Why do you need an engineer

Justin Coetzee

If you submit plans to a municipality for approval to build a new house, undertake a major renovation or construct a new office building or shopping centre, then more than likely you are required to have a Professional Engineer involved in your project. The obligation to use an engineer emanates from the National Building Regulations and Building Standards Act 103 of 1977 and the National Standard SANS 10400: Code of Practice for the application of the National Building Regulations.

What exactly does an engineer sign off, and why is this required by legislation? What should the engineer do for a project that the architect does not do?

Technical responsibility for planned work

At the commencement of a building project, an engineer will provide the developer with a SANS 10400 Form 2, listing all the technical work that the engineer will take responsibility for. This is the document that a local council will require from a building owner in order to approve building plans, and it sets out the engineer's role in the project until completion is secured.

Structural Design Options

The engineer can assist the developer in determining the correct option or choice of options in an appropriate structural system for the project – precast concrete slab versus in-situ concrete slab, steel beam versus pre-stressed lintel, raft foundation versus strip footings. The engineer provides the developer with advice on the best combination of performance, constructability and cost.

Specifications and engineering drawings

The engineer will provide specifications for all construction materials to be used in the project – such as the correct type and size of the steel beams, the correct amount of reinforcing steel, an appropriate strength of structural concrete and the best grading and density for earthworks. The engineer will also provide drawings and details for the execution of the works.

Site Visits and Inspections

The engineer will conduct regular site visits and inspections as construction progresses, providing advice and approval to the contractor to ensure that the developer gets the best outcome. The engineer assumes technical responsibility for the work being undertaken, and may issue site instructions through the

architect or in his or her own capacity. These instructions must be followed if a completion certificate is to be issued at the end of the project, and the developer must make sure that the engineer is part of the construction process.

Engineer's completion certificate for municipality's occupation approval

Once a project is completed, the engineer will carry out a final inspection of the works. If everything has been constructed according to plan, and the engineer is satisfied, he or she will issue a completion certificate, otherwise known as a SANS 10400 Form 4, which the municipality will require to provide occupation approval to a building owner.

WHY DOES A DEVELOPER NEED BOTH AN ARCHITECT AND ENGINEER?

The Architect: The architect is responsible for the concept, position, layout, etc. of a building, the specification of finishes, the submission and approval of architectural plans, ensuring compliance with planning requirements and National Building Regulations, and similar activities. The Architect works very closely with the Engineer on the technical details of the project.

The Engineer: As has been described above, the engineer is responsible for the design of any engineering aspects of the project that require rational assessment or design. The engineer should inspect the work for which he or she assumes responsibility and has to certify that the design has been correctly implemented.

WHAT IS CONSTRUCTION SUPERVISION?

Unless specifically requested to do so, the engineer does not supervise the contractor or take responsibility for the contractor's workmanship. When it is required or requested for a particular project – usually due to the complexity or size of a project – the engineer will determine the relevant level of supervision, which may be part-time or full-time supervision by the engineer or a designated subordinate.

WHAT ELEMENTS OF A PROJECT SHOULD ONLY BE DONE BY AN ENGINEER?

The Engineering Council of South Africa stipulates that certain design work and technical assessments should only be carried out by a Professional Engineer registered with ECSA, under the stipulations of the Engineering Profession Act 46 of 2000.

The following work requires the attention of a Professional Engineer:

- Compliance with the requirements of the National Building Regulations
- Flat roof and gutters design
- Dolomite land assessment and design
- Soil rafts, deep footings and sub-soil drains designs
- Slabs and earthworks fill design
- Storm-water management plans
- Assessment of deep excavations

- Fire protection system design
- Geotechnical investigations and solutions
- Ventilations systems design
- Drainage systems design
- Sewage disposal design
- Structural system design
- Roof truss design
- Design of water supply to fire installations
- Traffic impact studies

NATIONAL BUILDING REGULATIONS

The National Building Regulations (SANS 10400) set out requirements for all buildings. SANS 10400 provides details on the application of the National Building Regulations. In particular, SANS 10400 sets out measures that are deemed to satisfy the requirements of the Act.

Regulation A19 of the National Building Regulations requires the owner of a building to appoint a competent person (registered professional) to accept responsibility for the design, inspection and certification of the work if (a) a rational design or (b) a geotechnical investigation is required.

OCCUPATIONAL HEALTH & SAFETY ACT

The obligations with regard to supervision or inspection of the work extend only to ensuring that the design assumptions are valid, that the design is being correctly interpreted and that the execution of the work fulfils the design intent. In terms of these appointments, the competent person is not responsible for the day-to-day supervision of the contractor's activities, or for the quality of the contractor's work, except where such workmanship could endanger the integrity of the structure or adjoining development.

PROFESSIONAL INDEMNITY INSURANCE

The limitation of liability is set in many standard forms of agreement at twice the professional fees paid or a manually agreed amount. If professional indemnity cover is included as a condition of contract, the limit of indemnity (insured amount) should be specified. It is standard to include a limit of liability (maximum amount payable by either party to the other) and a limit on the duration of the liability (typically three years after completion).

HOW TO ENSURE QUALITY ENGINEERING?

There are a few simple ways to ensure that you receive the right advice and service. Firstly, make sure the engineer is registered with ECSA – the organization entrusted with curating the engineering profession. This can be

determined by visiting www.ecsa.co.za and by entering the registration number of your engineer.
Request references from previous clients, and check off the three dimensions of Quality, Cost and Timeliness. Good references should give you comfort in these three aspects of consulting engineering services. Use standard forms of agreement and put all agreements in writing from the start. Your engineer should keep careful track of all costs and inputs into your project, and should be able to provide you with a detailed breakdown of costs at all times.

If you are dissatisfied with the services rendered by a registered engineering professional, there are two main avenues of recourse:

- Lodging a complaint with the Engineering Council of South Africa if you feel there has been a breach of trust or an infringement of the Engineering Professional Code of Conduct;
- Pursuing the remedies laid down in the contract between the parties (if any), including legal action against the engineer.

A client may terminate the services of an engineer and appoint another, or may request a second engineer to review the work of the first, provided the correct procedures are followed. Clients should be aware that according to ECSA's rules of conduct for registered persons, one registered person is not permitted to knowingly attempt to supplant another on a particular project.

WHAT IS THE COST OF GOING CHEAP?

The cost of engineering design services only constitutes a small element of the total life-cycle costs of the facility being designed, and the client needs to be aware that professional fees that are too low
can lead to substandard professional advice or rushed work. This could significantly increase the costs of construction, and long-term operations and maintenance costs. This increased life-cycle cost is likely to overshadow any short-term savings made in the cost of the professional services.

An engineering firm that is charging less than standard rates for your project is most likely using junior staff to do the majority (or all) of the work on your project. Is the professional engineer only present on your project to sign the final drawings or to attend client meetings? Are you truly getting the skills, expertise and experience that you are paying for?

In order to ensure that you have access to the best combination of Quality, Cost and Timeliness for Engineering Services - please feel free to contact Justin Coetzee Consulting for a comparative quote on your next construction project.

ABOUT THE AUTHOR

Justin Coetzee is the Principal Engineer of Justin Coetzee Consulting (Pty) Ltd. He is a Professionally Registered Engineer accredited by the Engineering Council of South Africa,

with 10 years' experience in Civil & Structural Engineering. Justin has a Master's Degree in Transportation Engineering, and a Bachelor's Degree in Civil Engineering. For more information, please visit www.justincoetzee.com