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USSR Report

ECONOMIC AFFAIRS

(FOUO 2/82)

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INVESTMENT, PRICES, BUDGET & FINANCE

WAYS TO INCREASE EFFICIENCY IN CAPITAL CONSTRUCTION REVIEWED

Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 10, Oct 81 pp 67-76

[Article by Academician T. S. Khachaturov and Doctor of Economic Sciences V. P. Krasovskiy: "Investment Potential and Its Use"]

[Text] The industrial construction complex, or the complex of capital-creating sectors, is a very dynamic element in the economy's first subdivision. In addition to the construction industry which carries out construction work and the installation of equipment, this complex also includes the production of machinery and equipment for new enterprises or those under expansion and reconstruction and the production of construction materials and machinery used in capital construction. "The basic task of capital construction is to increase the nation's production potential on a new technical basis and to build housing and projects for municipal-household and sociocultural purposes," state the "Basic Directions of USSR Economic and Social Development for 1981-1985 and for the Period Up to 1990." The questions of the economics and effectiveness of capital investments are at the center of attention of Soviet science, in particular for the Academy of Sciences. They are studied at the Economics Institute where there is a sector of capital investment effectiveness, as well as at the Central Mathematical Economics Institute, the Institute of the World Socialist System and the Institute for World Economics and International Relations. The Economics Institute studies the ways for increasing capital investment effectiveness, it elaborates the procedures for determining their effectiveness and solves a number of problems related to investments. Under the Economics Department of the USSR Academy of Sciences there is a Scientific Council on the effectiveness of fixed capital, capital investments and new technology. This coordinates research on these subjects being carried out in the Academy's as well as in the sectorial, design and other institutes. The scientists are endeavoring to make an appropriate contribution to solving the urgent capital construction questions and are making proposals to improve work in this area.

On Capital Investment Planning

Each year our nation uses around one-quarter of its national income for accumulation. In 1980 the volume of capital investments reached 133.5 billion rubles (including 91.5 billion rubles from national income and 42 billion rubles from the amortization fund). The share of all the capital-creating sectors in the nation is around 17 percent of the gross national product and 18 percent of national income as well as around 8 percent of the fixed productive capital, 7 percent of the capital investments and 18 percent of the total number of persons employed in the national economy.

But until recently the establishing of indicators for the industrial construction complex as a separate group of sectors providing for the expansion and replacement of fixed capital was not carried out in drawing up plans and report documents. This impeded the balancing of the plan for the means of labor as well as cooperation between capital construction and machine building. In working out the long-range plans in which the major social, economic and investment programs are established, consideration of the complex of capital-creating sectors is completely essential and at present new approaches have been discovered for planning this complex, for mobilizing its reserves and for intensifying its use. In drawing up the Comprehensive Program for Scientific and Technical Progress at the USSR Academy of Sciences and the USSR GKNT [State Committee for Science and Technology], provision was made to establish the investment complex as a separate section.

For increasing the efficiency of economic potential in the nation and in the complex of capital-creating sectors, of major significance are the Decree of the CPSU Central Committee "On Further Improving the Economic Mechanism and the Tasks of the Party and State Bodies" and the Decree of the CPSU Central Committee and USSR Council of Ministers "On Improving Planning and Strengthening the Effect of the Economic Mechanism on Increasing Production Efficiency and Work Quality." The actual implementation of the measures envisaged by these decrees will make it possible to raise the efficiency of production and capital construction and ensure the obtaining of more significant end national economic results.

The impact of the new economic mechanism should be manifested in all the basic areas where the complex of capital-creating sectors is active. It can be seen in improving capital investment planning, the organization and level of designing, materi[illegible]-technical supply, the dates and organization of capital construction, in increasing the investment role of machine building, in reducing the amount of incomplete construction and the time required to open up new capacity. The quality of the construction products should be increased and all the major aspects of the investment process improved. Under present-day conditions, particularly essential is the orienting of the participants in the complex of capital-creating sectors to turn out a complete construction product, that is, production capacity and projects that are ready to operate.

The new economic mechanism demands the abandoning of the separateness of participants in the investment process and the giving up of an orientation toward gross results in money at each stage of capital construction. It presupposes close cooperation between all the capital-creating sectors and the encouragement of them only for results achieved in putting the new capacity and projects into operation. The capital investments should be made for products to be obtained as a result of technical reequipping or reconstruction while funds for new construction should be allocated only under the condition that the required amounts of product cannot be produced at the existing enterprises even with their reconstruction or technical reequipping. All these measures are aimed at increasing capital investment effectiveness and mobilizing the great resources frozen in the incomplete projects. These measures should reduce the material intensiveness of construction products, sharply reduce the use of heavy, expensive reinforced concrete structures, more widely employ local and light building materials and eliminate unnecessary long-distance shipments of building materials.

The planning of current production and capital construction as a single whole presupposes that the ministries and departments are given plan quotas for increasing products in the required assortment. The ministries and departments themselves determine in what manner this increase can be obtained more rapidly and economically, that is, whether by reconstruction, technical reequipping of existing enterprises or by new construction. Thus, the plan is given not for construction projects but rather for products and services while the projects are built solely as a means for achieving the production plan.

Up to the present there has been great concern over the continuing scattering of capital investments. As a consequence of the excessive amount of "incomplete projects" assets have been immobilized amounting to the annual capital construction plan. The growth of incomplete construction, due to the measures adopted, halted in 1980, and by 1983, according to the materials of the 26th CPSU Congress, the task has been set of bringing its volume down to the normed level, but this task would be carried out only in the instance that state interests will be strictly followed in establishing the need for each new construction project.

In the aim of rectifying the existing situation, over the next 1 or 2 years it is essential to convert to the allocating of capital investments not only for the sites as a whole but also for the projects which ensure the output of products. At the same time a real concentration of investments will be achieved. In the USSR national economic development plans it is essential to establish the capital investments for the major specific economic programs in a separate line indicating the volume of investments and the completion date of the projects under each program. The technical and economic bases for the program must be established in special documents. These should contain information about the amount of planned work, a schedule for its step-by-step inplementation, intersectorial ties and deliveries and executors, calculations for the integral effect of the program as well as plans for the gradual return of funds as the individual units of the program are completed. Here it is essential to also work out coordinated title lists, in moving from the establishing of different title lists for the departments to the planning and approval of integrated lists with their economic and technological coordination.

It is also essential to provide for the setting of limit indicators for the full cost of new projects or limit norms for proportional capital investments which would ensure the set efficiency of newly built enterprises and employ such norms in the expert evaluation of the plans and estimates and in bank control over the effectiveness of the extended credit. For the purpose of sharply reducing the duration of the investment cycle as well as for preventing premature obsolescence of the enterprises the construction and completion of which have been drawn out, it is recommended that thorough consideration of the time factor in capital construction be organized. It is possible to combine individual capital construction stages in time, for example: research, designing, the construction period and starting up.

Obviously it is time to change the procedure for compiling the standards for the construction duration of projects. In this regard the question arises of gradually converting the construction workers to two shifts. But this should be done without increasing their total number.

Improving Designing

The amount of design and research work (and likewise the amount of money received by the design organizations) is continually rising in proportion to the increase in capital investments and the growth of the estimated cost of construction. This makes it possible for these organizations to freely dispose of the funds and to carry out plans for projects not included in the construction plan. As a result, incomplete designing is annually increasing. The number of elaborated designs exceeds by more than 4-fold the need for design specifications for commenced projects. At the same time year after year the national economy shows a lack of design specifications for the planned volume of capital investments while many of the leading construction projects receive their blueprints and estimates literally "right off the press." An enormous backlog of design and estimate specifications pile up on the balance sheet of the clients but in terms of their range these documents do not conform to the composition of plans essential for construction.

At present a number of specific measures have been outlined to systematize and improve designing and estimating. Their implementation, in our view, requires a broadening of the rights and duties of the design organizations and the incorporation of them as part of the largest production associations. In this instance the design organizations could perform many functions related to capital construction, including orders for equipment in accord with the designed specifications of the machines, devices, instruments and so forth, supervision over the course of construction and the reaching of designed capacity as well as observance of the compliance of construction costs and other technical and economic indicators.

Certain design organizations which work out the technical plans and working drawings for equipment even now in practical terms are part of the large associations. The construction design organizations can become a component part of the construction ministries or their associations. An association of construction design organizations, aside from other advantages, creates the conditions also to reduce the amount of design construction specifications.

Reserves for the Territorial Organization of Capital Construction

A major reserve for increasing capital investment effectiveness in building up industrial regions, as is known, is the complete and consistent implementation of the principle of forming industrial centers. The experience of creating such centers has shown the possibility of reducing the territory set aside for development by an average of 30 percent in comparison with a variation of separate construction, the number of individual buildings and installations can be reduced by an average of 32 percent due to combined-use units, the use factor for the territory can be reduced by an average of 20 percent, the number of auxiliary buildings and installations can be lowered by 30 percent, the construction volume of the buildings can go down by 10 percent, the number of standard types and sizes for structural elements can be reduced to 70 percent while the length of transport communications can be reduced by 50-70 percent. Here the one-shot expenditures are reduced and the volume of fixed productive capital and operating expenses are lowered.

As a result of reducing the number of production buildings, the combining of spaces for different types of production in one building and reducing the cost of the passive portion of the fixed productive capital, and due to the standardization of the

projects, construction parts and elements and the greater opportunities for improving the organization of construction work and other design and construction factors, the share of the active portion of fixed capital can be significantly increased. At the same time the absolute amounts of the active portion of fixed productive capital for the same composition of enterprises are reduced. This happens primarily as a result of the concentration of preparatory, repair and auxiliary production at the specialized enterprises of the center.

At present, the main impediment on the path of extensively introducing the progressive center form for the territorial organization of capital construction is the departmental and local policy of the ministries and departments which obstruct the incorporation of their enterprises into the industrial centers endeavoring, to get by with their own system. A system has developed where initially the departments in a centralized manner are given capital investments, including for the center-common projects, and later on a good deal of effort is made to see to it that they actually use the money to build these projects. The procedure of persuasion works poorly and the "primitive" construction of isolated small inefficient shops and services continues.

For this reason it is advisable to allocate the money for the projects of the center-common system not between the ministries participating in the creation of the industrial center but rather allocate the money on a centralized basis to the head builder.

The organization of industrial centers should be carried out not only in newly developed regions but also in existing industrial centers on the basis of the reconstruction and technical reequipping of existing enterprises. The sectorial planning for the reconstruction of enterprises here should be combined with territorial planning of industrial centers from these enterprises. However, unfortunately, the plans for systematizing the existing industrial build-up are created by the territorial design institutes of the USSR Gosstroy significantly less often than general plans for new industrial centers (the ratio equals approximately 1:3).

In line with the territorial problems of capital construction, great urgency has been assumed by the question of the mobility of the construction-installation organizations and the increasing role of the so-called rebased enterprises in construction. This question is particularly pertinent in the nation's East where for virtually each new construction site one must recreate a construction base and at times this takes up an extended time. However, this in no way means that the solution to the question of the location of a new enterprise in one or another place must be taken proceeding from the presence of a construction-installation organization at this place. Unfortunately, this sometimes happens and this leads to the incorrect placement of the enterprises. For this reason it is essential to set up mobile construction organizations.

Reducing the Estimated Cost of Construction

The normalization of the investment process is impossible without the adopting of effective measures to reduce estimated construction costs. In the group of investment sectors one can observe the sharpest and most constant deviations from the comparable price system adopted in planning and economic practice. The problem is that the so-called fixed (comparable) prices in capital construction are not the prices

for the finished construction product (for example, per unit of capacity at an enterprise turning out a certain product and so forth) but rather the prices for the intermediate product (for 1 m^3 of earth moving, 1 m^3 of brick laying, 1 m^3 of reinforced concrete, 1 m^2 of plastering and so forth). As a result of applying prices for intermediate types in construction and the change in the structure of these types, the cost of a unit of capacity can be substantially increased and made incomparable with the cost of the previously built projects. The capital intensiveness of capacity for steel production calculated per ton in 1965-1970 was 431.3 rubles, in 1970-1975 it was 586.1 rubles, or 135.9 percent in relation to the Eighth Five-Year Plan, and in 1976-1980, 760.5 rubles, or 129.8 percent in comparison with the previous 5 years. The price calculated per megawatt for a turbine with a unit capacity of 800 megawatts is almost 2-fold more in comparison with a turbine having a unit capacity of 300 megawatts. In recent years the cost of one place on a dairy farm has risen by more than 3-fold, and on pig-dairy complexes by 4-fold. The most sporadic and uncontrolled changes in prices occur precisely in construction.

The increased cost of construction and installation work, as noted even in calculations in fixed prices and estimate standards, have been aided by the desire to increase the material intensiveness of this work as the more expensive the employed building materials and structural elements the greater the product volume and, respectively, the wage fund of the construction-installation organizations. The fact that the amount of designing also depends upon the scale of construction and installation established in the plans also impels the design organizations to increase the cost of the projects being designed. The procedure adopted up to now of economic incentives and work evaluation for construction workers and designers has frequently led not to reduced costs but rather to increased costs of the projects being built and to a reduction in capital productivity in the national economy.

Among the presently adopted measures to reduce the estimated cost of construction and thereby increase capital investment effectiveness, an important place is held by improving the structure of material resources employed in construction.

The task of the efficient use of metal has assumed particular significance. Construction is responsible for approximately 20-25 percent of the national consumption of rolled ferrous metals not including rails and steel pipe, while if these are included it is 35 percent of national rolled metals consumption. In the latter instance the building of large-diameter pipelines and the construction and repair of railroads are taken into account. But the opportunities for saving metal in construction are little used.

Little has been done about the production of metal substitutes, particularly nonmetallic pipe. One ton of plastic pipe can replace 5-5.5 tons of metal pipe and considering the service life this replacement is the equivalent of 10 tons of steel. The effectiveness of capital investments into the production of plastic pipe is 1.5-fold higher than for the production of metal pipe. However, our plastic pipe production for many years has been on a level of 40,000 tons a year and this is completely insufficient. Production has developed slowly and quality improved little for other types of nonmetallic pipe such as pressurized and nonpressurized nonreinforced concrete and asbestos-cement pipe, ceramic pipe and others. With the shortage of shaped steel flooring for light coverings of buildings, a significant portion of this grade is consumed for producing triple-layered wall panels the manufacturing of which could successfully employ any wall materials thereby ensuring

great durability of the buildings and a reduction in operating expenses. The delay in the production of site-cast concrete leads to increased production of reinforced concrete and this requires a good deal of metal.

One of the reserves for lowering estimated construction costs is the possibility of reducing the cost of inert building materials, the production of which surpasses 1 billion tons a year. The development of their output up to now has been based on the creation of large, highly mechanized enterprises in the aim of improving product quality and reducing current expenditures on manufacturing the products. But it makes sense to put up such enterprises only at large deposits which are frequently located far from the product's consumption area. As a result there has been an increase in the distances which inert building materials are shipped while their cost "in use" has surpassed their cost in the production area by 2- or 3-fold.

The need has arisen of fundamentally reorganizing the development of the inert materials industry, having focused attention on the creation of highly mechanized prefab and mobile enterprises of small and medium capacity (up to 200,000 m^3 a year). In this manner it would be possible to bring the product closest to the consumers, small deposits of inert materials can be put into use, large areas of land will not be needed for construction and the location of dumping grounds, short times (on the order of 1-1.5 years) will be achieved for creating new types of production and there will be a high share of the active portion of the capital accordingly.

Reducing the Material Intensiveness of Construction Projects

The total weight of building materials and structural elements produced in our nation exceeds 2.5 billion tons a year. Their cost exceeds 20 percent of the total capital investment volume. They are responsible for up to 15 percent of the freight turnover of rail transport and an even higher share of the cargo turnover for river transport. At the same time calculations show that a rationalization of the structure and quality of building materials would make it possible to reduce their weight per unit of work by approximately 25-30 percent. This would tell on the construction time, the labor intensiveness and costs.

The predominant use in construction of heavy structural elements, mainly heavy reinforced concrete, the share of which comprises 35-40 percent of the cost of all the consumed materials, is determined predominantly by organizational factors. The enterprises of the contracting construction ministries produce 96 percent of the prefabricated reinforced concrete. The prices for prefabricated reinforced concrete provide comparatively high profitability, approximately 20-25 percent. Up to now the cost of the employed reinforced concrete has been included in the fulfillment of the plan of construction-installation work and has thereby encouraged the predominant use of precisely this heavy material. Thus, the development of the production of site-cast reinforced concrete has been checked and the use of this would save up to 25 percent of the metal and concrete and significantly lower construction costs. It is also essential to bear in mind that an enormous amount of fuel is required to cure the 120 million m^3 of prefabricated reinforced concrete while steam is required in far from all cases for site-cast concrete.

Unfortunately, the growth of brick production has halted in the USSR. Even in 1977, we produced less brick than in 1976, while the production of haydite and other types

of wall panels increased correspondingly. This has led to a high consumption of metal. The technical level of brick production is 12-15 years behind the present level. At the new plant in Yaroslavl', equipment productivity is 800,000 bricks per worker against 70,000 at the old yards. From the bricks produced in 1 year by a worker at a modern plant it would be possible to obtain 1 000-1,250 m^3 of brickwork while one worker at a reinforced concrete plant manufactures just 200 m^3 of prefabricated reinforced concrete in a year, or 5-fold less (not considering expenditures on the production of metal, cement and so forth).

The installation of compact, less material intensive machines makes it possible to erect light foundations, enclosing structures and roofs, thinner walls and so forth. The effect of machine building on reducing the material intensiveness of construction fixed capital by lightening the structural elements is more substantial than the reduction of the weight (reducing the material intensiveness) of the machines and equipment themselves.

For lowering the material intensiveness of products in the capital-creating sectors it is essential to replace the indicators of physical tonnage in the production and delivery of a number of metal structural elements, building materials and finished equipment with other indicators but encourage a reduction in materials consumption. For example, we have in mind the delivery of rolled metal according to a theoretical weight in a minus tolerance field, the delivery of sets of equipment and so forth.

The Use of Construction Mechanization

The total cost of construction mechanization is presently many billions of rubles. However, this equipment is not used with sufficient efficiency. Machinery stoppages due to technical failure comprise 20-25 percent of the operating time. This is caused by the existing practice where the machine builders are involved only with one part of the machine's life cycle (technical designing, production and guaranteed operating period) and are removed from the basic period of operation (including major overhaul and write-off). As a consequence of this the construction machines and mechanisms are overhauled not only frequently but also expensively and poorly. The actual expenditures on a major overhaul of many types of machines are presently 60-70 percent of their listed price and 55-65 percent of the metal intensiveness of a new machine.

Major overhauls on equipment must be turned over to the machine builders in creating an effective sysem of flaw detection for the machines, the units and assemblies for them, the most rational production plans and unified standards and rules for planned preventive repairs considering the design features and specific use of the machines in the various national economic sectors. Also of national economic significance is the creation of a unified interdepartmental construction-wide system of major overhaul enterprises with the gradual centralization of major overhauls for all basic construction equipment within the system of the USSR Minstroydormash [Ministry of Construction, Road and Municipal Machine Building] and the creation of a special main administration for repairs and territorial trusts in the regions. Here one may assume a rise in the average level of repair concentration of approximately 5-fold.

The carrying out of a unified technical policy in the area of construction equipment repairs should lead to improved quality in the repaired machines and to a rise in their operating life between repairs from 50-60 up to 80 percent and to a reduction of the time spent by the machines in repair and waiting for this. This is the equivalent of the additional use of mechanization valued at around 1 billion rubles and to a corresponding reduction in the capital investments for creating this.

Shortening the Time for Reaching Full Capacity

For Soviet industry as a whole, the actual times for completing the fixed capital and production capacity surpass the standards by 1.8-2-fold. Here a significant role is played by construction flaws, by design mistakes and by the mismatching of individual elements of production processes. Delays in developing new technology occur, as a rule, due to a few difficult assemblies. In cost terms their share is not more than 5-8 percent but improving them takes up a good deal of time.

Starting-up work has been turned, in essence, into a continuation of construction. Here in many instances it is a question not only of eliminating individual construction flaws or removing particular errors made by the designers but rather the building of entire projects which had been excluded from the plans during their expert evaluation and approval. Slow starting-up rates are one of the basic reasons for the low return on newly completed capital which is substantially below the average sector (averaged) capital productivity.

World-wide experience in capital construction shows that the reaching of full production capacity should not be made a separate item as the brief starting-up period can be combined in time with construction. Here the construction stage is not limited to the erecting of the buildings and the installation of machines but without fail presupposes the testing out of equipment and the bringing of it up to designed productivity. Under the conditions of the new economic mechanism, the acceptance of new projects can be carried out only when the period of their starting up and putting into operation has been completed. The "turnkey" delivery of capital construction projects assumes that they are fully ready to operate at full designed capacity.

Under the conditions of the new economic mechanism, an evaluation of the activities of construction organizations and their economic encouragement should be carried out in accord with the results of fulfilling the plans for completing production capacity and projects, for commodity construction product, for the growth of labor productivity, for net product and profit, that is, in terms of the specific contribution to increasing production efficiency and work quality. These same principles lie at the basis of planning and incentives for the clients, the design organizations, the equipment supplying plants, the building materials enterprises and the supply and transport organizations, that is, all the participants in the investment process. They all should receive incentives only under the condition of achieving the above-listed indicators which are tied to the successful carrying out of the starting-up program.

A most important principle in the investment policy is the intensification of production and capital construction and the greatest possible rise in their efficiency. At present it is a question of increasing products, improving their quality and assortment to an ever-greater degree by the complete and rational use of the already