

is an urgent need for a realistic level of thermal insulation, the actual level of which is linked to our ever rising fuel costs.

In considering the position of fuel costs, the actual cost to the consumer of the four major fuels over the past five years is analysed to highlight the changing position of the cost per useful G.J. of each fuel.

Having shown the dramatic increases in all our domestic fuels over the last five years, it is no longer viable to consider the choice of a particular domestic heating system on initial cost alone. A series of cost-in-use studies compares a range of systems, fired by the various fuels. The results of these studies showed that, within the parameters of the project, a coal fired system and two gas fired systems were more economic than the oil or electric systems which were considered. However the critical factor in all of these studies was the

cost of the fuel. Any change in the relative cost of the fuels would change the relative economics of the systems under consideration.

The cost-in-use studies considered the following items of cost:

- (a) Initial Costs – Using a price guide of the price important items the cost of the various systems were built-up.
- (b) Annual Fuel Costs – based on current fuel costs and calculated in accordance with I.H.V.E. recommendations.
- (c) Annual Maintenance Costs – based on information obtained from "Which" magazine.
- (d) Periodic Service Costs – based on information obtained from "Which" magazine.
- (e) Inflation.

# Performance Bonds in Construction

by G. M. Smith, FRICS, FI Arb (Fellow)

*This article first appeared in Building and is here reproduced by kind permission of the Editor.*

As a corollary to this article, the author states that it would require but a small change of attitudes to use the philosophy of bonding as the basis for effective control of the industry by self-discipline at financial advantage to the contracting companies and at the same time saving the passage of legislation requiring registration. In simple terms, if all contractors were to call upon their collective worth as the surety on each contract they could quickly have a huge invested sum at their back and at the same time an effective tool to police the entire industry. If the sums contributed by contractors for each and every contract as indemnity fees were both a measure of the companies' shareholding in the mutual fund and a measure of the support from the fund recalcitrant members would soon be made to conduct their businesses in a way that did not lead to a drain upon the fund.

A performance bond is a written undertaking by a third party given on behalf of a contractor to an employer wherein the surety accepts responsibility to ensure the due completion of the contractual works. Once the employer declares the contractor to have failed to perform and seeks redress, the surety has three courses open. He may:

- (a) Pay damages to the employer up to the full value of the bond.
- (b) Engage another contractor to complete the work remaining to be done; if the cost of this is in excess

of the bond, arrangements must be made for the employer to meet the additional expenses incurred beyond the amount of the bond.

- (c) Make such arrangements, financial and other, that the surety considers fit and proper to enable the contractor to complete the contractual works.

The surety therefore always takes a position saying, in effect, "I believe little will occur to my detriment". This is in sharp contrast to the insurer who is pessimistic declaring that "catastrophe of whatever form will befall". The opposing points of view can be illustrated using the case of an accused receiving bail. A surety guarantees attendance in court by saying his client will not abscond. An insurer in the same situation says "the accused will abscond". In commercial terms bonds can be seen as an extension of credit.

Where a performance bond is written and a call is made upon the surety to honour his obligation, the surety automatically obtains rights in subrogation to stand where the person aided stood himself. Thus if a surety made payments to parties trading with his principal, the contractor, the surety would be entitled to recover those monies from the contractor. Indemnification of a surety has long been recognised at law. It is usual for sureties to prepare a written statement to show on the one hand the natural redress in his hands and, on the other, to enmesh other assets to protect or enhance the worth of the party bonded. The latter can take any of three forms:

- (a) To legally encumber the corporate wealth of the company bonded.
- (b) To legally join the company bonded and its parent or principal to ensure that the indemnity has real worth. It is often necessary to prevent the parent or holding company divesting the company bonded of its wealth.
- (c) To re-inforce the corporate wealth of the company bonded by obtaining further indemnities joining the personal fortune of a principal officer of the company to the company's assets. This is done where a managing director is, virtually, a lone principal, the other directors of the company having little equity or little influence on the conduct of the affairs of the company or both.

### Other types of bonds

Whilst the performance bond is by far the best known bond form circulating in the construction industry, four other bonds are prominent.

#### (1) Bid bond

A bid bond is an undertaking by a surety that in the event of the bid or tender being accepted the contractor will enter into contract with the employer and the surety will issue a bond guaranteeing due performance of the contract by the contractor. In addition the surety can be called upon to make good the difference in value, subject to any limit contained in the bid bond, between the bid tendered by the contractor and the next highest bidder should the contractor withdraw his bid after tenders have been received.

A virtue of a bid bond is that the surety will satisfy himself that the bid tendered is responsible, practical and complete. Many employers feel the scrutiny or checking of bids by a surety prior to tendering to be a substantial benefit and one that greatly reduces the chance of irresponsible or careless bidding.

#### (2) Labour and material payment bond

A bond of this kind requires the surety to ensure that all debts incurred by the contractor during the course of the contract are discharged. In the event of default the surety is committed to discharging the debts that have arisen. It is a bond form that has been created to satisfy the obligations of the various Mechanics' Lien Acts enacted in the provinces of Canada and the states of the United States of America. In Ontario, for instance, a contractor is required to produce a certificate within 37 days of the completion of a contract showing that all wages have been paid. As some contracts have included the supply of materials as part of the sub-contract it follows that the certificate does in many cases cover both wages and materials.

#### (3) Supply bond

Supply bonds are usually associated with the shipment of goods across international boundaries. Bonds of this kind are widely used in commerce and often save litigation in foreign courts.

#### (4) Maintenance bond

Maintenance bonds attempt to cover the costs of making good a defective article or installation. Usually the goods incorporated into a finished structure are of an expend-

able character and have an agreed service life. Built-up roofing, floor and wall finishes are frequently involved. The surety agrees to make good by either paying an agreed sum of money to the employer or engaging and paying someone to effect the remedial work. It is usual for the liability to be stated as an arithmetic regression. These bonds have been found to be wanting largely because it has not been found possible accurately to measure inflation during the term of the bond. When a call has been made on the bond, the surety has preferred to pay the monetary damages, a sum invariably smaller than the actual costs of repair. Bonds covering built-up roofing installations once widely issued in Canada have largely disappeared since the early 1960's.

From the counter indemnities sought of contractors, it can readily be seen that sureties are always concerned with the easily realisable assets of a company. This is sometimes referred to as the "net quick position". A surety is always concerned with the expense to be borne by himself and his ability to distrain upon the assets of a contractor as soon as possible after he, himself, has had to incur expense.

In North America it is customary to operate a positive bank account. This is achieved by allowing the lender to register a legal charge upon collateral. The full negotiable value of the collateral is then reflected in funds advanced. In Britain it is customary to deposit collateral with a lender, usually a bank, who in turn will allow monies to be advanced up to a stipulated maximum. Should the surety not be the party handling the company's accounts, it can readily be appreciated that the surety does not have an immediately apparent valuation of the company to hand. The floating debt may be adequately covered from the lender's point of view but invariably the debt is subject to short term recall by the lender and is of a lesser value than the collateral made over to the lender. The surety is no more than another creditor in the event of liquidation. The surety is therefore anxious to protect his position by placing a charge upon the unencumbered assets of the company. As the assets of a company are frequently secured *in toto* for overdraft facilities the surety must look elsewhere for protection. A surety obtains this protection from the principal officers or supporters of the company in the form of undertakings permitting the surety to register a charge upon their personal wealth.

A company already obligated to its financial backers and unable to re-negotiate assets encumbered except by leave of those having registered a charge thereon, has its manoeuvrability further restricted by having the assets of its corporate friends made over to the surety. The "discretionary spending" of the company is severely curtailed and, with it, corporate flexibility to counter adverse trading positions.

It is estimated that bonding in Canada earns \$25 m in premium income in a \$14,000 m market. In Britain the construction industry is worth £4000 m but bond income does not exceed £3 m. The value of bonds written in Britain is substantially lower than in North America. Whereas it is customary to seek a 50% performance bond which may be coupled to a 50% labour and material payment bond and a bid bond, performance bonds issued in Britain do not usually exceed 10% of contract value.

The cost of bonds varies greatly, largely turning on the financial health of a company. In times past it has

been rare to find a company providing a performance bond to an employer seeking comparable indemnity from its sub-contractors. Through the unwillingness or unappreciated need to redress a contractor's exposed position, a contractor has had to bear the burden of sub-contractor failures, the bulk of the statistically high failure rate reported for the construction industry. This statistical fact must inevitably colour the thinking of those engaged in bonding contractors. It can readily be seen that a surety has been concerned not only with the financial health of a contractor to complete the work, but the contractor's ability to absorb, without disastrous effect, the failure of a subsidiary contractor or supplier engaged on a contract and the company's technical and managerial expertise.

In summary, a performance bond serves two purposes. At its face value it indemnifies the employer against financial loss, subject to an agreed limit, should the contractor fail to complete the contractual works. The issuance of a performance bond by a surety affords the

employer a second opinion of the validity of the bid or tender. In so doing the surety more or less says that the obligations facing the contractor are known, manageable and complementary to the contract about to be undertaken. The fact that the surety will take security in one form or another from the contractor is further assurance that the employer and the contractor are wise in their declared intention to enter into formal contract with each other. The employer can take comfort in the knowledge that the surety will monitor the affairs of the contractor if only to protect himself and so offer a continuing stewardship acting to the mutual advantage of the employer, the contractor and the surety.

*Sources:*

General Surety & Guarantee Co. Ltd., Manchester (who publish a descriptive booklet "Bonds & Guarantees").  
Sun Alliance & London Group, London.  
Federated Employers Assurance Co., Ltd.  
Tate Emes & Co. Ltd., brokers, London.

# Slip-Forming can save time and costs

by Professor W. Heynisch

*Techniques of slip-forming concrete with moving shuttering have nowhere received more attention than in the German Democratic Republic. The solutions evolved in the construction of many notable buildings are here discussed by the President of the Academy of Building of the G.D.R., Professor W. Heynisch, who has acted as a consultant in the design and construction of a number of slip-formed buildings.*

*This article is reproduced by the kind permission of the Editor of Batiment International/Building Research and Practice, the Journal of the CIB. Unfortunately we have been unable to reproduce some of the fine photographs which illustrated Professor Heynisch's original paper.*

The slip-forming method of concreting is quite common for erecting tall cast-in-situ industrial-type structures, for example silos, cooling towers, chimney stacks, TV relay stations and so on. The many types and shapes of structures constructed by this method prove its flexibility. It also has the essential merit that, in addition to the comparatively low basic investment required, the speed of erection and the resulting economies increase with the height of the structure.

In order to apply these advantages to as many other types of buildings as possible and at the same time to improve on existing techniques, extensive development work has been carried out in the GDR. Techniques were evolved for slip-forming conical chimneys up to 300 metres high as well as hyperboloidal shells for cooling towers of approximately 80 metres diameter and 115 metres height. Considerable experience with structures of this type eventually sparked off research into the

application of the slip-forming method to housing and related construction. The intention was to open up new possibilities of combining high-rise architecture in urban planning with the advantages of industrialised methods and rapid construction.

By employing the slip-forming method quite exciting focal points have been achieved within towns for residential buildings, for hotels, for university buildings, for research institutions and the like.

## Where walls predominate

Taking its economic threshold into consideration, slip-forming – which can be classified as an industrialised method of construction – can effectively be used to construct tall buildings of any type that are chiefly composed of walls. Slip-forming has proved to be a highly efficient method of construction that allows for the comprehensive mechanisation of all operations. In