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# PROGRAMMING & RESOURCE MANAGEMENT WRT CIVIL ENGINEERING CONTRACTS


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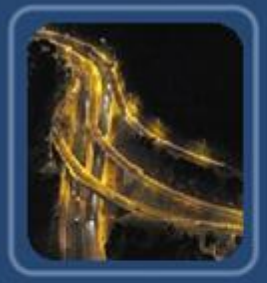

South African Road Federation

# PROGRAMMING & RESOURCE MANAGEMENT

- **Course Overview:**
  1. The reasons for and purpose of the programme
  2. The 3 types of programmes – Tender, initial & revised programmes
  3. Guide to setting up a programme
  4. Setting up a standard contract programme
  5. Group Exercise
  6. Tracking progress
  7. Updating the programme
  8. Programme non-compliance
  9. Internal programme/s
  10. Delays and Disruptions
  11. Resource Planning

# PROGRAMME MANAGEMENT

- Disclaimer:
- The course today is about a practical guideline on the preparation of the contract programme and is not about the use of the software
- Programming Software:
  - MS Project
  - Candy
  - Primavera
- The form & software are normally specified in the tender document

# 1. The reasons for and purpose of the programme

- Contractual requirement of all construction contracts
  - FIDIC - Contractor to submit a detailed programme to the Engineer within 28 days from the commencement date (cl. 8.3)
  - GCC - deliver an initial programme to the EA before commencing with the Works, within the time stated (generally 14 days) in the Contract Data (cl. 5.6.1)
  - NEC - submit a first programme to the PM within the period stated in the Contract Data (cl. 31.1)
- Programme must clearly show the manner and sequence in which the Contractor plans to carry out the Works within the stipulated contract period
- Programme is the Contractor's intent and can change, but the dates are contractual
- The EA has a certain amount to time to either approve or not accept the Contractor's programme, giving his reasons.
- Once approved, this becomes the contractual programme.

# 1. The purpose of the programme

- **Contractor:**
  - Assists with managing the contract
  - Assists with planning of resources
  - Tracking progress and taking the necessary corrective action
  - Assist with delay & disruption claims
- **Employer's Agent**
  - Check that Contractor understands the scope
  - Monitor progress for reporting purposes
  - For the planning of his own resources
  - Keeping ahead of schedule iro information schedule
  - To protect the Employer against delay claims from the Contractor
- **Employer**
  - Planning & co-ordinating its own business activities

# 2. The three types of (standard) programmes

- Tender programme
- Initial programme
- Revised programme/s

# 2. The three types of programmes

## 1. Tender programme

- Tenderers to submit a tender programme as one of the returnable schedules
- Can be part of the tender adjudication e.g. qualifying criteria
- Purpose is to demonstrate that the Tenderer understands the Scope of Work and that the Works can be executed within the stated contract period
- Used (can be used) for pricing of supervision resources for the contract
- Could form the basis of an alternative tender offer
- Generally not a requirement of the contract to be concluded

# 2. The three types of programmes

## 2. Initial programme or Accepted programme

- A requirement of all construction contracts & must show the following:
  - The commencement date, due completion date & planned completion date
  - Sequence, timing & resources for carrying out the Works
  - Dates for Site access, approvals, instructions, inspections, tests & all information required to carry out the Works
  - The critical path
  - Contractor's time risk allowances & float
  - Other programming information as set out in the Scope of Works
  - Once approved, becomes the contractual (or Accepted) programme
- Complexity of the programme to be proportionate to the project
- *"Programme should be as simple as possible and no simpler"- Einstein*

# 2. The three types of programmes

## 3. Revised programme/s:

- Contractor should revise the approved programme whenever major changes occur
- Revised programme should be accompanied by a report explaining problem areas, anticipated delays & the effect on the completion date
- Contractor to revise the programme when it is clear that actual progress will not meet the Due Completion date
  - Fidic cl. 8.3, GCC cl. 5.6.4, NEC cl.32
- Does not relieve the Contractor from his contractual obligations
- Employer's Agent could request a revised programme when a specific probable future event may delay the execution of the Works, e.g. a VO
- Programme to be revised after every approval of an extension of time.

# 3. Guide to setting up a programme

- **Method statement/preamble to the programme**
  - A supporting document that talks to the programme
  - Generally flows from your approach paper/execution plan submitted with tender
- **Work breakdown schedule**
  - Break up the Scope of work into practical work packages & deliverables, giving as much detail as possible
- **Planning & scheduling**
  - Lists the tasks/activities required under each WBS, insert durations & link activities logically
- **Resourcing and Planned production**
  - Allocate resources to the main activities (Plant & Labour)
  - Planned Unit production against main activities

# 3. Guide to setting up a programme (cont.)

- **Compliance with Project specifications**
  - Project specifications will give the additional contract specific requirements to be included in the programme
  - Electronic submissions and software specifications are becoming the norm.
- **Information required schedule**
  - Programme should clearly show when information will be required and be logically linked to activities and not merely dates

# 3. Guide to setting up a programme (cont.)

- Typical checklist for the contract programme:
  - All major items of work included
  - Key milestone dates are included
  - Mobilization periods are reasonable
  - Procurement periods and delivery dates for major equipment/materials
  - Task durations are realistic, individual activities should not exceed 4 weeks
  - Production rates are reasonable
  - Logical relationship between activities
  - Critical path and float clearly indicated
  - Calendar set up with planned working week & public holidays
  - Allowance for inclement weather
  - Employer obligations programmed in
  - Subcontractor details
  - H&S and QC provisions factored in
  - The programme concurs with the method statement

# 4. Setting up a standard construction programme

- Timescale:
  - Set up using 3-tier scale for contracts greater than 12 months
  - Set up planned working week, special non-working days & Christmas break
  - Inclement weather allowances
  - Set all tasks to ‘auto schedule’
- Structure
  - Key contractual dates
  - Break down the Scope of work to the level of detail required
  - Refine and optimize the schedule

# 4. Setting up a standard construction programme (cont.)

- Project constraints
  - Factor in all the project constraints as required in the Project specifications
  - Construction Milestone activities
  - Key subcontractors
  - CPG contractors
- Links & Critical Path
  - Is the logic sound?
  - Check the critical path & adjust where necessary
  - Use your judgment based on experience/knowledge of the tender.

# 4. Setting up a standard construction programme

- **Examples of standard programmes**
  - Example 1: Programme runs over the stipulated time for completion
    - Check durations
    - Change CP durations to bring compl. date within time for completion
  - Example 2: Contract period well within the stipulated time for completion
    - Double check durations/productivities
    - Insert dummy activity/ies to align contract period with Employer's TFC
    - Be aware Float belongs to the project

# 5. Developing a ‘standard’ programme

Group Exercise

- Break up into groups and each group to draw up the contract programme for this ‘Flood repair’ project.
- ..\Group Exercise - Flood Repair project.docx

# 6. Tracking Progress

- Progress should be tracked at every reporting cycle, not later than the reporting cycle or 1 month.
- Save the approved programme & baseline it, i.e. 'lock it in'.
- Insert the percentage complete against each activity
- When tracking, move through the programme from top to bottom, checking each task before moving on
- Adjust durations where necessary. All incomplete work must be re-scheduled to a date after the status date
- Insert delay/disruptions where they have occurred to illustrate the direct impact on the programme
- Analyse the tracked schedule – take corrective action if fallen behind
- Use the tracked programme to report on progress at the monthly site meetings

# 6. Tracking Progress

- ..\..\Desktop\MSP13 Progs\SARF TRAINING - Tracked programme.mpp

# 7. Updating the programme

- Programme must be updated at regular intervals or when significant changes occur.
- The updated programme records actual progress against planned progress & is used for determining any EoT
- Some reasons for updating:
  - Actual progress, mitigation or acceleration measures
  - Scope changes
  - Actual or potential delays that may impact completion date
  - Changes to logic, methods & sequencing of the work
  - More detail available on sections of work
- Approval of an updated programme does not relieve Contractor of his obligations.
- A revision to the Due Completion date can only occur after approval of an EoT claim, followed by a new baseline.
- Use chronological numbering of revisions for each contract programme update – rev.0 being the initial approved programme

# 7. Updating the programme

..\..\Desktop\MSP13 Progs\SARF TRAINING - Updated Programme.mpp

# 8. Programme non-compliance

- **Contractor:**
  - Similar to steering a ship without a compass!!
  - Loss of EoT entitlements
- **Employer's Agent:**
  - Contracts make provision for sanctions against the Contractor to be applied in the event of non-compliance.
    - GCC – Engineer may instruct suspension of the Works (cl. 5.11.2)
    - FIDIC – Engineer can issue a "Notice to correct" the Contractor's failure and to remedy it within a specified time (cl. 15.1)
    - NEC – PM may penalize the Contractor 25% of the value of the Work done to date until Contractor complies
- **Employer:**
  - Contracts make provision to terminate the contract in the event of continuing failure to comply.

# 9. Internal Programme/s

- It is good practice to draw up an internal programme targeting earlier completion
- Sectional/team programmes to be developed from the contract programmes for the following purposes:
  - Assist with procurement
  - Full details of the item being built
  - Weekly/daily progress monitoring
  - Inform on the corrective action to be taken wrt resourcing
  - Comparison of actual costs to allowable
- Information required schedules can be more accurately developed
- Note: you cannot rely on the internal programme for claims

# 9. Internal Programme/s

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# 10. Delays and Disruptions

- **Delays:**
  - Contractor liable for all delays caused by Contractor's risk events.
  - Delays and disruptions caused by an Employer's risk event entitle the Contractor to claim an extension of time and/or additional costs.
  - The programme is a critical tool in the evaluation of contractual entitlements
  - Contractual entitlements for an extension of time flow from the approved contract programme.
  - EoT will only be granted if the Due Completion date is extended - onus is on the Contractor to prove.
  - Contractor has a general duty to mitigate impact/costs of any delays
  - EA does not have to approve EoT, but can instruct acceleration to achieve the Due Completion date – there is a cost to that!!.
  - No automatic entitlement to payment of costs with EoT
  - Generally with EoT comes automatic payment of P&Gs (time related general items in bill of quantities).
  - No direct costs are payable in EoT claims – direct costs are only payable on EoT on non-critical activities, except in the case of Employer risks.

# 10. Delays and Disruptions (cont.)

- Concurrent delays
  - Where Contractor & Employer delay occurs & both cause a delay to the Completion Date, the Contractor is entitled to EoT for the Employer's delay. – "Delay & disruption protocol" adopted by most of the standard forms of contract.
  - However Contractor cannot recover direct costs caused by its own delays
- Disruption
  - A disturbance, hindrance or interruption to the Contractor's normal working methods, resulting in lower productivity or efficiency.
  - Some examples:
    - Piecemeal access to the site
    - Design changes
    - Out of sequence works
  - Contractor entitled to recover additional costs incurred if the cause is due to an Employer risk event.

# Do’s and Don’ts of programming

- The Contractor’s primary obligation is to construct the Works expeditiously, so focus!!!
- Do not get into a paper war with the EA wrt approval of the programme – get on with the Works
- The programme is the Contractor’s intent, so you must progress in accordance with your programme - if you need to change the sequencing, inform the EA.
- Don’t manage the programme, manage progress in line with the programme.

# 11. Resource Management

- Applicable reference documents:
  - Method statement/execution plan
  - Programme
  - Pricing worksheets
  - Project Specification

# 11. Resource Management

- The Site team to interrogate the method statement & programme using their collective experience
- Resource plan to be drawn up using the contract programme as the starting point
- Start with available internal resources and reference back to the estimating worksheets & the Project specifications
- Review daily/weekly productivities to see whether the plan is being achieved
- Be flexible & adaptable to evolving situations on site

# 11. Resource Management

- Resource types:
  - Human resources
  - Plant & equipment
  - Materials
  - Subcontractors

# 11. Resource Management

- **Human resources**
  - Staffing requirements to be developed from the programme & forwarded to HR
  - Factor in MS approvals before commencement & snagging/handover on completion

# 11. Resource Management

- **Plant & equipment:**
  - Use the estimating worksheets as the basis to develop the Plant resources, but do not get stuck on exact combinations of Plant
  - Use Plant Manufacturer's catalogues as a guide
  - Try standardizing items of Plant to minimize establishment costs
  - Maximise Plant utilization – machines do not tire!!
  - Capex for Plant & equipment may result in delays

# 11. Resource Management

- **Materials:**
  - Procurement of bulk materials to commence early
  - Some materials may require quality tests & approvals
  - Be aware of long lead items & import procedures, if any

# 11. Resource Management

- **Subcontractors:**
  - Approval of Safety Files can result in delays
  - Specialist subcontractors may require approval in terms of the contract
  - Contract may stipulate procurement processes for CPG subcontractors
  - Potential risk of delays in mobilization

# 11. Resource Management(cont.)

- A. **Typical Roadworks contract**
  - i. Earthworks (dig, load, cart & compact)
    - Excavator (20t or 30t)
    - Tiptrucks
    - Dozer (D4, D5, D6) – (dependent on material type & average daily production)
    - Water tanker
    - Vibratory roller
    - Labour team
    - Combinations dependent on terrain, constraints, volume,
  - ii. Layerworks (dig, load, cart & compact)
    - Excavator (20t or 30t)
    - Tiptrucks
    - Grader
    - Water tanker
    - Vibratory roller
    - Labour team

# 11. Resource Management(cont.)

- A. **Typical Roadworks contract (cont.)**

  iii. Stormwater drainage (excavate, lay pipes & backfill)
  - Excavator
  - Labour team
  - Crane
  - Ped roller
  - Water tanker

  iv. Surface drains
  - TLB
  - Formwork team
  - Concrete dumper/ready mixed concrete truck
  - Concrete team

# 11. Resource Management(cont.)

- B. **Typical Civils contract**
  - i. Excavation (dig, load & cart off site)
    - Excavator
    - Labour team
    - Crane
    - Ped roller
    - Water tanker
  - ii. Foundation/building
    - Formwork team
    - Rebar team
    - Concrete dumper/ready mixed concrete truck
    - Crane (mobile or tower)
    - Concrete team

# 11. Resource Management(cont.)

- B. **Typical Civils contract (cont.)**
  - iii. Structure (roof, equipment)
    - Labour
    - Crane
    - subcontractor
  - iv. Pipeline
    - TLB/excavator
    - Pipelaying team
    - Ped roller
    - Water tanker
    - Backfill team

# 11. Resource Management(cont.)

- C. **Typical Infrastructure contract**

  iii. Stormwater drainage (excavate, lay pipes & backfill)
  - Excavator
  - Labour team
  - Crane
  - Ped roller
  - Water tanker

  iv. Surface drains
  - TLB
  - Formwork team
  - Concrete dumper/ready mixed concrete truck
  - Concrete team

# Do’s and Don’ts of Resource Management

- Do not be too theoretical – use your judgement & experience
- Don’t be pennywise and pound foolish – make sure you have spare resources
- Use the correct equipment to suit the conditions on site and the type of material
- Don’t take your eye off the programme!!!

# Summary and Close

THANK YOU