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# USSR Report

CONSTRUCTION AND EQUIPMENT

No. 66

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## CONSTRUCTION

### LATVIAN PARTY OFFICIAL OUTLINES CONSTRUCTION TASKS

Riga KOMMUNIST SOVETSKOY LATVII in Russian No 4, Apr 82 (signed to press 23 Mar 82)  
pp 31-39

[Article by Yu. Yura, head of the department of construction and municipal services of the Latvian Communist Party Central Committee, and Candidate of Economic Sciences V. Oleynik: "Pressing Tasks of Perfecting the Republic Construction Complex"]

[Text] In a speech at the November (1981) CPSU Central Committee Plenum, L. I. Brezhnev cited capital construction as one of the decisive sectors of the five-year plan. The rates of growth at which the country's economic potential increases, ensuring proportional, planned development of the national economy and raising the material and cultural standards of living of the Soviet people will depend on the state of affairs in this branch.

In actualizing the resolutions of the 26th CPSU Congress and the 23rd Latvian Communist Party Congress, republic builders concluded 1981 with certain accomplishments. The start-up of fixed assets through state capital investment increased six percent as compared with 1980, including a three-percent increase in industry and a 14 percent increase in agriculture. The value of fixed assets in the republic national economy increased by more than 700 million rubles.

Last year, we finished building the guy bridge across the Daugava at the site of Uliĥa Gor'kogo and Furniture House. Work was done on construction of a television and radio broadcasting complex and a sports training facility at RPI [Riga Polytechnical Institute] in Riga, Daugavpilsskaya GES, Ventspils port factory facilities, "Olaynfarm" production and REZ [Riga Electrical Machinebuilding Plant], Liyepayskiy Haberdashery Combine, the mixed feed plant in Liyepaya, and many other projects.

Stockraising premises for 4,600 head of cattle, nearly 24,000 hogs and 142,000 poultry were built on sovkhozes and other state agricultural enterprises. Grain storage facilities for 16,700 tons of storage at one time, 5.5 hectares of hothouse combines and glass greenhouses, vegetable storage facilities for 11,200 tons of storage at one time, repair enterprises and workshops to handle 1,600 conventional repairs a year and other facilities were put into operation.

The start-up of a total of more than a million square meters of housing enabled us to improve the housing conditions of nearly 60,000 people. The number of places in children's preschool institutions increased by 2,800 and in general-education schools -- by more than 4,400; new hospitals and new projects in personal and municipal services, trade and public catering were put into operation.

Along with new construction, considerable attention has been paid to renovating and retooling existing enterprises, to improving the working and living conditions of those working in all branches of the national economy. Capital investments used to renovate and retool existing enterprises comprised 35 percent of all production-type capital investment.

At the same time, branch operation continued to have serious shortcomings in 1981. Plan assignments for putting fixed assets into operation were met by only 81 percent, assignments for total housing space put into operation -- 95 percent, and the limit on capital investments was only 93 percent used, and that on construction-installation work -- only 90 percent. The republic Ministry of Construction finished the year unsatisfactorily. Negative tendencies towards lower return on capital were not overcome in construction and building materials industry and labor productivity improvement assignments were not met.

Branches have not made full use of the available scientific and technical potential or the practical experience of the leading collectives to resolve these tasks. Whereas one in every five new equipment assignments was not carried out this past five-year plan in the republic Ministry of Construction system, 36 percent of the assignments were not met in 1981. Some 11 percent of such assignments were not carried out in the Latvian SSR Ministry of Building Materials Industry system.

Carrying out the tasks outlined by the 1981-1985 republic economic and social development plan will require significant improvement in the state of affairs in construction. The 15 percent increase in national income, 15.8 percent growth in industrial production volume and 13 percent increase in average annual gross agricultural output volume planned for the 11th Five-Year Plan must be ensured without increasing capital investments and with a 10 percent reduction in construction-installation work volume, which will require a fundamentally new approach to both the distribution of capital investments and construction organization.

Thus, the plan anticipates improving the technological structure of capital investments as follows: the proportion of construction-installation work in it will drop from the 47 percent of 1976-1980 to 42.5 percent. In industry, more than 70 percent of the capital investment is being directed into expanding, renovating and retooling existing enterprises. In rural areas, the material-technical base of farming, including feed production, will receive preferential development, and in the nonproduction sphere -- the construction of housing, cultural and personal-services facilities. State capital investments in developing the nonproduction sphere are being increased by more than 35 percent.

In the current five-year plan, along with ensuring the start-up of planned fixed assets, builders are faced with resolving a number of complex qualitative tasks: labor productivity is to be increased 13.2 percent and we are to achieve a 7-9 percent savings of rolled metal and lumber and a 5-7 percent savings of cement, as well as with contributing to reducing energy consumption and improving the operating characteristics of the facilities being built.

Actualization of the tasks facing capital construction will depend both on builders themselves and on the activity of related branches and production facilities -- enterprises of building materials industry, the ministries of forestry and timber industry, wood-processing industry, local industry and other branches providing builders with their products. The condition of the production and social infrastructure, the

availability of stable labor collectives, material-technical supply organization, the quality of scientific research and planning organization work and the activities of planning and financial organizations, clients and others will be of great importance.

These functionally connected branches, production facilities and types of activity ensuring the development and start-up of fixed production and nonproduction assets form the republic's construction complex, which is obligated this five-year period to achieve radical improvement in capital construction affairs. Comprehensive intensification of construction production is the basis of this turning point.

Successful functioning of the construction complex depends on proper determination of strategy and tactics for developing all its links, on effective coordination of the activity of its participants.

The quality of city design and construction, architectural, technological, modular-layout and design resolutions is of important significance to increasing capital construction effectiveness. In this connection, the ministries and departments and the Gosstroy of the Latvian SSR must achieve improvement in the work of planning and prospecting organizations.

Designers must proceed from the assumption that the orientation in industry will be foremost towards increasing capacities through the retooling and renovation of existing production facilities and enterprises, by introducing highly productive equipment, and by mechanizing and automating production processes. The modular-layout resolutions of industrial buildings and structures must permit locating basic and auxiliary production facilities in them and the easy modernization or replacement of technology.

Agricultural production construction projects will be of optimum capacity and their technical resolutions must ensure the start-up of individual lines, each of which is to be built in under two years.

Expanding architectural and city design and construction opportunities for development and increasing production efficiency will be facilitated by the development and introduction, in stages, of an open system of standardization on the basis of a unified components and items catalog, as well as by inter-series standardization.

We are changing over to the construction of houses using new standard design series with improved apartment layouts and better-quality building sanitation-engineering systems and noise-suppressing enclosure components.

In cities, housing complexes must be put into operation fully complete, with public amenities and large public buildings. Broadening the products list of housing and public facilities being produced by the Livany Experimental House-Building Combine will permit the diversification and industrialization of building housing with few stories in rural areas.

One feature of the current and forthcoming periods is the objective necessity of reducing expenditures of materials and energy resources, which must, in particular, be reflected in improving the insulating properties of buildings, as 20-30 percent of the fuel being extracted in the country is being spent on heating. We should expand the use of triple-layer outer wall-panel components and single-layer components with improved insulating characteristics and switch over to triple-pane window glass and double glass panes. Greater use must be made of automatic heat and fuel expenditure

regulators in heat-supply systems. We need to set up the use of recovered energy resources.

We will continue perfecting the settlement system and network of urban and rural population centers in the 11th Five-Year Plan in accordance with the Latvian SSR Regional Settlement Plan. The sociocultural potential of the small and medium-sized cities will be further developed. The layout and development of rural population centers must ensure that they are transformed into settlements provided with public amenities and corresponding to the specifics of agricultural production and the character and conditions of rural life. First to be developed will be promising settlements and their service centers.

The conditions under which the republic construction complex will be developing in the 1980's places serious demands on its scientific-technical level. The scientific research institutions are called upon to play a large role in this. In order to increase the effectiveness of the research and accelerate the introduction of its results into production, five republic scientific and technical programs were approved for the 11th Five-Year Plan. In order to carry them out, creative brigades were created from among representatives of the developers and the implementing organizations. We have quite a few examples of well-done research.

There is active work being done on developing chemical additives which improve the quality and freeze-resistance of concretes, ensuring a 10-15 percent savings of cement. Chemical additives are being successfully introduced at many plants of the ministries of construction, building materials industry, municipal services and other departments in the production of road concretes and items made from them.

In late 1981, the republic succeeded in obtaining a commercial gypsum 3-4 times stronger than ordinary binders. This permits its use in lightweight partition components, in the manufacture of acoustic and finishing elements, in floor foundations and other components, thus saving cement and metal. The Ministry of Building Materials Industry immediately displayed an interest in introducing this development at Sauriyeshskiy Building Materials Combine. Jointly with combine specialists, its developers have already begun making the designs. Such efficiency deserves all manner of approval.

The aggregated composite concretes we developed for stockraising facility floors have been evaluated highly by specialists. Developments in the area of automated control by design organizations are of important significance.

At the same time, the path from concept to practical implementation remains too long. One often encounters in the ministries, organizations and enterprises an insufficient interest in introducing innovations. For example, a method of reinforcing with less metal, permitting a 20-40 percent reduction in reinforcing steel expenditures in outside wall panels, has been developed in the republic. Pskov, Novgorod, Leningrad and Central Asian organizations have begun or are preparing to begin introducing it. But in our republic, thus far only two enterprises -- Daugavpils Building Materials and Components Plant and Riga Large-Panel House-Building Plant -- have introduced this method of reinforcement. Other enterprises have yet to pick it up. The "Liga" finishing compounds are in use at dozens of republic projects and at projects outside the republic. However, the Ministry of Building Materials Industry and Ministry of Construction have for several years now been unable to solve the problem of organizing the industrial production of these compounds. The manufacture of effective

stamped installation pieces turns out to be disadvantageous for the experimental machine shop due to imperfections in the planning indicators. There is no interested organization prepared to begin producing tile for stockraising facility floors. The Ministry of Construction has been in no hurry to prepare to produce a perlite conservation-type heater, to change-over to three-layer panels or to introduce other innovations.

The construction ministries and departments must radically alter their attitude towards new equipment. Does it do honor to the collegiums of the Latvian SSR ministries of construction and building materials industry that they have not once examined the question of science for production or the status of construction science developments and their practical introduction in recent years?

"We need to eliminate everything which makes the process of introducing innovations difficult, slow and painful," L. I. Brezhnev pointed out at the 26th CPSU Congress. "Production must be vitally interested in mastering faster and better the fruits of the thoughts and labor of scientists and designers." All work on creating and introducing new equipment demands serious restructuring, and the republic Gosstroy must play an active role in that.

The level of construction industrialization, the degree of factory-readiness of components and parts, opportunities for using efficient materials and components and improving construction quality depend largely on the condition of the branch's material-technical base, a leading place in which belongs to building materials industry and construction industry enterprises. In the 10th Five-Year Plan, their fixed assets increased 23 percent. New enterprises were put into operation and production was expanded. However, the provision of construction sites with both new and traditional materials and components remained unsatisfactory. As a result of the lack of proper organizational work, capital investments for developing wall materials production were consistently not utilized. And things did not change last year.

This situation must be radically changed by ensuring outstripping development of building materials and components industry, increasing production volume at least 12 percent by 1985 and significantly improving the technical level of production, labor productivity and output quality.

Prefabricated reinforced concrete will remain the basic structural material in the 1980's. Republic builders, we know, have achieved high indicators in the amount of it used. The next task is to perfect the prefabricated reinforced concrete structure and expand the production of components made of lightweight concretes, prestressed components and components made of high-strength concretes.

We also need to expand the use of industrial wooden and large asbestos-cement components, components made of gypsum-cardboard sheet, and other efficient structural and finishing materials.

Large-panel house-building will be further developed in republic large-scale housing construction, reaching 75 percent of all housing construction by 1985. By the end of the five-year plan, large-panel house-building capacities must have been increased to one million square meters of total housing space per year. The increment must be provided by the Liyepayskiy Building Materials and Components Combine, the Daugavpils Building Materials and Components Plant, No 1 house-building combine and the Ministry of Construction's Riga Large-Panel House-Building Plant, and "Latvkolhozstroy"

enterprises. We need to organize the development of specific measures to increase capacities in the indicated ministries and departments and to ensure that the republic Gosstroy monitors progress in implementing them.

Along with the significant increase in the production of single-apartment houses, the Livany Experimental House-Building Combine should pay more attention to improving their quality and perfecting modular-layout and, most importantly, structural resolutions.

Increasing the production of components for large-panel children's preschool institutions is an important task: production volume must be increased to at least 5,600 spaces by 1985. In Riga, we need to master the release of components for the new, 104th series of these buildings.

Much work will be done to increase the production of wall materials. The goal has been set us of eliminating the deficit in them by the end of the five-year plan. Their total production volume must be increased to 732.5 million conventional-brick units. The Ministry of Building Materials Industry, as the main producer of bricks, is faced with renovating and retooling shops at "Lode" and "Spartak" plants, the Kantsiyemskiy Building Materials Combine and the Daugavpils Building Materials and Components Plant. Simultaneously with increasing production, we should improve the quality of the brick and expand the release of high-strength brick and efficient hollow block.

We need to expand the production of pre-stressed components at enterprises of the Ministry of Building Materials Industry and Ministry of Construction (to 32 and 20 percent, respectively) and of components manufactured using percussion technology. The Ministry of Building Materials Industry must master the production of plasticizers to increase concrete strength, the "Liga" dry finish mixtures and high-strength gypsum-cardboard sheet for frame partitions, and to expand the assortment of lining and acoustic materials. The Ministry of Construction needs to create the production of perlite-based efficient heaters and gypsum-perlite partition items at its own enterprises. Much work needs to be done to increase the factory-finish of the output being produced.

Enterprises of other branches of republic industry can and must make their own contribution to broadening the material-technical base of construction. Capacities to produce 200,000 square meters of parquet panel will be created at "Furniyers" plant. Quite a bit can be done by enterprises of the Ministry of Light Industry to provide construction with needed materials by organizing the production of special fabrics. "Latvbytkhim" enterprises should set up the release of compounds to seal seams and the machinebuilding ministries should set up the release of high-quality brackets, technological furnishings and power tools.

Construction production mechanization is an effective factor in improving efficiency. It must be oriented towards attaining the primary goals of significantly reducing expenditures of manual labor (by 20-25 percent) and raising labor productivity in construction. A great deal of work must be done along these lines.

Although the availability of machinery to labor in construction has increased by more than 30 percent in recent years, labor productivity has risen insignificantly, and the level of manual labor has hardly dropped at all. Why? Analysis has shown that there are several reasons. First, the fleet of machinery for construction sites has

not been designed or assembled into sets as a system which is optimum in terms of type and size, and it is expanded by adding machinery of different kinds, making it technologically inefficient. Second, there are serious shortcomings in organizing the use of construction machines and machinery; there is much idle time and the shift index is low. Machine operators are not interested in the end results of production. In large measure, equipment productiveness depends on inadequately improved construction work technology which, in turn, depends in large measure on planning resolutions and the materials and components being used. All these shortcomings need to be eliminated as quickly as possible.

In the years ahead, construction organizations will be reinforced with highly productive machines and higher unit-power motor transport, while the machine fleet structure must retain equipment for low-volume, scattered work. The products list of means of mechanization needed for brigades must be determined by the work plan and supplied to the brigade in the form of standardized complete sets.

Important organizational measures which must be carried out in the years just ahead include: a 40-50 percent rise in the equipment operation shift index, a 15-20 percent reduction in the proportion of machines and machinery with above-normative time in service, centralization of construction equipment in mobile mechanized columns and in small-scale mechanization sectors, securing mobile diagnostic and servicing equipment for them, organizing the centralized repair of the basic construction machinery, including that based on interdepartmental cooperation.

Measures to mechanize construction must ensure the freeing of 2,600 workers from manual labor in the five-year period. Mechanization must comprise 20 percent of the planned increment in labor productivity.

The largest reserves for improving capital construction efficiency are to be found in the organizational sphere. Improving management, raising the level of production and labor organization, strengthening technological discipline and improving work with personnel must provide about 40 percent of the planned growth in labor productivity and material resources economy. Calculations show that the optimum territorial organization of prefabricated reinforced concrete components production, for example, could provide an annual savings of about 500,000 rubles by reducing transport outlays; improving construction management on the basis of general-plan management principles could save 10 million rubles, and improving the organization of the material-technical base of construction could save 10-15 million rubles. Organizational measures must therefore always be kept in view by the leaders of construction departments and organizations and by all communists working in the branch.

The directions in which organizational improvement in construction management must move are: transition to a two- and three-link management system; transferring new construction from organizations of nonconstruction ministries and departments to the lead construction organizations, the Ministry of Construction and the "Latvokolkhozstroy"; increasing the independence of general-contractor construction organizations in anticipation of a closed production technology by transferring to them organizations performing assembly and other special work, creating specialized work sectors in mobile mechanized columns and strengthening the production bases of trusts, administrations and interkolkhoz construction organizations.

The construction material-technical base management will be improved along the lines of interdepartmental production cooperation and specialization and the elimination of

small enterprises. We cannot reconcile ourselves to the fact that many small production facilities and workshops with poor equipment, high labor expenditures and high output and services net costs function in parallel in regions of the republic. Ventspilsskiy Rayon, for example, has eight mechanical repair shops, Daugavpilsskiy and Yelgavskiy rayons have seven woodworking shops, and in addition, Daugavpilsskiy Rayon has 10 slurry centers, eight sawmills and six nonore materials quarries. Moreover, each rayon has dozens of production facilities of kolkhozes, sovkhozes, the "Latvsel'khoztehnika" and other departments. The republic Gosplan should analyze in depth the system of territorial organization for construction complex production facilities and, together with the departments concerned, make a decision on improving it along the lines of production concentration and specialization and on creating interfarm enterprises.

The brigade contract should be introduced more actively at construction sites, especially such progressive forms of it as the integral-process flow-line brigade contract based on comprehensive engineering preparation for production, and material and moral incentives for it should be improved.

Introduction of the measures outlined in the USSR Council of Ministers and CPSU Central Committee Decree "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Improving Production Efficiency and Work Quality" must exert a great influence on improving capital construction efficiency. It anticipates orienting plans towards the indicator of commodity construction output and collectives towards the end results of construction production, putting production capacities and facilities into operation. This will facilitate concentrating forces and funds at the construction sites most important to the national economy. Introducing comprehensive quality control systems and automated control systems is an important reserve for intensifying construction production. We need to constantly improve the management of scientific and technical progress in construction and building materials industry.

The demand of the 11th Five-Year Plan that the economy be economical will be successfully met if the style and methods of our work are changed, if all the levers of the economic mechanism are revealed and brought into play. The changing economic situation has required nontraditional resolutions and new searches.

Under these conditions, the role of economic leaders has increased significantly. Business-like people of a socialist mentality must be highly competent and enterprising, must act in a party-like manner and skillfully combine the interests of the state with those of the collective and of each worker.

The leaders of construction ministries and departments must pay a great deal of attention to concern for people. Organizing construction worker everyday living and recreation conditions and providing them with housing, kindergartens, schools and cultural centers is a complex task in whose resolution local Soviets must participate, along with the construction departments. Experience has shown that personnel turnover is lower and people work better when a developed social infrastructure has been created.

A year in which we celebrate a remarkable anniversary, that of 60 years since the formation of the Union of Soviet Socialist Republics, 1982 is underway. Laborers throughout the country, including those in our republic, have widely developed socialist competition under the slogan "60th Anniversary of the Formation of the USSR -- 60 Shock-Work Weeks."

There is now no more important task for all participants in the construction complex than the struggle to improve capital construction efficiency. The party organizations of the ministries and departments, enterprises and organizations, must mobilize the collective to reveal and use production reserves, improve labor quality, strengthen organization and develop in every way possible creative activeness and initiative so as to successfully carry out the assignments of the second year of the 11th Five-Year Plan.

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CONSTRUCTION

CURRENT CONSTRUCTION PLANNING PROBLEMS REVIEWED

Vilnius KOMMUNIST in Russian No 2, Feb 82 (signed to press 22 Feb 82) pp 47-52

[Article by Yu. Viyeykis and B. Mel'nikas, candidates of economic sciences: "Effectiveness of Capital Construction"]

[Text] It is unnecessary to prove that fulfillment of the tasks set by the 26th CPSU Congress in the field of the country's economic and social development requires a substantial rise in the effectiveness of capital construction. This means that in the 11th Five-Year Plan there has to be improvement of the process of project planning, construction and attaining rated capacities, higher quality has to be assured, and construction times have to be reduced along with a simultaneous reduction of materials intensiveness and the cost of projects put into operation.

Certain problems have arisen in recent years in the development of construction, and LiSSR is no exception. The problems include a rise in the materials intensiveness and estimated cost of construction.

The course initiated in the republic in the sixties toward industrialization of construction was aimed above all at using expensive reinforced concrete, whose use, as we know, is not always advantageous. For instance, according to the calculations of scientists (V. Tolpygin, "Technical Progress in Construction Work," VOPROSY EKONOMIKI, No 8, 1979, p 124), the relationship among prices of different types of wall materials and the level of labor expenditures in applying them often indicates the advisability of renouncing the use of prefabricated reinforced-concrete structural elements (see the table).

<u>Types of Wall Materials</u>	<u>Price Per Cubic Meter</u>		<u>Cost of Labor Input Per Shift Per Worker</u>	
	<u>Rubles</u>	<u>Relative to Prefabricated Reinforced Concrete, %</u>	<u>Rubles</u>	<u>Relative to Prefabricated Reinforced Concrete, %</u>
Prefabricated reinforced concrete	60.0	100.0	160.0	100.0
Red facing brick and mortar	22.0	36.7	36.4	22.8
Ready-mixed concrete	19.2	32.7	88.4	55.0

In the 1970-1980 period the use of prefabricated reinforced concrete increased 41 percent in the republic's industrial construction, 14.6 percent in housing construction and 22 percent in public works construction (effective area). This is one of the main reasons for the rise in materials intensiveness of the construction sector's output.

The high materials intensiveness of the end product of production makes its capital intensiveness and labor intensiveness high as well, since the increase in the expenditure of raw materials and supplies is accompanied by a rise in the specific expenditures of the means of labor and manpower. The high materials intensiveness of construction also is conducive to a sharp increase in shipping costs and higher construction costs.

The rise in the materials intensiveness of construction is making it more complicated to organize the supply of materials and equipment. For instance, in the opinion of more than 70 percent of the foremen, work supervisors and section superintendents improving their qualifications in the institute for improvement of qualifications of specialists of the LiSSR economy, the most substantial shortcoming at our republic's construction sites is the late and incomplete delivery of physical resources, which causes workers and machinery to stand idle and increase its construction time.

The problems of the economic mechanism should be noted among the problems of construction. To be specific, the organizational and managerial system of construction does not fully meet the requirements of optimum combination of concentration and specialization of construction work. Shortcomings in the sphere of the organization of management resulted to some degree from the system of planning and material incentives in capital construction that was in effect up until 1980. The problem of optimum combination of concentration and specialization has two aspects: On the one hand a rather high level of concentration of physical resources is indispensable in each of the sectoral groups and in the complex as a whole, while on the other these resources must be used through certain specialized channels.

At the present time construction contracting organizations operating in the republic are subordinate to more than 40 union, union-republic and republic ministries and departments. Project planning and surveying are done by more than 30 project planning and other institutes, various bureaus and other organizations. All of this is naturally causing numerous difficulties of an organizational and legal nature and is having an adverse effect on coordination of the actions of participants in the investment process.

It might be worthwhile to think about unifying all construction organizations in the sense of guiding both the technical policy for development of construction and also distribution of physical, labor and financial resources.

The set of norms and standards which serve as the basis for planning and managing capital construction needs to be improved in the very near future in order to carry out the requirements of the decree of the CPSU Central Committee and USSR Council of Ministers dated 12 July 1979 and entitled "On Improving Planning and Strengthening the Influence of the Economic Mechanism on

Increasing Production Efficiency and Work Quality." This applies above all to the setting of standard allowances on construction time.

As we know, construction time can be shortened only on the basis of proper planning of the entire construction cycle, which regulates the deadlines for carrying out the economic tasks which are posed and which is based on normative documents. Unfortunately, the present system for setting standard times for the entire process of building production capacities and facilities does not meet the relevant requirements.

The documents now in effect include the "Temporary Standard Times for Project Planning," "Standard Construction Times of Enterprises, Buildings and Installations and Partial Completion in Construction," "Standard Allowances for Attainment of Rated Capacities at Enterprises Put Into Operation," which have a number of essential shortcomings: They do not cover all branches, they do not correspond to the present structure of industry, most of the standard times for project planning, construction and attainment of rated capacities are not linked to one another on the basis of the type of project or with respect to the indicators of the production capacity of the project.

For instance, according to the data of scientists (G. Klimenko, "Standard Times Are Needed To Cover Project Planning, Construction and Attainment of Rated Capacities," EKONOMIKA STROITEL'STVA, No 1, 1981, p 39), only 462 of 4,504 standards in effect, or 9.8 percent, were determined on the basis of the same project classification and production capacity of projects and extend over all stages of creation of projects and enterprises from start to finish. The standard allowances now in effect do not take into account time spent to perform many operations which actually occur in various stages of the investment process and which for certain construction projects comprise from 5 to 24 percent of total expenditures of the time required to build the project.

This discrepancy between the standard allowances and reality makes it considerably more complicated to monitor adherence to standard construction times. There is nothing to justify the existence of these discrepancies, and they should be eliminated. It should be noted in this connection that monitoring adherence to standards of an economic nature as a whole, their linkage to form a unified complex, and guaranteeing their mutual correspondence are immediately bound up with use of the All-Union Classifiers of Technical and Economic Information, whose introduction has unfortunately been held up for a number of years.

Improvement of the forms of cooperation among participants in construction is an important condition for increasing its efficiency. Within the process of cooperation the joint activity of participants in the investment process--those who plan, those who build and those who operate projects--ought to be aimed at the ultimate goal of the entire system of management of construction: speeding up activation of production capacities and fixed capital. But often in practice a situation comes about in which certain participants in the investment process are fulfilling planning targets with respect to the basic indicators which are planned, while the functions of the system as a whole, consisting of activating projects, are not performed, and the overall duration of the investment process increases.

Departmental divergence in capital construction is one of the factors of unjustified scattering of capital investments and physical resources. Cases of artificial division of large projects into several small ones have unfortunately been quite frequent in our republic in the recent past; this is done in order to simplify the procedure for examining and reconciling project plans and estimates. The result is that additional difficulties arise in organizing unified construction sites, in applying up-to-date construction technology at large projects and complexes, and in the use of advanced methods of organizing production and work.

It is indispensable to enhance the responsibility of all participants in the investment process for fulfillment of planning targets for activation of projects. In 1980 there were cases when planning targets were not fulfilled. For instance, a number of interkolkhoz construction organizations--Kaumas, Prenay, Shal'chininkskiy and Ignalina--fulfilled annual targets at a level of less than 85 percent. Such cases indicate not only shortcomings in the operation of construction organizations, but also oversights in planning and the need to improve the soundness and guarantee the realizability of planning targets.

Given the present scale of construction and the high technical and technological complexity of projects being built, requiring that a large amount of project planning work be done and that a multitude of resources of various types be delivered, there is also a need for organizational relations in which all the elements of the investment process would be aimed at achievement of the ultimate goal. To that end it is necessary to eliminate gaps between the stages of the investment process and to ensure their concurrence more frequently.

The experience of a number of construction projects in our country and abroad--in the GDR and other countries where the individual stages in creation of production capacities are synchronized--can serve as an example. This organization makes it possible to reduce the overall construction time. For example, attainment of rated capacity, including the training of personnel and the makeup of gear should in part be done during the period assigned to construction. There is a need to reduce the time for the drafting and approval of project documentation. Construction time can be substantially reduced by making performance of these and other parts of the process concurrent, in accordance with research done in the Central Scientific Research Institute for the Organization, Mechanization and Technical Assistance of Construction of USSR Gosstroy.

Guaranteeing mutual consistency of 5-year and annual plans of construction work is an important aspect of increasing the effectiveness of capital construction. Unfortunately, cases when annual plans do not correspond to 5-year plans are encountered very frequently in practice. According to the data of surveys done in the Vilnius Construction Engineering Institute, during the last 5-year period the annual programs of organizations of the republic's construction ministries differed considerably from the corresponding 5-year plans. For example, of 100 projects chosen at random, whose construction was scheduled in accordance with the 5-year plan of the trust Vil'nyusstroy in 1979, only 28 projects were included in the annual plan for that year, 33 projects

were altogether eliminated from the plan, and 39 new projects were included. Planning assignments for 1979 as given in the 5-year plan as a whole were approximately 35 percent greater than those given in the annual plan (A. Yakutis and V. Urbonas, "Five-Year Assignments and Annual Plans," STATIBA IR ARKHITEKTURA, No 4, Vilnius, 1981, p 7). Examples of the low quality of planning may also be given concerning a number of other construction organizations, which indicates the need for a better state of affairs in planning work.

In recent years steps have been taken to improve the system of functions of the various participants in capital construction and to distinguish them more strictly from each other. As is well known, under the present conditions the situation of both the client and also the contractor in capital construction is a very complex one. The former is forced to perform functions which are by no means related to his basic activity and to create specialized subdivisions for that purpose, while often the latter becomes dependent upon the effectiveness of operation of numerous and not sufficiently competent staff services which are organizationally detached from the principal organizations discharging the obligations under the contract.

It seems to us that the practice of making clients responsible for making up the equipment and specialized materials for construction projects is outdated. At a time when there are large construction organizations in operation, providing all resources to construction projects should be turned over entirely to contractors. The customer's functions should include approval of the blueprints, monitoring the quality of equipment to be installed, materials to be used and jobs to be performed, supervision over delivery of work items of subcontractors, and also monitoring deadlines for completion of work items and stages of construction, acceptance of projects after a comprehensive check of the terms and conditions of the contract, detection of construction defects in the period when the project is being brought up to rated capacity, and their notification to the contractor for correction.

The data of economic experiments conducted in our country and in this republic in particular, as well as foreign experience indicate that turning over to the contractor a portion of the functions of the customer (especially providing equipment and specialized materials for construction projects) yields constructive results. Both construction organizations and also machinebuilding enterprises and project planning organizations may act as general contractor in this system. The construction organization may act as general contractor in cases when the volume of construction and installation work considerably predominates over the cost of equipment or if that work is extremely complex. Should the cost of manufacturing equipment predominate in the breakdown of capital investments, and also when there is a large amount of installation of multistage manufacturing lines, the machinebuilding enterprise may become the general contractor. If there are many technically new solutions in the construction of the project, the functions of the general contractor should be performed by the project planning organization.

Various forms of the contract should be used as a function of the real conditions and possibilities for the activity of participants in the investment

process, but the main principle in selecting them should be the orientation toward the general contractor's delivery to the customer of a "turnkey" project that is functioning normally.

The need has arisen in the republic to solve the problems of setting up staff services of a unified customer in capital construction. This would essentially alter relations between customers and general contractors. Lack of coordination among customers causes funds to be scattered and detracts from the effectiveness of capital investments. For example, when rural projects are built on a contract basis there are more than 450 customers involved at the present time. It obviously would be advisable to turn the funds of kolkhozes and sovkhazes (with their consent, of course) over to regional agricultural administrations, which would have to set up the staff services of the customer. This would considerably simplify mutual relations and business relations between customers and general contractors. It seems to us best to bring customers together according to the functional characteristic of the intersector construction complex, as a function of the orientation of construction: agricultural, housing, industrial, and so on.

Solving a number of problems of a legal nature is an important aspect of increasing the efficiency of construction.

At the present time legal regulation of the activity and mutual economic relations of participants in construction are mainly based on administrative norms. The enactments now in effect regulating relations and duties do not cover all participants in the investment process, which makes it possible at times for some of them to evade fulfillment of obligations. Losses, which often arise through the fault of other participants in construction, are borne as a rule by those organizations figuring as the general contractors. That is why in these cases it is advisable for the relevant loss to be "distributed" among all the participants in the investment process according to the share of the blame borne by each of them. At the present time, as we know, construction organizations in Lithuanian SSR figuring as general contractors annually exact 0.8-1.0 million rubles from individual participants in construction for failure to fulfill their obligations, but, as shown by preliminary calculations, they might exact approximately tenfold more. In organizations to which the claims are addressed a situation is often created of tolerance and mutual forgiveness with respect to participants that do not fulfill planning targets with respect to activation of projects.

It seems to us that it is now manifestly inadequate for contractors to bear responsibility in the final stage of the investment process--in the attainment of rated capacity. The attainment of rated capacity would seem to be separate from the process of creating the product of construction. The costs of the period of attainment of rated capacity are not included in the estimated construction cost, which, to be specific, is one of the reasons for the difficulties in determining full costs per unit of the capacity attained at a project put into operation. Standard allowances for attainment of rated capacities are not oriented toward the speediest completion of the investment process.

Improved use of labor resources is an important aspect of increasing the effectiveness of capital construction. In this connection we should point out the need to hold onto workers, to reduce their turnover, especially in rural construction. Unfortunately, in many construction organizations of the republic personnel turnover was very substantial in 1980. For instance, in certain interkolkhoz construction organizations--Vilkavishkis, Kaunas, Skuodas, Prenay, Masheykyay and others--personnel turnover was more than 30 percent. Between 1979 and 1980 output per worker dropped in certain cases in construction and installation work and in subsidiary production operations.

Increasing the effectiveness of the intersector construction complex necessitates the drafting and performance of measures that would specifically include detailed definition of coordination of activity of the various participants in capital construction, improvement of the norms and standards used in planning capital construction, and improving the effectiveness of the system of cost-accounting (khozraschet) relations. This is the orientation of the decisions of the 26th CPSU Congress and of the 18th Congress of the Communist Party of Lithuania.

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## CONSTRUCTION

### CONSTRUCTION ECONOMICS

#### Larger Construction Contractor Profit

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pp 37-39

[Article by L. I. Kopnina, senior staff scientist of the laboratory of USSR Stroybank, candidate of economic sciences: "Increasing the Profitability of Construction Work"]

[Text] The 26th CPSU Congress listed among the most important tasks of capital construction raising the effectiveness of capital investments by making use of the advances of scientific-technical progress and advanced know-how and by economizing on materials and labor. Emphasis has been put on the need to enhance the responsibility of ministries, departments, associations, organizations and enterprises for strict enforcement of state price and estimate discipline and for fulfillment of the plan for production and construction. In this connection the economic mechanism is being improved to create additional incentives for reduction of the cost of construction work and for strengthening the motivation of contractors, project planners and construction clients to reduce construction costs and to increase profit.

Many authors have recently been skeptical in the economics literature concerning the profit indicator. They say that it cannot correctly characterize production efficiency, since the principal goal of socialist production is to satisfy people's needs, not to extract profit. It is also noted in this connection that many outlays made to improve working conditions do not increase profit, while there are elements in the pricing system that make it possible to hike up the price artificially, and so on.

That this indicator has certain weak points does not contradict the principle that the effort to fulfill the profit plan and to realize profit over and above the plan by reducing costs is the most important way of raising production efficiency. Statistical data indicate that every quarter a number of organizations are not fulfilling the plan for accumulation. Financial authorities and banks are discovering many cases of incomplete use of potential for increasing profit and reducing production cost.

Under the new conditions, in which the mechanism for the conduct of economic activity is being improved, this indicator is taking on still greater importance, especially in construction. Now a profit target is being assigned not only in annual plans, but even in the 5-year plan. This will indisputably strengthen the aspiration of workers of construction organizations to utilize speedily the potential for reducing construction costs and for adopting a true economy regime.

Let us examine the profit and profitability indicators in construction in a comparison with the other sectors of the economy.

Table 1

Sectors	Millions of Rubles						Percentage		
	1940	1965	1970	1975	1979	1980	1980 1965	1980 1970	1980 1975
Construction	-16.0	1,605	4,736	8,566	7,766	7,299	454.8	154.1	85.2
Industry	16.9	25,548	55,956	65,941	70,346	73,295	286.9	131.0	111.2
Transport and communications	674.0	6,830	11,523	15,557	16,129	16,943	247.1	146.7	104.9

These figures indicate that the growth rates of profit of construction organizations dropped in the 10th Five-Year Plan. Nevertheless, the relationship between the total profit of industry and construction did change to the latter's advantage. For instance, in 1965 profit was 1.6 billion rubles in construction and 25.5 billion rubles in industry (the ratio was 1:16; in 1970 it was already 1:12; in 1975--1:7.7; and in 1979--1:9.1). Over the last 14 years it has increased 4.8-fold in construction, 2.8-fold in industry and 2.4-fold in transportation.

Between 1970 and 1979 profit rose 1.6-fold in construction, 1.3-fold in industry and 1.4-fold in transportation and communications. This positive difference is a direct consequence of rapid industrialization of the construction process and of a sizable increase in the scale of operations, together with higher efficiency in the sector's entire performance.

An analysis of the profitability of various sectors of the economy is of great interest:

Table 2

	In percentage				
	1965	1970	1975	1979	1980
Construction contractors*	6.1	11.3	15.9	12.5	11.4
Industry	13.0	21.3	15.8	12.6	12.2
Communications	11.3	13.8	11.8	13.3	14.5

\* Ratio of profit from work delivered to production cost.

It is evident from the table that in the 1965-1979 period the profitability of construction contractors more than doubled. In other sectors it remained stable or even dropped over that same period. In addition, in 1975 its level reached the level of profitability in industry, which indicates a steady rise in the efficiency of capital construction.

When we examine the profit indicator in construction in recent years we can draw the conclusion that the use of profit has held to a stable pattern: more than 70 percent was turned over to the budget, 14-17 percent was transferred to economic incentive funds, and 13-14 percent went for capital investments, to cover losses of housing and municipal services and for other purposes.

When we analyze the mechanism for the use of profit in construction as compared to that of industry, we can spot certain distinguishing peculiarities:

- i. construction contractors pay a larger share of profit into the budget (70 or 72 percent, while industrial enterprises pay in 59 or 61 percent);
- ii. construction organizations pay more than half of the profit going to the budget in the form of the unassigned remainder, while for industrial enterprises this is 31 and 33 percent;
- iii. a larger share of profit is left at the disposition of enterprises and organizations in the industrial sector than that which is left to construction contractors for their own needs (39-41 percent and 28-30 percent, respectively).

A comparison shows that the most important principle of cost accounting, which consists of the motivation of the enterprise to realize the amount of profit at its disposition necessary to expand production, to furnish financial incentives and to augment working capital is observed to a lesser degree in the case of construction contractors. It seems necessary, then, to increase that portion of profit left to construction organizations for their own needs.

The normative method of profit distribution will be introduced gradually as the economic mechanism is improved. This proposal should be taken into account when the standard rate which is to go for the needs of construction organizations is set. In any case the scheme for the use of profit in construction must not differ greatly from that which has taken shape in industry.

In order to increase the importance of profit in the cost-accounting activity of construction organizations one can recommend increasing the rate of the charge on capital for those organizations in which there are large remainders of profit, establishing the proper relationship to the benefit obtained from the introduction of new technology, and linking more closely the level of the charge on capital to the deduction from profit for economic incentive funds. There is also a need to alter the procedure for reflecting unrealized profit in the balance sheets of organizations. The urgency of this issue has been proven in the literature, but it has not been resolved in practice. It is advisable, then, to reexamine the proposals for amending the procedure for reflecting and recording profit of construction contractors.

The importance of the charge on capital in the cost-accounting system also needs to be strengthened. It ought to be extended to the sum total of working capital. It would be wise to reduce benefits, to raise the charge on capital in the necessary cases, and to link it more closely to the rate of interest on credit. One can concur in the proposal for introducing deductions from profit that depend upon the size of the wage fund. Adoption of this kind of payment would promote mechanization and automation of production, reduction of manual labor, and reduction of the size of the work force by virtue of higher productivity.

The profitability level indicated above for the ministry as a whole reflects, of course, its average level. A survey of profit and profitability of primary construction contractors revealed a substantial unevenness in its level (Table 3).

Table 3

<u>Profitability Level</u>	In percentage of total		
	<u>1977</u>	<u>1978</u>	<u>1979</u>
Operating at a loss	5.0	6.8	8.4
0- 5	11.6	18.6	16.7
5-10	23.3	25.6	18.3
10-15	21.7	18.6	30.0
15-20	21.7	15.2	13.3
20-30	16.7	15.2	13.3
Above 30	--	--	--
Total	100.0	100.0	100.0

This table, in which the organizations surveyed were grouped according to the level of profitability against current costs, shows that the number of organizations operating at a loss increased over the last 3 years.

Their relative share increased from 5 to 8.3 percent. The number of organizations with a profitability under 5 percent in 1979 was 16.7 percent of the total number of organizations surveyed. Almost half of them had a profitability against current costs of 10-15 percent, 16 organizations, or 26.6 percent, had a profitability between 15 and 30 percent. The figures also indicate a relatively stable dynamic behavior characterizing a majority of construction organizations as moderately profitable. Profitability was between 10 and 30 percent for 34 organizations (56.6 percent).

But since 1975 the level of profitability of construction work as a whole has been dropping every year. It is evident from the table given previously that it dropped from 15.9 to 11.4 percent in the years of the 10th Five-Year Plan. This dynamic behavior is a consequence of the objective character of financial and economic activity of many construction organizations and of shortcomings in that activity. The objective causes include above all the rise of wholesale prices of building materials, changes in transportation arrangements and

conditions for the shipment of materials, and a number of others. For such reasons the actual production cost of construction and installation work for the LiSSR Ministry of Construction, for example, exceeded the planned level by 3.4 percent.

Only 6 of that ministry's 22 contract organizations fulfilled the plan for reduction of production cost. The principal causes of the higher production cost were these: substitution of materials, fabrications and components envisaged by project plans by more expensive ones (increasing the cost 480,000 rubles); higher prices of materials and components than the cost-estimate prices (2.2 million rubles); shipment of materials and fabrications over distances exceeding the average distances assumed in the cost estimates (1 million rubles); correction of defects in fabrications and components at construction sites (609,000 rubles); expenses of worker transportation and payment of traveling expenses (more than 1 million rubles). We should also note such a factor in the higher cost as the rise of depreciation deductions resulting not so much from enlargement of the stock of machines as from their increased value.

In discussing the factors that brought about higher production cost that depend upon the performance of construction trusts, we should single out under-fulfillment of the target for the volume of the marketed construction product, failure to adhere to an economy regime in use of physical, energy and labor resources, payment of penalties, fines and forfeits, as well as payment of higher than the planned rates of interest on bank credit in the context of the Belorussian experiment. The effort to increase profit and to raise profitability should be aimed above all at guaranteeing that conduct of economic activity in which various losses, price increases and expenditures would be minimized.

Correction of serious shortcomings in the performance of many construction contractors constitutes a most important potential for increasing profit and raising profitability. Unfortunately, in many ministries there are still a number of organizations operating at a loss and also those which are not performing planning targets for the most important indicators of financial and economic activity. In 1979 there were 37 enterprises operating at a loss in the BSSR Ministry of Industrial Construction with total losses of 9,778,000 rubles, and in 1980 it had 39 organizations with a total loss of 9,859,000 rubles. In 1978 the BSSR Ministry of Industrial Construction fulfilled the profit plan at a level of 72.3 percent, in 1979--82.3 percent and in 1980--81.7 percent.

It has been noted in an analysis of the causes tending to reduce the amount of profit and level of profitability of construction organizations that whereas previously expenditures related to factors tending to increase the cost were reimbursed to the organizations from outside, i.e., by the ministry or department, or from the budget, now this compensation is made as a rule from the construction contractor's own profit. This, of course, reduces balance-sheet profit and the profitability indicator.

An examination of the profitability of construction contractors throughout the country and also individual organizations revealed that on the average its level did not exceed the profitability of industry, transportation and other sectors. But certain economists feel that the profitability of construction organizations is too high and that it is supposedly making new capital investments more expensive. For example, A. A. Malygin\* tries to show that the growth of profit in construction organizations needs to be restricted and "reduced to at least the level achieved by the construction work incentive fund." He supports this argument with data from the reference book "Narodnoye khozyaystvo SSSR v 1975 g." [USSR National Economy in 1975].

The conception he sets forth vividly manifests an unequal approach to assessing the economic performance of construction organizations as compared to other sectors. The fact that the product of these organizations is fixed capital by no means clarifies why the profitability of construction work needs to be sharply reduced. Machinebuilding plants supplying machines for capital construction and also metallurgical plants supplying metal to construction projects are also participants in the investment process. But the question of reducing profitability of these enterprises is not brought up.

The customary profitability of under 15 percent reflects that level of net income which is created on the average by a worker in any branch of material production. To artificially split off capital construction and to cut the profitability of construction contractors in half, as certain authors propose, makes no sense. Every construction contractor should be assured a normal level of profitability sufficient to take advantage of the normative method of profit distribution, envisaged by the decree of the party and government dated 12 July 1979. This task is a very urgent one for consistent achievement of cost accounting in construction.

\* Malygin, A. A., "Vosproizvodstvo i ispol'zovaniye osnovnykh proizvodstvennykh fondov--vedushcheye zveno v povyshenii effektivnosti zatrat proizvodstvennykh resursov" [Reproduction and Use of Fixed Productive Capital--The Leading Link in Raising the Efficiency of Inputs of Production Resources], Nauchn. tr. NIEI pri Gosplane SSSR, Moscow, 1978.

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#### Capital Investment in Tashkent Region

Moscow FINANSY SSSR in Russian No 3, Mar 82 (signed to press 12 Feb 82)  
pp 43-45

[Article by Ye. M. Rodygin, chief of the economic planning division of the Tashkentskaya Oblast Office of USSR Stroybank: "Aspects of the Effectiveness of Capital Investments"]

[Text] In 1980 the total volume of capital investments in Tashkentskaya Oblast rose 65 percent over 1975. Their reproductive pattern and technological pattern improved. Whereas in 1975 61.6 percent of appropriations for construction of production facilities went for reconstruction, expansion and

retooling, in 1980 the figure was 80.8 percent. Outlays for new construction dropped from 35.1 to 19.2 percent. In 1976 expenditures for equipment represented 39.7 percent of total capital investments assigned to construction, while 52.1 percent went for construction and installation work. In 1980 these figures were 46.3 and 42.8 percent, respectively. The improvement of the pattern of reproduction and technological pattern of capital investments indicates a reduction of expenditures of live labor and a further industrialization of construction, which is speeding up the pace of construction, reducing production cost and improving quality.

The planning of the volume of construction of production facilities and of the makeup of work items has improved somewhat. For example, the 1980 plan included 13 fewer new construction starts and reconstruction projects on existing enterprises than in 1979.

At the same time, as the volume of capital investments has grown and their planning has improved, the construction industry has expanded and become stronger. Capacities of the industrial enterprises of the construction industry have been built and put into service or updated, the production capability of construction and installation subdivisions operating as contractors has developed, and the organization of construction work has improved. All of this made it possible during the 10th Five-Year Plan to put more than 5 million rubles of fixed productive and nonproductive capital into service; its average annual growth rate was 23 percent.

The growth of unfinished construction was halted in 1980, for the first time in the years of the 9th and 10th Five-Year Plans; as of 1 January 1981 its overall level was 16.2 percent lower than at the outset of 1980

We should note at the same time that there are substantial shortcomings in capital construction, among which the main ones are low-quality and tardy project planning, incorrect planning of capital investments, the chronic non-fulfillment of assignments for activation of capacities and projects, and the low quality of construction. The capital investment plan for the years of the 10th Five-Year Plan was fulfilled at a level of 95.3 percent, and the target for activation of fixed productive and nonproductive capital at a level of 88 percent. Production facilities were not put into service at a number of major industrial enterprises under construction, and the shortfall for housing construction was 108,600 square meters.

This situation had the result that in spite of the reduced volume of unfinished construction achieved thanks to improvement of the planning and assimilation of capital investments, as of 1 January 1981 its total volume was 80 percent of the 1980 volume of capital investments, whereas the standard allowance is 65 percent. The actual volume of unfinished construction exceeds the standard level by 73.4 million rubles.

The average annual growth rate of the volume of unfinished construction was 25.3 percent, exceeding the growth of the volume of capital investments by 2.9 percentage points--by 7.5 points for construction of production facilities alone.

The failure to meet targets for activation of capacities and projects under construction had the result that the actual average construction time in the oblast for construction of new production facilities exceeded the standard allowance by 2.2-fold, and it exceeded it by 2.1-fold for reconstruction and expansion of existing enterprises.

At the outset of 1980 there were 103 construction projects in Tashkent and the oblast whose planned and allowed construction dates had passed long since. Their total estimated cost was 422.5 million rubles, and the amount of capital tied up in unfinished construction was 336 million rubles. A majority of these construction projects remained unfinished in 1980. Projects under construction for about 10 years or more included the No 2 Housing Construction Combine and the Southwest Industrial Park of Glavtashkentstroy, the steel enamelware shop at the Uzbek Metallurgical Plant imeni V. I. Lenin, a chemical reagent production facility, the Pioneers Center in Tashkent, the administration facility of "Spetsmontazh" of the UzSSR Ministry of Municipal Services, the consolidated DOSAAF technical school, the building of the republic office of Gosbank, the weak nitric acid installation and the GIAP-3 catalytic reactor of the production association Elektrokhimprom, and other projects. This situation is mainly explained by poor organization of construction work. Construction and installation subdivisions are experiencing a shortage of manpower and interruptions in the supply of materials, fabrications and components. These resources are spread thin. Labor productivity of workers is also low because of slow introduction of progressive new forms of organization of work and remuneration.

Construction sites were not prepared before construction began at the administration facility of "Spetsmontazh" of the UzSSR Ministry of Municipal Services in Tashkent, or the regional communications junction of the UzSSR Ministry of Communications in Chinaz; defective equipment was delivered for production of weak nitric acid; a portion of the equipment was missing for the GIAP-3 catalytic reactor and the Caprolactam production facility of the production association Elektrokhimprom in Chirchik; and the set of equipment for the Kuchluk petroleum facility arrived incomplete.

Construction is also drawn out because the drafting and delivery of project plans and estimates is late and of poor quality. Technical documentation for construction of the Tashkent Tractor Plant was approved after a delay of 4 months, for the plant Uzbeksel'mash after a delay of 9 months, for the Almalyk Chemical Plant after a delay of 3 months, for projects of the production association Elektrokhimprom after a delay of 5 months, for the Angren Building Materials Combine after a delay of 1 year. Documentation was delivered quite late for construction of the plant for manufacturing kitchen and other furniture. In 1979 530 complaints covering total oversights of 3.3 million rubles in the estimates were addressed to the Moscow head institute of GIAP [State Scientific Research and Planning Institute of the Nitrogen Industry and Products of Organic Synthesis] concerning technical documentation for construction of the Caprolactam facility of the association Elektrokhimprom, and in the first quarter of 1980 there were 34 complaints totaling 200,000 rubles, and the bank's check into the quality of this documentation established that the estimated cost of construction had been hiked up 1.7 million rubles. Complaints concerning low quality were addressed to the state project planning

institute Giprovtdor for the documentation it drafted for construction of the No 1 truck terminal of the UzSSR Ministry of Construction Materials Industry in Tashkent, to the institute UzNIIP-gradostroitel'stva, which drafted the documentation for the DOSAAF consolidated technical school, and to the institute Tashgiprotorg, which drafted the documentation for the combine Uztorg-reklama, etc.

The review of project documentation because of its low quality and also the dragging out of construction of facilities and projects, causing an increase in the estimated cost, makes it necessary to seek out additional labor, physical and financial resources, which in turn tends to lengthen the construction time of projects and to increase unfinished construction.

Construction time is considerably influenced by shortcomings in the planning of capital investments and of the volume and makeup of work items, when numerous projects and facilities are planned for construction at the same time and the financing is not fully furnished. This compels construction contractors to spread out their labor and physical resources. In the construction trusts Uzbekmetallurgstroy, Uzbekshakhtostroy and Tashmetrostroy of UzSSR Ministry of Construction and at many trusts of Glavtashkentstroy, though resources were insufficient for projects to be completed within the year and projects to be carried over, the 1980 plan included more than 100 new starts of nonproduction facilities. The Almalyk Chemical Plant, the Administration of the Central Asian Railway, the USSR Ministry of Tractor and Agricultural Machinebuilding, Ministry of Transport Construction and Ministry of Chemical and Petroleum Machinebuilding, the UzSSR Ministry of Construction Materials Industry, Ministry of Municipal Services, Ministry of Procurements and Ministry of Motor Transport, the association Uzplodoovoshchvinprom and others included in intraproject titles lists for 1980, and contractors agreed to build 74 new construction starts of projects with a total estimated cost of 56.6 million rubles, for whose construction 9.1 million rubles had been allocated. At the same time financing was short 4.2 million rubles to complete 18 projects being carried over. We should note that construction of new projects is not in most cases dictated by priority need. Included in the 1980 construction plan were 112 projects (including more than 20 construction starts) for administrative, public, athletic, auditorium and other buildings and installations with an annual volume of capital investments of 62 million rubles and 47.5 million rubles of construction and installation work. A good half of the construction projects enumerated that had already been begun could have been put in mothballs because of the low technical readiness, and the new construction sites not built at all, and the resources made available could have been transferred to projects and facilities for completion within the year, and their completion on schedule would have made it possible to increase the effectiveness of capital investments.

Errors in planning are especially notable against the background of the shortage of production capacities and the poor organization of production work in the construction trusts No 6 and No 160 of Uzbekmetallurgstroy, of Tashpromstroy of UzSSR Ministry of Construction, and of Glavtashkentstroy.

Failure to meet deadlines for activation of production capacities at just 39 enterprises included in records in 1980 meant that industrial output worth 2.6 billion rubles was not produced, and another 1.2 billion rubles were wasted because deadlines were extended to 1981 and subsequent years, which detracts substantially from the effectiveness of capital investments.

Shortcomings in project planning and in the planning and organization of production have an adverse effect on attainment of rated capacity at production facilities. This process is not satisfactory. The shortfall of industrial output for this reason at just the 11 enterprises included in records was 122.6 million rubles, which is almost equal to their output in 1.5 years at full rated capacity. The shortfall of output was 16.7 million rubles at the Angren Building Materials Combine, 11 million rubles at the Bekabad Cement Combine, 28.1 million rubles at the Kibray Beer and Nonalcoholic Beverages Plant, 14.8 million rubles at the plant for kitchen and other furniture, and 37.4 million rubles at the Almalyk Pile (tufting) Carpet Factory. In physical terms these losses represented 1,575,000 tons of ammonium nitrate, 80,000 tons of caprolactam and 336,000 tons of ammonium sulfate, 13,850 decaliters of beer and 9,031 decaliters of nonalcoholic beverages, 100,000 tons of cement and 21,000 sheets of roofing, 80,000 tons of ordinary cement and 29,000 tons of decorative cement, 8 million standard cans of tomato paste, 45 million standard cans of canned fruit and vegetables, and 4,000 tons of takhinnaya halvah. There was also a shortfall of many other products, and a number of planned services were not rendered to the public.

Unsatisfactory attainment of rated capacity was a consequence of construction defects, oversights in project planning in which outdated equipment was used, industrial capacities were not correlated, or the raw materials base and social and demographic factors were not taken into account. Among the other adverse factors are shortcomings in planning volumes of output, the supply of raw materials, spare parts and supplies, low labor productivity, incomplete use of equipment, high personnel turnover and low occupational training of workers. All of this also detracts from the effectiveness of capital investments. At the leather accessories combine, delivered by construction administration 33 of Trust No 6 of Glavtashkentstroy, when the main facilities were put into operation, the group of auxiliary shops for preparing the components of the principal production operation were not suitable for operation, nor was the pumping station or the fuel and lubricant warehouse; the freight elevators had not gone into operation in the main building. At the Novyy Tashkent Canning Plant PMK [Mobile Construction Machine Convoy] No 109 of Trust No 6 of UzSSR Ministry of Construction did not complete installation of the three-flight conveyor for feeding glass containers, and this operation was done by hand, two freight elevators and a gantry crane were not installed in the main production shops, connection of vessels for aseptic storage of fruit juices was not completed, and the sterilizer and other facilities were not ready for operation. In the production association Elektrokhimprom a weak nitric acid installation was installed with low capacity that did not meet the capacity called for in the design and it has often broken down. At the Kibray Beer and Nonalcoholic Beverages Combine the design did not call for installing a grading machine for barley, which has lowered production of beer and detracted from its quality. Nor did the plans call for construction of housing or

facilities for cultural and consumer services, and this has resulted in high personnel turnover. At the Yangiyul' Canning Plant the design did not adjust the capacities being added to the water supply system, and at the Novyy Tashkent Canning Plant the plans called for using outdated equipment, in particular driers which industry is not manufacturing.

Solving the problem of a further rise in the economic effectiveness of capital investments in the light of the decisions of the 26th CPSU Congress necessitates a radical improvement of performance on the part of all sections of the construction complex, including project planning institutes, planning agencies, suppliers of materials and equipment and construction organizations. Only if that condition is met can the motto be realized: "We will build ahead of schedule and we will reach rated capacity ahead of schedule."

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## METALWORKING EQUIPMENT

### ECONOMICS OF ROBOTIZED PRODUCTION DISCUSSED

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[Text] Industrial robots are a qualitatively new means for automating modern production which change essentially its functioning principles. The use of robots makes it possible to eliminate physically difficult and monotonous operations and to transform human activity in a fundamental way, leaving only monitoring and observation functions.

In contrast with ordinary automation facilities, industrial robots, which execute numerous production functions, can be used extensively in all types of production. These robots are controlled with the help of special programs.

Experience has shown that the introduction of industrial robots requires re-examination of production processes and the use of new technology elements or shortening of the technological cycle. It also becomes necessary to provide auxiliary equipment and to simplify the construction of, and standardized parts for, various types of articles with respect to the types of industrial robots which will be used in the production in question to execute operations or operate various tools, automatic lines, etc.

The introduction of industrial robots has a significant influence on the production process, and consequently on changing the forms in which it is organized. Robot technological complexes have been created which represent a qualitatively new basic organizational form for robotized production. The role of industrial robots in the formation of these complexes is determined by the fact that they unite existing production machines and mechanisms into a continuously functioning system. The formation of robot technological complexes makes it possible to realize the principle of continuous production, which becomes one of the primary factors in improving production efficiency. In his investigation of large-scale machine production, K. Marx devoted a great deal of attention to the fact that a system of machines is "...the more sophisticated, the more continuous is the

process it carries out, i.e., the fewer interruptions there are in the flow of raw material from the first to the last phase of the process, and consequently the greater the degree to which it is moved from one phase of production to the next by the mechanism itself, rather than by human hands."<sup>1</sup>

Improving reliability and service life of equipment in robotized production involves maximum loading of the industrial robots. These devices work almost without interruption, i.e., for two or three shifts daily. In addition, they may operate at significantly higher rates than would be the case if production workers were carrying out the same operations. For example, the findings from research carried out at one of the machine-building associations in Leningrad indicated that the equipment work cycle was reduced by a factor of 2.3 in medium-scale press forging when a robot technological complex based on an industrial robot press was built. At the same time, the breakdown rate of dyes and other parts of related equipment increased. This points out the necessity of a timely solution to the problem of improving the reliability and service life of the equipment operated by industrial robots.

As research indicates, the robotization of industrial production will develop along the lines of enlarging robot technological complexes on the basis of moving from a technological to an objective specialization of robotized production. For example, the Petrodvorets Watch Plant Association has switched over from individual robotized operations to assembly of clocks under the complete control of an industrial robot system.

The introduction of industrial robots requires a qualitatively new approach to operational planning and organization, since as the size of robot technological complexes increases it becomes difficult to determine the volume of production both qualitatively and quantitatively. The first such difficulty involves a thorough study of each article in order to find which are the most labor-consuming and which could benefit most from robotized production; the second difficulty involves the need to tie the planned amount of articles produced by the robot technological complex to the requirement for these articles in other subdivisions. Robotized production manufactures products in a pre-programmed rhythm, which is one of the basic factors of its efficiency under the conditions in question. The efficiency of robotized production is a sufficiently complicated economic category. The basic terms in the effect to be achieved from introducing industrial robots include the total savings through reducing human labor which can be achieved by replacing workers directly with robots, and savings in reified labor resulting from the increased output of robots over that of workers, as well as the social effect. The thoroughness with which the latter is reflected depends to a significant degree upon whether the cost terms and results are accounted for correctly in creating and applying robotized systems. For example, specific tasks are now appearing in terms of organizing the accounting and development of methods for determining expenses and for calculating the prime cost of robotized production.

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<sup>1</sup>K. Marx and F. Engels. Collected Works, Vol. 23, p. 392

When robots are used, operational accounting becomes simpler and the economic source data is condensed, making it easier to solve these problems. For example, accounting for the movement of various types of semi-finished blanks and parts is done as follows. The robot technological complex operator receives a limit card for each working day which indicates the required normal amount of blanks and parts, which is calculated on the basis of the output of the complex and its production program. As the articles are fabricated, the operator sends groups of a particular type of product to the next complexes or to storage. Internal movement of blanks within the robot technological complex makes it unnecessary to account for article movement, since the industrial robots in the complex follow defined pre-assigned programs, and principles of continuous synchronized operation are observed between the equipment and the industrial robot. The replacement of industrial workers in this case with industrial robots eliminates the need for laborious accounting for the individual output of each worker, for time off, making sick lists, for computing payroll, etc. In robot technological complexes, the labor required of operators and technicians who carry out service and monitoring functions takes on a conventional permanent nature, making it possible to account only for their working time.

The use of industrial robots makes it possible to develop scientifically founded standards for the consumption of raw and other materials, blanks, semi-finished articles, parts, etc., which helps to a significant extent in solving the problem of efficient utilization of all types of material resources and of creating and introducing techniques and technology which conserve resources.

One urgent problem which arises when production is robotized is the accounting for defects and finding ways to reduce defective products. This requires equipping the industrial robots with sensing devices which can identify defective articles. Investigations which we have conducted at a number of associations in Leningrad permit the conclusion that the lack of responsible accounting and control of blanks and parts between robot technological complexes and related production is the cause of defective production.

The problem of accounting for manual labor becomes more important when industrial robots are introduced. Associations and enterprises are not doing a good enough job of this, which makes it more difficult to introduce industrial robots into the production process.

The prime cost of robotized production plays an important role in defining the social and economic efficiency of industrial robots. This cost is comprised of all of the current costs needed to produce a particular type of product, and interacts with many of the indicators of robotized production. Prime cost is associated most closely with the labor productivity indicator, which determines variation in costs per unit of production.

When robot-technological complexes are organized using industrial robots it becomes necessary to account for the production costs and to calculate the prime cost of a unit of production for each complex. One of the basic tasks in this problem is to develop a classification of costs which could be used to draw up

a scientifically founded nomenclature of articles of prime cost for robotized production.

Analysis done at Leningrad enterprises and associations have made it possible to determine the typical prime cost structure of stamped production before and after the introduction of a robot technological complex (in percent) (cf. table 1).

In making the comparative analysis of the prime cost structure of robotized production, the equipment maintenance and operation costs involved prior to introduction of industrial robots are shown in this table expanded over the articles of expense. Prior to introduction of industrial robots, the main article in stamped production was the production workers' wages, which amounted to 69.13% of all of the production costs. The second most important expense article was amortization, which made up 12.60% of the prime cost of production.

Table 1

<u>Production Expenses</u>	<u>Prior to introduction of robot complex (1976)</u>	<u>After introduction</u>
Primary production workers' wages	69.13	-
Robot complex service personnel wages	-	12.91
Auxiliary materials*	2.17	4.51
Energy costs	2.60	4.51
Amortization	12.60	44.52
Current maintenance	2.60	12.25
Wear of low-cost, short-life articles Including:		
technical fittings costing less than 100 rubles with service life of less than one year	3.91	9.05
software development costs	-	5.80
General shop expenses	3.92	6.45
Losses to defects	3.04	-

\*The absence of a "raw and other materials" article in this structure results from the fact that this category remained unchanged for the same amount of production when robotization was introduced.

In connection with the elimination of production workers, the costs under the article of "production workers' wages" are omitted, and the article of "robot complex service personnel wages" is introduced. The costs under this article are

not directly related to the amount of product produced by the robot technological complex, but rather take on a conditional permanent nature. The article of "wear of low-cost objects with short-service life" includes costs for robot software development and debugging, as well as software for controlling the robot technological complex as a whole. As these data indicate, costs which previously made up an insignificant part of the prime cost structure increased after the introduction of industrial robots. The largest share of the costs became those of amortization.

The new makeup of production prime cost requires resolution of the question of standardizing expense articles and of the order in which they are used in calculating the prime cost per unit of production. In our view, it is best to account for production costs by place of occurrence when a robot technological complex is put into operation.

The problem of distributing costs per part of operation arises in the process of forming the prime cost of robot technological complex production, which requires selecting a distribution basis. As we know, the article "basic production workers' wages", which was the basis for distribution of indirect costs prior to the introduction of industrial robots, is eliminated when robotized production is put into operation. In connection with the qualitative change in the structure of production prime cost in robotized production, it is amortization costs which come to play the leading role. Amortization represents the cost of previous labor, and is stable and amounts to a large share of the total. This is because the means of labor under these conditions have taken on a leading role in executing direct production functions in producing an article; human labor used in a particular production process carries the function of monitoring and operating the existing labor facilities. In addition, costs under the "amortization" article refer to prime cost according to established standards, so that the distribution base can neither be increased or decreased by comparison with wages, which has been influenced by inaccuracies in determining the amount of work done. Hence, the indirect costs per unit of production will be distributed on a firmer foundation.

The scientifically founded development of methods of compiling production costs thus creates conditions for more precise definition of the actual prime cost of robot technological complex production, which will make possible an objective characterization of the social and economic effectiveness of the use of robot technology.

As our research indicates, robotized production activity is evaluated in all analyzed production units using robot technological complexes with the help of a previously existing system of indicators which under the new production conditions is not able to reflect fully the production process. This complicates the use of robot technology in industrial production and distorts the actual economic effect achieved by using industrial robots. Traditional indicators and methods cannot be used to determine the total social and economic effect, and stand in the way of economic analysis. In our opinion, the construction of a scientifically founded system of indicators for the economic effectiveness of using robot technology in production requires that two groups of indicators be developed

first which reflect the use of manual labor and the efficiency of robotized production. This will create conditions for determining the optimal boundaries of efficient utilization of industrial robots in production. Assuming that manual labor is decreased and that the sphere of application of industrial robots is expanded, these indicators should reflect the changes which occur in sufficient detail.

The use of industrial robots in a particular labor intensive type of production, e.g., at a number of enterprises in Leningrad, makes it possible to reduce the amount of manual labor required. This trend is manifested to a significant degree in assembly production, where manual labor predominates. For example, the proportion of manual labor in 1975 at the Petrodvorets Clock Plant in Leningrad in 1975 was 90%, and dropped to 25% after the introduction and assimilation of assembly robots. During the introductory period, the use of the assembly robots was economically inefficient for two primary reasons: first of all, the output of the assembly robots did not reach the design level during the introduction period, and secondly, not enough robots were in place during that period. A total of 125 assembly robots were in use during the first year of introduction, and the level of robotization of assembly production was 52.5%. In 1977 there were 137 robots actually functioning, with a robotization level of 67.5%, and in 1978 these numbers were 150 and 75.4%, respectively. The level of robotization was calculated by the formula

$$L = \frac{N_r}{N_t} \cdot 100\%$$

where  $N_r$  is the number of operations carried out by assembly robots;  $N_t$  is the total number of operations.

When 150 assembly robots were on line, resulting in a robotization level exceeding 75% and an output of 80% of the design level, savings were achieved in 1979 amounting to 368,800 rubles, and the number of production workers was reduced by 194 over the preceding year. In connection with further improvement in robot output, the increase in savings in 1980 amounted to 300,200 rubles, or 72.3% of the increased profit of assembly production; an additional 149 workers were released.

Table 2

Dynamics of Basic Economic Indicators of Robotized Assembly Production at Petrodvorets Clock Plant Production Association, Leningrad, 1975-1980 (in %)

<u>Indicator</u>	<u>Years</u>					
	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>
Prime cost per unit of production	100.00	103.37	100.60	99.69	89.92	80.35
Basic production worker wage per unit of production	100.00	101.09	98.05	76.94	59.17	46.36
Industrial robot output	-	100.00	110.76	122.75	157.18	170.33

Production costs increased during the initial period of assimilation of new technology. For example, in 1976, the costs per unit of production at the Petrodvorets Clock Plant assembly production activity increased by 3.37% over 1975 (cf. table 2), and there is an overall trend of reduction of the actual prime cost of robotized production.

The main element in production prime cost prior to the introduction of assembly robots was production workers' wages. As the table indicates, the increase in the rate of reduction of direct labor costs determined an overall reduction in the prime cost of a unit of production.

A determining factor in increasing the social and economic effectiveness of industrial robots is their output. In the assembly production activity analyzed, the rate of growth of industrial robot output increases. For example, the increase in production in 1980 was 70.33% over 1976.

During the introductory period of the industrial robots, expenses for maintaining and operating industrial robots and equipment made up the greatest share of the prime cost of robotized production.

The efficiency of robotized assembly production will depend upon how rationally the labor facilities are utilized -- the industrial robots and equipment which it serves in the present case.

The economic effect calculated per unit of reduced costs, which include both current and one-time expenditures, can be characterized most completely. These costs, which are aimed at introducing, assimilating and operating industrial robots, are directly related to the economic effect to be gained from their use. For example, in the assembly production activity we analyzed, the economic effect per ruble of reduced expenditures in 1980 increased by more than a factor of two over 1979.

The savings for one robot line was 8,400 rubles in 1979, and 15,500 rubles in 1980; the savings for one assembly robot were 600 and 1,100 rubles, respectively.

One source of savings in robotized production can be direct savings in human labor costs achieved when production workers are replaced with robots and expressed in the form of wage savings. The savings resulting from reducing the cost of manual labor totaled 245,700 rubles in 1980.

Increased product output due to high robot productivity has a decisive influence on increasing savings (amounting to 424,300 rubles in 1980).

When assembly production was robotized, the capital consumption increased, causing an actual drop in economic savings of 27,900 rubles.

Having a direct influence on reducing manual labor, industrial robots also create conditions for increased savings through the action of social factors. The savings in assembly production, using industrial robots, due to social factors amounted

to 46,900 rubles.

Furthermore, robotization of production also resulted in a direct social effect from reduced expenses for hospital maintenance of patients and polyclinic treatment amounting to 21,100 rubles<sup>2</sup>, including 3,900 for reduced visits to polyclinics and 17,200 for reduced numbers of patients in hospitals.

The overall social-economic effect from using robots in assembly production at the Petrodvorets Clock Plant in 1980 amounted to 73,700 rubles, and the coefficient of social-economic efficiency of robotized production, calculated as the ratio of these savings to one-time expenses, was 0.274.

As a qualitatively new process which creates conditions for reducing manual labor, production robotization thus requires the determination of areas in which robots can be used more efficiently in various branches of industrial production. In our opinion, this requires the following: organization of on-line accounting for robotized production; development of accurate methods for determining the actual prime cost of robot technological complexes, as well as technical-economic and social indicators of robotized production; clarification of the methodology for calculating and composition of indicators of utilization of manual labor.

All of this will make it possible to define the boundaries for the assimilation of robot technology in branches of industry, which will make it possible to reduce manual labor significantly and increase the social-economic efficiency of production.

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<sup>2</sup>Calculated from actual hospital and polyclinic reports.