INTERNATIONAL SYMPOSIUM

"Practices and Trends for Financing and Contracting Tunnels and Underground Works", Athens, 22-23 March 2012



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MAIN POINTS

CHOOSING TUNNEL DESIGN DEVELOPMENT METHOD

AN INSIDE LOOK AT FAST – TRACK DESIGN AND CONSTRUCTION PROCESS

FAST TRACK DESIGN: UPS AND DOWNS

DESIGN RISKS - LIABILITY / CONTRACTUAL ISSUES

DESIGN MANAGEMENT FOR FAST TRACK PROJECTS

FAST TRACK RULES TO FOLLOW

KEY ELEMENTS OF SUCCESS IN FAST TRACK

MAIN LESSONS LEARNT











CHOOSING TUNNEL DESIGN DEVELOPMENT METHOD

- Important decisions

- Several alternatives

Traditional design – bid - build

- · Design and construction management at-risk
 - Fast track design and construction
 - Multiple prime Contractors
 - · Design and Build



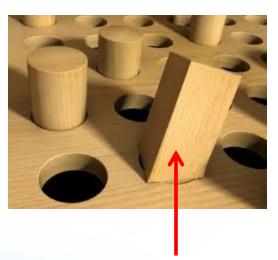


TRADITIONAL DESIGN – BID – BUILD

MAIN DISADVANTAGES







Traditional design – bid - build:
NOT ALWAYS THE BEST CHOICE

- Time consuming process
- All design work must be completed prior to construction
- Limited Designer's ability to assess time / cost constraints
- Owner's exposure to Contractor's claims over design and construction issues
- Owner accepts liability of design
- More adversarial relationships between Owner, Designer, Contractor
- Contractor may pursue a least-cost approach
- Increased demand for oversight and quality review by the Owner
- Absence of Contractors input into the design
- Important decisions without full consideration of a construction perspective











AN INSIDE LOOK AT FAST - TRACK DESIGN AND CONSTRUCTION PROCESS

FT Process: overlapping of functions and development stages to reduce the amount of





When time constraints cause standard design and construction procedures and timelines to be compressed

Time is of essence and the need for time sensitive decisions takes precedence over other forces

Processes that normally would run in sequence must be run in parallel



- 1. Construction commences prior to the completion of all design and final coordinated construction documents.
- 2. Phased completion of design and stage-by-stage construction kick-off process.



MAIN ORIGIN: FTD has been around for decades in major building projects (i.e. USA, JAPAN, MIDDLE EAST etc.)

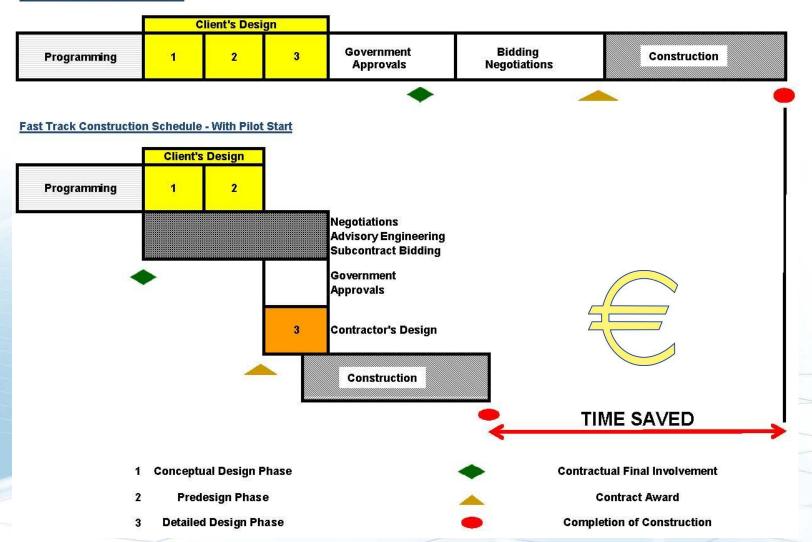






FAST TRACK PROJECT DEVELOPMENT

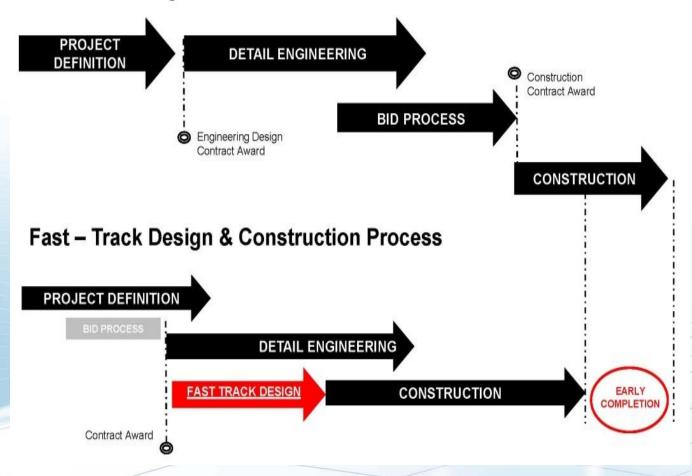
Normal Construction Schedule







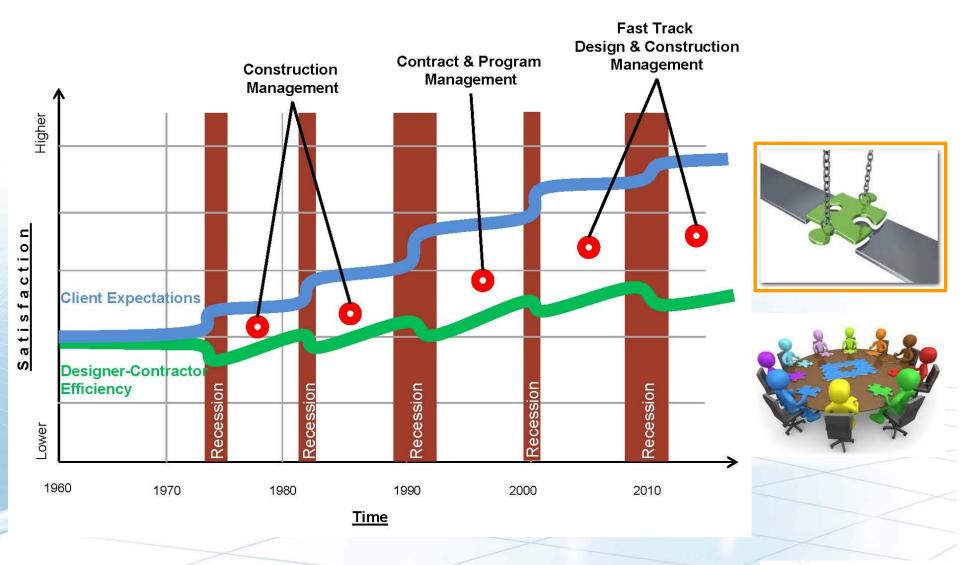
Traditional Design - Bid - Build Construction Process







BRIDGING THE GAP BETWEEN CLIENT EXPECTATIONS AND DESIGNER/CONTRACTOR EFFICIENCY













FAST TRACK DESIGN: UPS AND DOWNS











Earlier project completion



Time reduction before the work. starts



Efficient collaboration between Owner, Contractor, Designer



Shorter financing period



Earlier material procurement



Risk of dealing with incomplete information



Construction starts without knowing the final cost



Difficulty in making costeffective changes



Limited ability to compress Conventional Regulations or **Reviewing Authorities**

Risk is inherent BUT Reward can be great!

KEY FACTOR:

To understand risks and embrace uncertainty

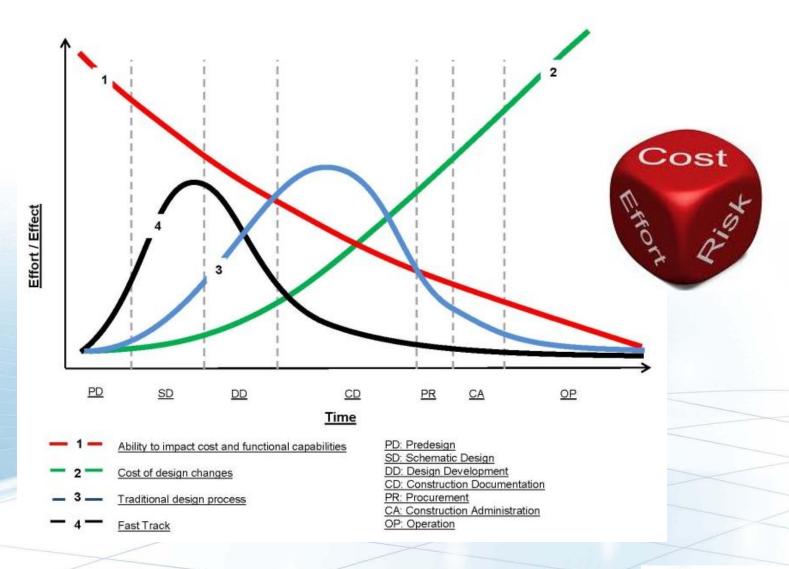








EFFECT ON PROJECT COST DUE TO DIFFERENT DESIGN APPROACHES













DESIGN RISKS - LIABILITY / CONTRACTUAL ISSUES

- Limited number of insurance companies for project cover
- > Greater professional liability exposure for Designers
- > SPEED MAY KILL
- Quality, Safety and Design Details may suffer
- ➤ MULTI-TASKING is needed by Designers
- Expensive modifications and design changes
- Inexperienced or unrealistic Clients
- Designer's incompetence to meet the stress and time/quality demands









KEY STEPS TO LOWER THE DESIGN RISKS



- To bring the Client's expectations in line with reality
- To ensure that the Client understands the risks
- Modifications to design documents are inherent and should be budgeted
- Contingency fund to be established
- Tailor-made design contracts and scopes of work
- Avoid unauthorized design changes
- Every step should be documented with detailed notes
- Well established document management system















DESIGN MANAGEMENT FOR FAST TRACK PROJECTS

CONSULTING ENGINEER: A professional experienced in the application of scientific principles to engineering problems

ALSO A BUSINESSMAN =

(schedule, budget, profit, quality, future, capacity, reputation, market)



TARGET

To operate within a budget so design can be performed efficiently Cost should not become more important than the project



TOOLS:

- Integral design process
- Concurrent engineering
- Document management systems
- Team dynamics, team spirit
- Communication
- Information handling
- Face-to-face meetings
- Coherent project knowledge base
- Well trained design team







TRUST BETWEEN CONTRACTOR AND DESIGNER

- ➤ Necessary to neutralize "BIG BROTHER EFFECTS"
- Possible communication with less misinterpretation







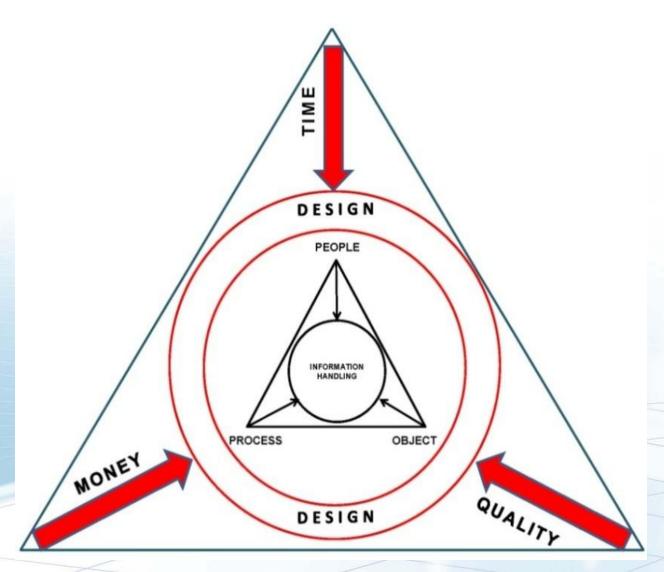
MAIN RULES

- Trust is not blind
- Trust needs boundaries
- Trust demands learning and openness to change
- Trust is tough
- Trust needs bonding
- Trust needs touch
 - Trust requires leaders





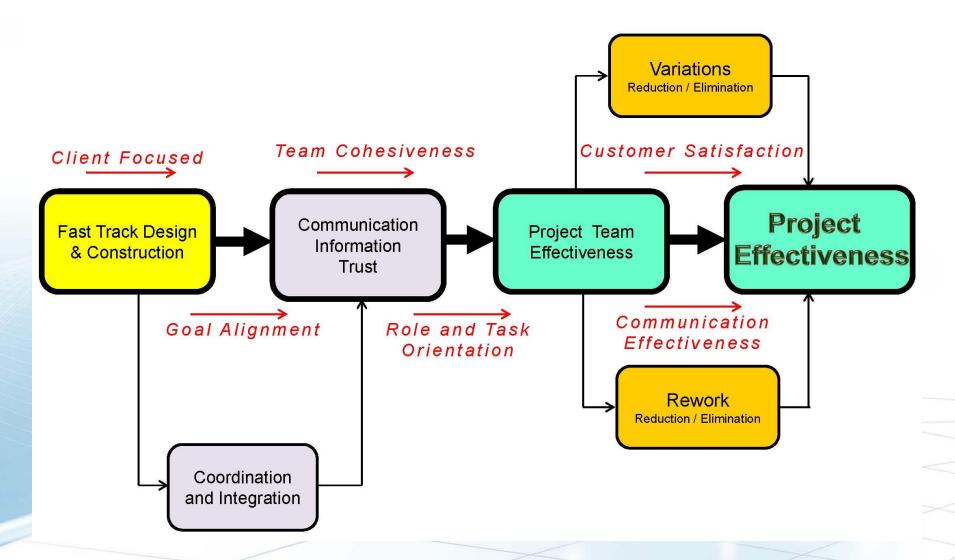
PRINCIPAL PARAMETERS AFFECTING THE DESIGN APPROACH







FAST TRACK APPROACH TOWARDS PROJECT EFFECTIVENESS













FAST TRACK RULES TO FOLLOW

- clear chain of command
- very few decision making individuals
- no changes when decisions have been made
- > well thought out program of requirements
- > close contact with the Designer during construction
- Designer on site follow up services
- > strict control and quality assurance of any subcontractors activities
- > constant interaction and communication with the Checker/Client
- by the Contractor

 Succession

 Succession









FAST TRACK RULES TO FOLLOW

- > avoid design processing delays for insignificant modifications on drawings
- > ready to make immediate design decisions
- > regular design meetings according to construction phasing
- > early engagement of all authorized personnel to meet deadlines
- > continuous enforcement in terms of schedule
- management of design activities on site
- > systematic follow up of design fees developed during phased construction
- clear definition of communication chain with designated people to facilitate

timely decisions









FTD TUNNEL PROJECTS

- 1. MALIAKOS KLEIDI MOTORWAY Concession project Greece
 - MALIAKOS KLEIDI CJV (HOCHTIEF AKTOR J&P AVAX VINCI CGP – AEGEK – ATHENA)
 - Designer: Consortium OK CONSULTING SA, ILF Austria & HOCHTIEF CONSULT
 - Twin bore highway tunnels T1, T2 and T3 (21.6km), NATM









- 2. <u>ELEFSINA KORINTHOS PATRAS MOTORWAY Concession</u>

 <u>Project Greece</u>
 - APION KLEOS CJV (VINCI CGP HOCHTIEF J&P-AVAX AKTOR GEK/TERNA ATHENA)
 - Designer: OK CONSULTING SA
 - Twin Bore T26 Panagopoula Highway Tunnel (7km) and Twin bore Platanos Highway Tunnel (3,2km), NATM





FTD TUNNEL PROJECTS

- 3. KRABBE TUNNEL Fidic Contract Albania
 - AKTOR SA
 - Designer: OK CONSULTING SA
 - Twin Bore Highway tunnel at the Tirana Elbasan motorway section in Albania (5 km), NATM







- AKTOR S.A.
- Designer: OK CONSULTING SA
- Twin bore AS1 and AS2 Highway Tunnels and AS3
 Single Bore Highway Tunnel (4,2km), NATM











KEY ELEMENTS OF SUCCESS IN FAST TRACK

- **❖** Effective teamwork between Contractor and Designer
- Collaboration starts from tender period
- Encourage everybody to contribute ideas
- **❖** Open minded radical management approach
- Share the common goal to minimize cost and time
- Focus on ease of construction and customization
- Elaborate Contractor's preferred methods of construction
- Develop a better understanding of the risks
- Reviewing member (Ind. Eng., Superv. Eng., Authorities) to work "within the Contractor's spirit" through interactive checking process
- Breakdown barriers of independence between Designer and Checker







FAST TRACK TUNNEL DESIGN - "BATTERY LIMITS" AND STEPS

- > PROGRESSIVE COMPLETION of geotechnical interpretation
- TUNNEL DESIGN CONTRACT RUNS INDEPENDENTLY
- > SEQUENTIAL execution of detailed construction drawings for excavation and initial support
- > Agreement in principle between Contractor, Checker and Client ("fast eye check")
- > Brief descriptive reports (no analysis, no detailed calculations)
- Design drawings for the portal cuts
- > Tunnel split in stretches and progressive feeding with drawings
- Contractor's responsibility to communicate with the Client
- FTD is a strictly internal technical process between Designer and Contractor
- Incorporation of important design interfaces
- Any possible effort to minimize modifications on already constructed stretches due to the final design
- > Final certification of the project through the official design submission flow

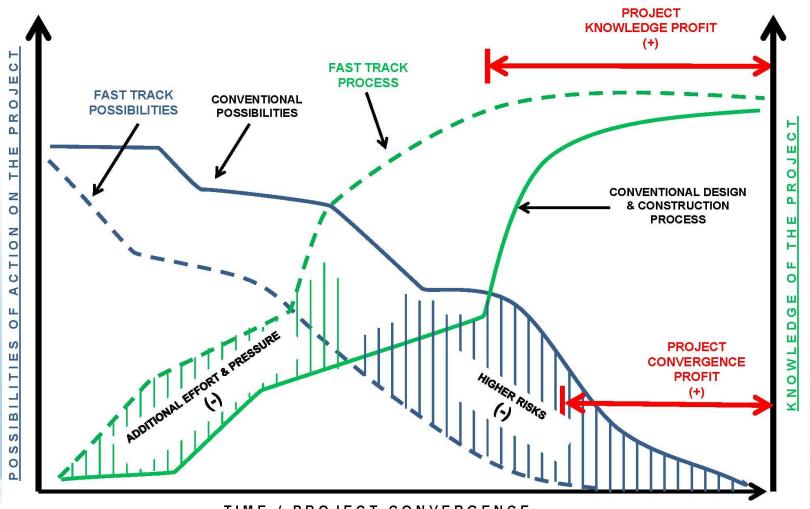


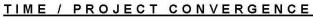






PROJECT KNOWLEDGE AND CONVERGENCE PROFITS BY USING FAST TRACK DESIGN APPROACH















MAIN LESSONS LEARNT

- FTD: a really attractive concept
- ONLY for capable Designers and well-trained Contractors
- ONLY for flexible and educated Clients
- CLEAR CHAIN OF COMMANDS
- FEW DECISION MAKING INDIVIDUALS
- **NO CHANGES WHEN DECISIONS ARE MADE**
- *** CLOSE CONTACT AND INTERACTION**
- CLOSE ADMINISTRATIVE AND DESIGN MANAGEMENT CONTROL
- ONLY WHEN IT IS REALLY NEEDED
- **AVOID FTD PROJECTS RUNNING SIMULTANEOUSLY**
- **❖ IT IS A RISKY VENTURE BUT WELL WORTH IN TERMS OF TIME SAVING**
- *** TIME IS MONEY**











THANK YOU FOR YOUR ATTENTION



