna priporočila (npr. zahteva po jasnem in neposrednem prenosu sil v temelje), ki so odvisna od razumevanja in izkušenj arhitekta in/ali statika. Spet druga so podana v obliki analitičnih izrazov (npr. za minimalno torzijsko togost etaže) za katere je potrebno izvesti določene predhodne analize.

problematika v arhitekturi, umestitev obravnavane teme v te tokove in njen pomen

Arhitekt projektant mora poznati vse tiste zahteve zakonskih predpisov drugih tehničnih strok, ki se nanašajo na arhitekturo, kot tudi vrste in tehnološke meje sodobnih tehničnih rešitev, da jih lahko vključi v idejno zasnovo objekta. Naloga vključuje povzetek, razlago in uporabo relevantnih tehničnih predpisov s področja zasnove konstrukcij na potresnih območjih. Ta pristop predstavlja novost, ki bo direktno vplivala na kvaliteto projektiranja kot tudi na konkurenčnost naših projektov arhitekture v širšem evropskem merilu.

V raziskavi ne gre le za poznavanje predpisov, temveč tudi za njihovo pravilno tolmačenje in vključevanje v idejno zasnovo arhitekture. Pogosto je to onemogočeno, saj so tehnični predpisi prilagojeni inženirjem in zahtevajo predhodne analize, ki v fazi idejne zasnove objekta ter iskanju rešitev in kompromisov z investitorjem niso niti izvedljive niti smiselne.

ključne besede

Zasnova gradbenih konstrukcij, potresno varna gradnja, arhitektura konstrukcij, eurocode 8, gradbeni predpisi

summary

The research tackles the very wide issue of structural concepts in architecture and stems from the hypothesis that the production of earthquake resistant structures demands both a structural engineer and an architect. The research gives an expansive summary of results of several years of research and systematically deals with various topics, such as: explanations of basic terms of earthquake engineering, architect's approach, structural engineer's approach and problems linked to their cooperation, historical background of the issue etc. The research brings a collection of stipulations, regulations and rules, which an architect-designer should respect when planning the concept of an earthquake resistant building, and which emerge, this time fully, from the new Eurocode 8 standard. The issue is dealt with on the level of the idea proposal, where the architect-designer has to be as self-sufficient as possible, and the level of project for obtainment of building permit and building itself, where an architect has to cooperate with civil engineers. In this case it is necessary that the architect, as project leader, basically has knowledge about demands of technical professions and masters methods of their integration in the final project.

intentions, goals and results

In general, designing is a complex process that includes many experts from various disciplines, which is often done by iteration. In any case of more serious discordance of demands the primary concept has to be harmonised, implying lengthening of time limits for completion, frequent disagreements between the professions, unharmonised projects and, of course, buildings of bad quality. A sound structure has to be thought about in early stages of the structural design, but this depends most on the architect, designer of the building.

Some principles are stated only as descriptive recommendations (e.g. the demand for simplicity of load-bearing structures and clear and direct transfer of loads to the foundations), thus their implementation depends on the understanding and experience of the architect and/or structural engineer. Others are presented in the form of analytical equations (e.g. minimal torsion rigidity of floors, coefficient of heat conductivity of peripheral walls), which require carrying out certain preliminary analyses of the structure.

architectural issues, positioning the topic in ongoing debate and its' significance

The architect designer has to have sound knowledge about all demands from legal documents of other technical professions, which directly affect architectural work, as well as types and technological limits of contemporary technical solutions, since in this way they can be integrated in early stages of the design work. The research contains a summary, explanation and use of relevant technical regulation concerning the field of structural design in earthquake-prone areas. This is a novel approach, which can directly affect the quality of design as well as competitiveness of domestic architectural projects in the wider European scale. This is not just an issue of knowledge of regulations, but also their correct interpretation and integration of demands of technical professions into idea proposals of architecture. The present condition of technical regulations is often unbeneficial, since regulations are adapted to engineering needs and demand previous analyses, which in early stages of designing and finding solutions and compromises with investors cannot be done or would be senseless.

key words

Concept of engineering structures, earthquake-safe construction, construction architecture, Eurocode 8, building regulations