

Contractual Practices in Tunnel and Underground Works in India

(A Presentation on “Contractual Practices Worldwide”
at World Tunnel Congress – 19th -25th Sept, 2008 ,
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By



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COMMON PRACTICES

- Majority of projects owned by Govt. or Public Authority.
- Funding by Govt. or multilateral financing agencies.
- Contract conditions based on
 - Standard Bidding Document in case of financing by World Bank/IBRD etc.
 - Govt. practice / guidelines for projects financed by Govt.
- Disclaimer clauses and exculpatory language.

COMMON PRACTICES

- Bid proposals invited on
 - Turnkey or,
 - Item rate/BoQ basis
- Engineer is Owner's employee.
- Disputes resolved through arbitration or courts
- Alternate Dispute Resolution methods for dispute resolution in contracts financed by WB/IBRD/JBIC etc.
- Decision making subjected to govt. guidelines and delegation of powers.

COMMON DEFICIENCIES

- Exploration phase inadequate to appraise fully sub-surface conditions.
- Limited time prior to tender – inadequate for bidder to assess sub-surface conditions.
- Bidder constrained to submit unconditional bid due to fear of being declared non-responsive.
 - Includes high contingency in bid price or,
 - Raises claims during execution stage.

COMMON DEFICIENCIES

- Substantial variations in sub-surface conditions during execution stage –
- Variations in sub-surface conditions lead to
 - Claims
 - Time and Cost overrun
- Engineer not an independent authority – guided by Owner's policies.
- Delayed claims settlement and contract closure.
- Shortage of funds for state projects.

EXPERIENCE WITH NATHPA JHAKRI HYDRO-ELECTRIC PROJECT – 1500 MW

India's biggest Hydro-electric Project



NJHEP – SALIENT FEATURES

CIVIL WORKS

- 62.5m high concrete Dam to divert 486 cumecs of water thro' four intakes
- Underground Desilting Complex – four Chambers, each 525m x 16.31m x 27.5m
- 27.4 km long Head Race Tunnel of 10.15m dia with design discharge of 405 cumecs
- 301 m deep Surge Shaft of 21m dia
- Three steel lined Pressure Shafts of 4.9m dia
- Underground Power House Cavern of size 222m x 20m x 49m
- 982m long Tail Race Tunnel of 10.15 m dia

NJHEP – SALIENT FEATURES

ELECTRO - MECHANICAL WORKS

- **Francis Turbines designed for Gross Head 486 m, Rated Head 428 m**
- **Six Generating Units of 250 MW each**
- **Annual Generation of 6950 MU in a 90% dependable year**
- **Provides valuable 1500 MW peaking power to the northern grid**

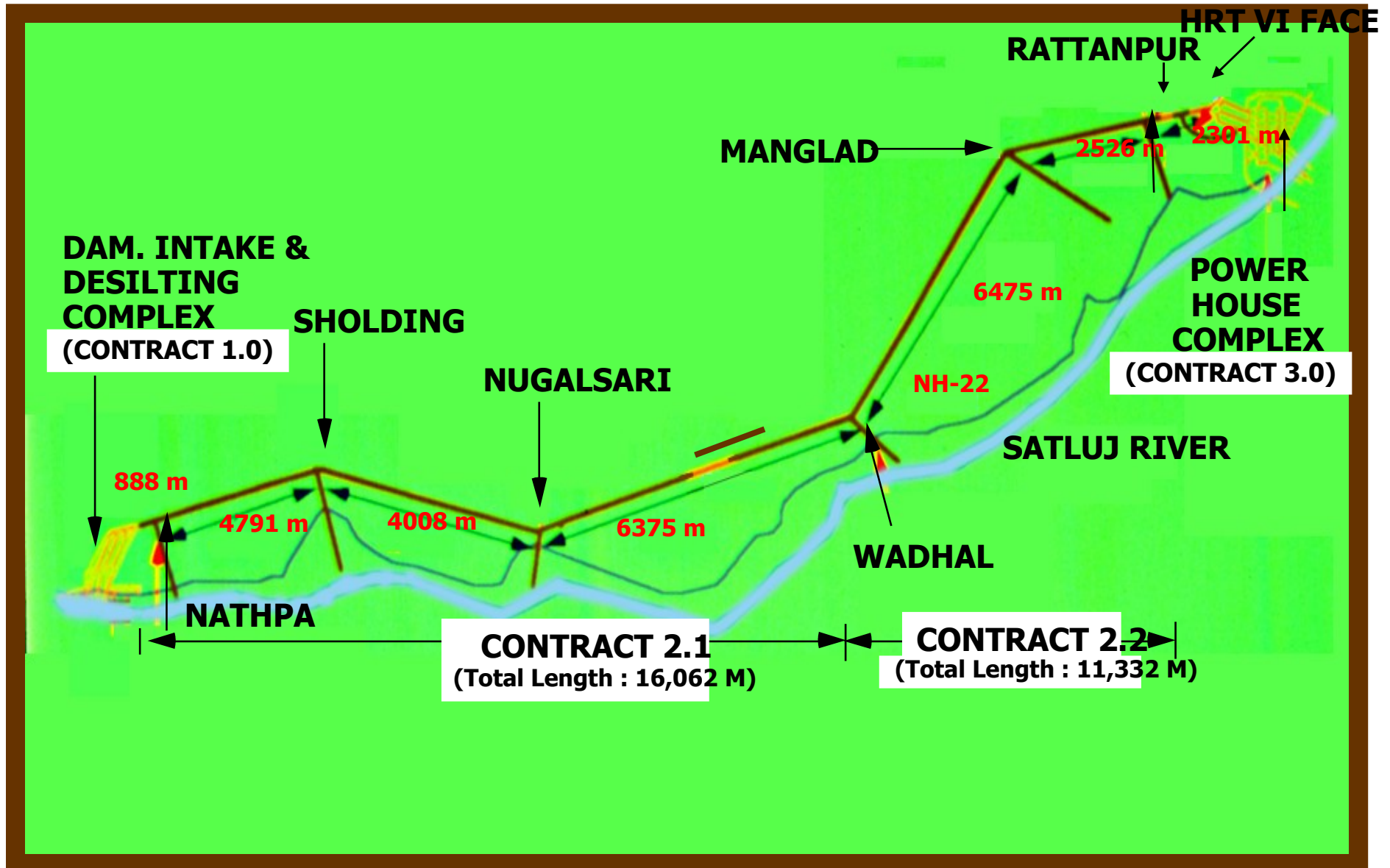
PACKAGING OF PROJECT CIVIL WORKS

Project Civil Works divided into four packages:

- Package-1.0 - Dam, Intake and Desilting Chambers **(INR 4393.80 Mn)***
- Package-2.1 - 17 Km of Head Race Tunnel and Sholding Works **(INR 5179.10 Mn)***
- Package-2.2 - 11 Km of Head Race Tunnel and Surge Shaft **(INR 6081.90 Mn)***
- Package-3.0 - Power House Cavern, Valve House, Transformer House Cavern, Main Access Tunnel, Tail Race Tunnel and Pothead Yard. **(INR 4750.10 Mn)***

*** 1992 Price Index**

NATHPA JHAKRI PROJECT - LAYOUT PLAN



CONTRACT HIGHLIGHTS

CIVIL – UNDERGROUND WORKS

- **Bid Proposals invited from pre-qualified bidders on BoQ – item rate basis.**
- **Contract Conditions based on FIDIC/Standard Bidding Documents of World Bank.**
- **Comprehensive Geo-technical Report (CGR) enclosed with bidding documents.**
- **Pre-bid meeting conducted.**
- **Contracts award to Joint ventures of Indian and foreign companies.**

Contd.....

CONTRACT HIGHLIGHTS

CIVIL – UNDERGROUND WORKS

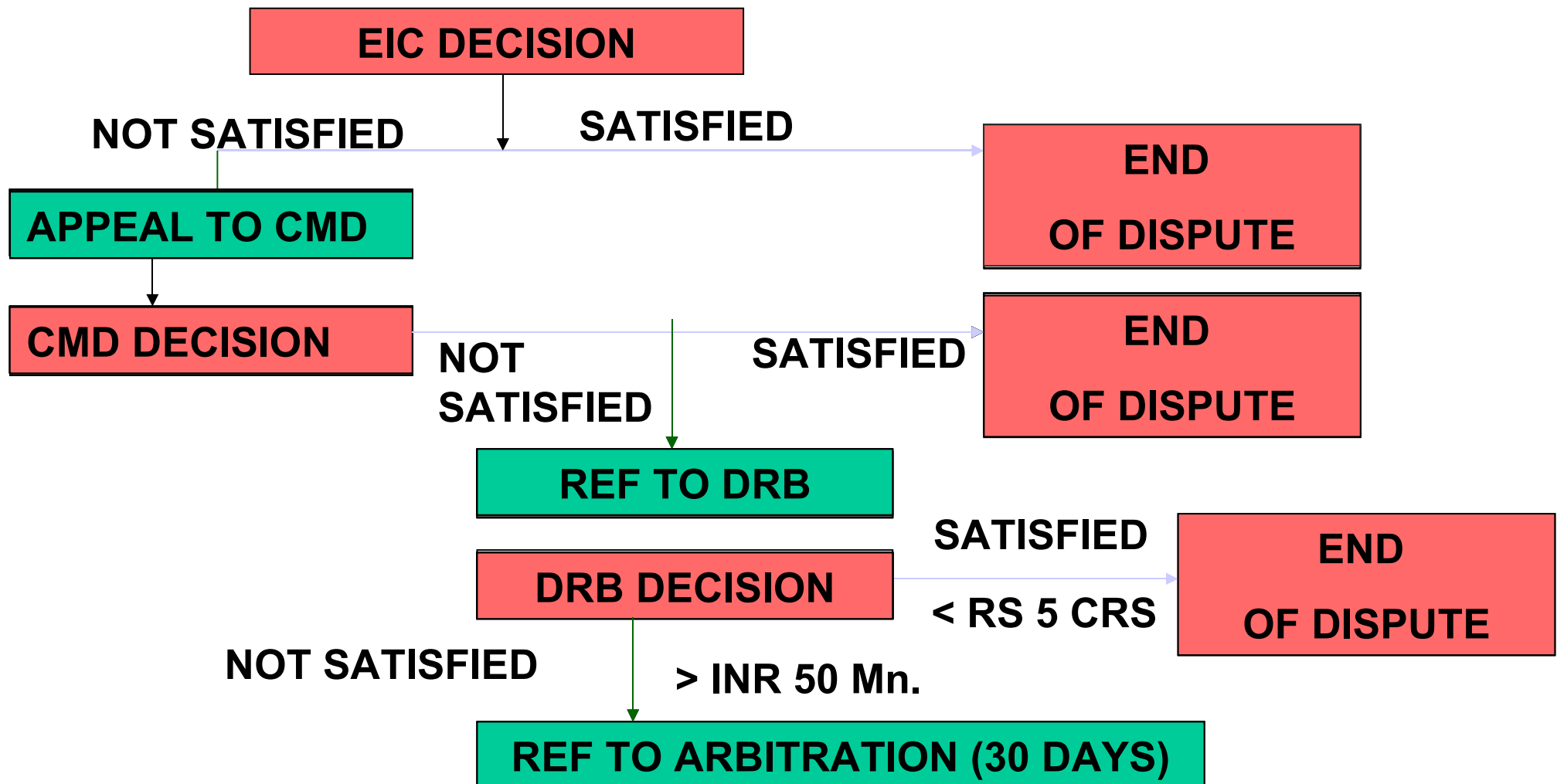
- **Payment for underground excavation based on class of rock.**
- **Entire underground excavation divided into six classes.**
- **Provision for Extra-ordinary Geological Occurrence (EGO) at mutually agreed rates.**
- **Reasonable time related cost compensation accordingly cost for;**
 - **Delay in issue of drawing or instruction**
 - **Delay in possession of site**
 - **Unforeseen Physical conditions or Artificial Obstructions**
 - **Suspension of work(s)**

CONTRACT HIGHLIGHTS

CIVIL – UNDERGROUND WORKS

- Provides interest on delayed payments beyond certain period.
- Provides interest free mobilization and equipment advance.
- Dispute resolution through DRB –
 - **DRB decision upto INR 50 Mn binding on parties.**
 - **Arbitration beyond INR 50 Mn.**
- Engineer – Owner's employee
- Method Statement, excavation cycle, proposed min. quantity of equipment – part of contract agreement.

STEPS IN CLAIMS SETTLEMENT



PROBLEMS ENCOUNTERED IN PROJECT EXECUTION

- **Major slide of approx. 1 Mn cum at dam site on contract commencement.**
- **Geological problems in desilting chambers.**
- **Rock slide and slope destabilization at left bank of dam and outfall area.**
- **Extreme hot water conditions in HRT.**
- **Differing rock conditions.**
- **Encountering of Extra-ordinary Geological Occurrence (EGO) and flowing conditions.**

PROBLEMS ENCOUNTERED IN PROJECT EXECUTION

- **Design changes in rock support system.**
- **In flow of hot water in HRT.**
- **Frequent blockade on National Highway.**
- **Frequent blockade on project approach roads.**
- **Frequent interruptions and failure in primary power supply.**
- **Major floods in 1997 and 2000.**

PROBLEMS ENCOUNTERED IN PROJECT EXECUTION- MAJOR ROCK SLIDE

- **Unforeseen rock slide in July'93 – Approx. 1 Mn cum.**
- **Required relocation of diversion tunnel and removal of slide.**
- **Paid as extra item.**
- **Resulted into claims for cost and time overrun.**



Rock slide removal by blasting

PROBLEMS ENCOUNTERED IN PROJECT EXECUTION – ROCK SLIDE AT RIGHT AND LEFT BANKS – DAM SITE

- Major rock slide at left and right banks - Dam site.
- Not foreseen by contract.
- 750 nos. 200 T rock bolts on left bank and 760 nos. 100 and 40 T rock bolts on right bank installed.
- Treated as extra item and paid.
- Claim for time extension and cost compensation for delay.



PROBLEMS ENCOUNTERED IN PROJECT EXECUTION – GEOLOGICAL PROBLEMS IN DESILTING CHAMBER

- **Desilting chamber encountered shear seams, cavities and rock falls.**
- **Not foreseen by contract.**
- **Treatment required – 12600 mtr long concrete beams, 1900 nos. 60 T cable anchors besides rock bolts, grouted anchors and inspection gallery.**
- **Treated as extra item.**
- **Claim for time extension and cost compensation.**



PROBLEMS ENCOUNTERED IN PROJECT EXECUTION – NATIONAL HIGHWAY BLOCKADE

- **Contract conditions stipulated that approach to project will be suitably improved to National Highway (NH) Standards.**
- **NH blocked frequently, particularly in monsoon season.**
- **Jakhri to Nathpa reach in particular extremely bad.**
- **Claim for time extension and cost compensation lodged.**
- **Attempted to improve Highway situation by taking up matter with govt.**



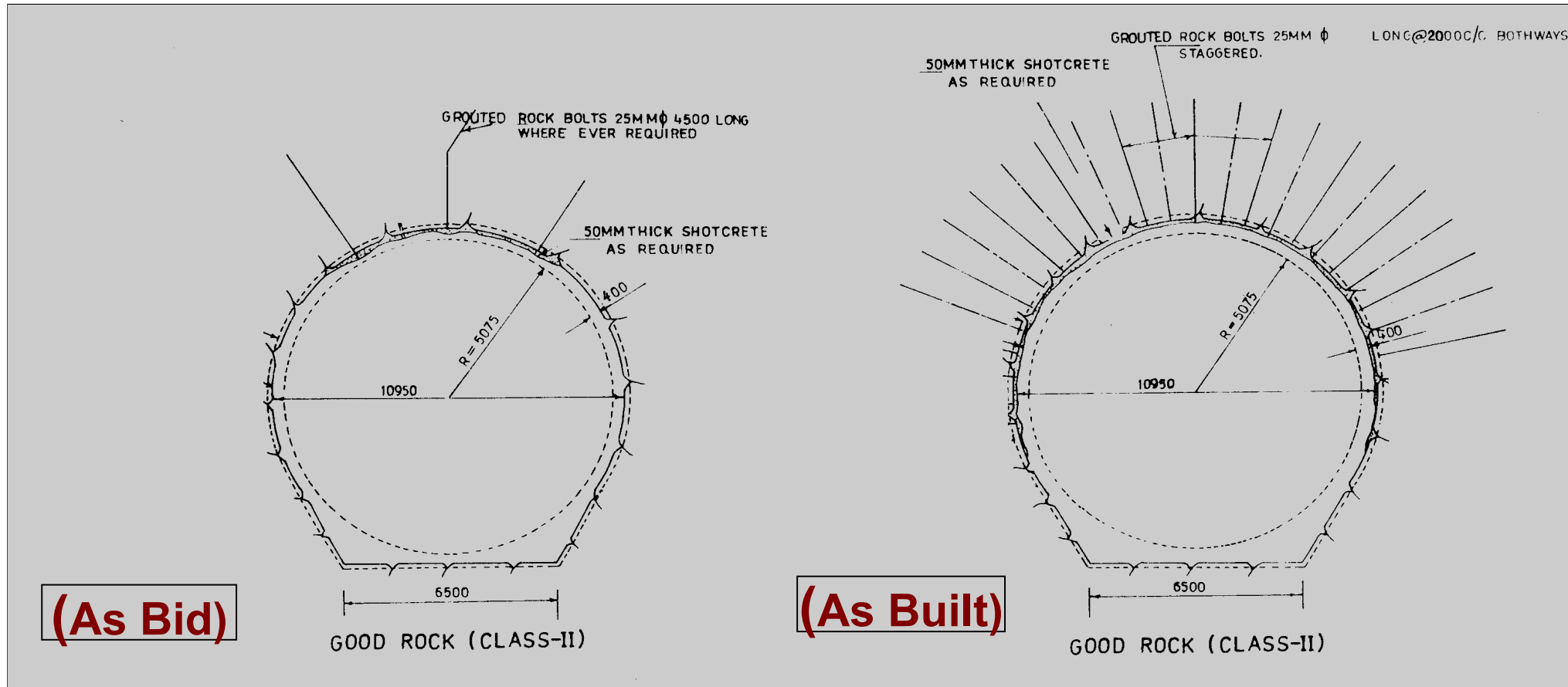
PROBLEMS ENCOUNTERED IN PROJECT EXECUTION – APPROACH ROADS

- **Contract conditions stipulated that named approach roads will be constructed and maintained by SJVNL.**
- **Frequent land slides obstructed approach roads.**
- **SJVNL entered separate contracts with main agencies using approach roads and paid cost of maintenance.**
- **Claim for time extension and cost compensation lodged by contractors.**



Approach road to Nugalsari Adit

PROBLEMS ENCOUNTERED IN PROJECT EXECUTION – DESIGNED CHANGES IN SUPPORT SYSTEM



- Change in rock support design effected construction cycle time resulting in Claim for time extension and cost compensation.
- Payment made based on actual quantity at BOQ rates.

PROBLEMS ENCOUNTERED IN PROJECT EXECUTION – DIFFERING ROCK CONDITIONS

- **Contract classified entire underground excavation of Head Race Tunnel into six class of rocks, the worst being class- VI.**
- **Envisaged class- VI rock quantity only 50m in entire 27km tunnel length.**
- **Actual class- VI length encountered more than 600m.**
- **Flowing conditions encountered claimed to be EGO.**
- **Actual progress less than 0.1m per day against foreseen progress of 1m per day.**
- **Claims settled based on DRB decisions.**

PROBLEMS ENCOUNTERED IN PROJECT EXECUTION – DIFFERING ROCK CONDITIONS



NORMAL TUNNEL FACE



ACTUAL FLOWING CONDITIONS

PROBLEMS ENCOUNTERED IN PROJECT EXECUTION – MAJOR FLOODS

- **Project encountered two major floods – Year 1997 and 2000.**
- **Entire infrastructure at Dam and Desilting chamber sites (Nathpa) lost.**
- **Power House cavity completely flooded.**
- **Contract provides no payment on account of flood.**
- **Contractors claimed damages from insurance.**
- **SJVNL granted adjustable financial assistance to contractors for restoration.**
- **Claim for time extension and cost compensation lost by contractors.**

PROBLEMS ENCOUNTERED IN PROJECT EXECUTION – MAJOR FLOODS – AUG'2000

- **FLOOD DISCHARGE : 6500 CUMECS**
- **FLOOD FREQUENCY : 1 IN 61,000 YEARS**
- **DESIGN DISCHARGE : 5600 CUMECS**
- **DESIGN FREQUENCY : 1 IN 10,000 YEARS**

FLASH FLOOD WAS IN THE FORM OF A 15 M HIGH WAVE OF WATER.

PROBLEMS ENCOUNTERED IN PROJECT EXECUTION – MAJOR FLOODS

- The infrastructure provided by SJVNL and lost during flood restored at SJVNL cost within 9 months.
- Entire situation brought to pre-flood situation in 9 months.



Approach Bridge before
and after flood

PROBLEMS ENCOUNTERED IN PROJECT EXECUTION – MAJOR FLOODS

- Contractors provided infrastructure restored within 9 months.
- SJVNL provided adjustable financial assistance within 2 weeks of flood occurrence.
- Contract provided for Contractors All Risk (CAR) policy and invoked by contractors.

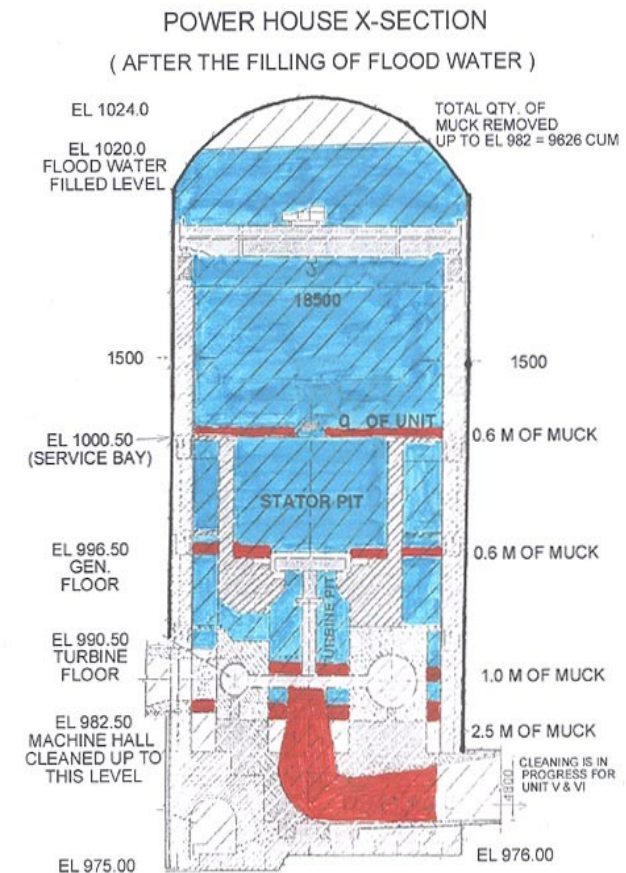
Before Flood



After Flood

PROBLEMS ENCOUNTERED IN PROJECT EXECUTION – MAJOR FLOODS

- Power house cavity flooded in Aug'2000 flood.
- Contractor restored the pre-flood situation in 9 months.
- SJVNL paid for removal of slush and flooded water as extra item.
- Contractor claimed for time extension and cost compensation.



PROBLEMS ENCOUNTERED IN PROJECT EXECUTION – CLAIMS MANAGEMENT

- **Category of claims lodged by contractors**
 - Rates for extra items.
 - Rate revision for deviated items.
 - New rates/ compensation for differing conditions, EGO etc.
 - Loss of production/ financial loss claims.
 - Claim for time extension and cost compensation thereof.

PROBLEMS ENCOUNTERED IN PROJECT EXECUTION – CLAIMS MANAGEMENT

- **Approach adopted for settlement :**
 - **Acknowledgement**
 - **Presentation - record verification**
 - **Review and evaluation**
 - **Negotiation if found admissible**
 - **Settlement**
 - **Rejection if found to be un-tenable.**
 - **Reference to DRB by aggrieved party.**

DISPUTE REVIEW BOARDS (DRB)

- **One DRB for each contract.**
- **Consists of three members one each nominated by respective party and third member selected by first two members.**
- **DRB decision binding for claim amount upto INR 50 Mn.**
- **DRB in place immediately after contract signing.**
- **One Additional DRB for each contract exclusively for EOT claims**
- **All DRB members experienced in the type of work contracted and with technical background.**

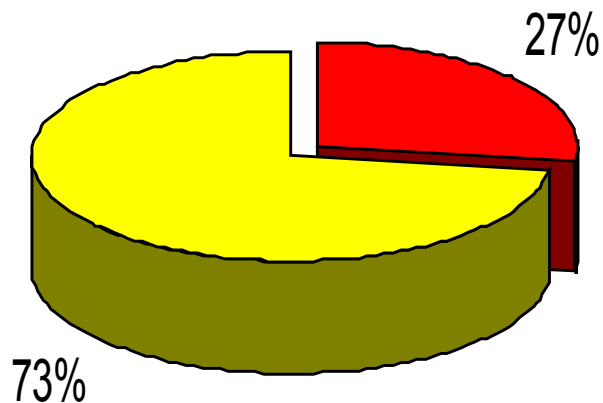
DISPUTE REVIEW BOARDS

-EXPERIENCE AT NJHEP

CONT NO.	CLAIMS REFERRED		CLAIMS DECIDED			CLAIMS UNDER CONSIDERATION	
	NOS.	VALUE OF CLAIMS (INR Mn)	NOS.	CLAIMED AMOUNT (INR Mn)	AMOUNT AS PER DECISION (INR Mn)	NOS	CLAIMS AMOUNT (INR Mn)
1.0	29	590	27	540	170	2	50
2.1	35	1070	33	940	210	2	120
2.2	44	1180	43	1140	250	1	40
3.0	34	2870	26	740	290	8	2120
TOTAL	142	5710	129	3360	920	13	2340

ANALYSIS OF DRB DECISIONS

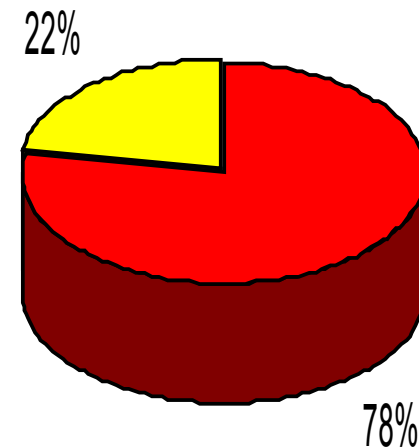
IN TERMS OF CLAIMS (NOS.)



■ REJECTED

■ DECISIONS IN FAVOUR OF CONTRACTORS

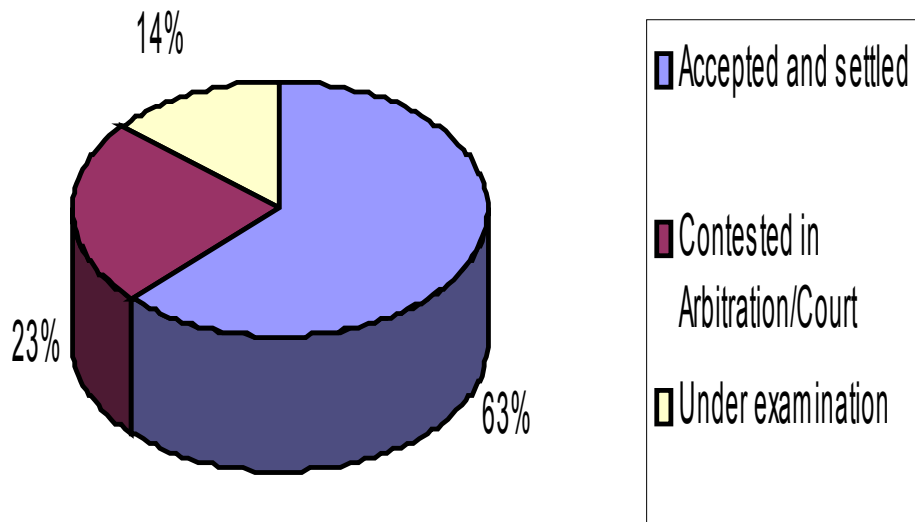
IN TERMS OF AMOUNTS



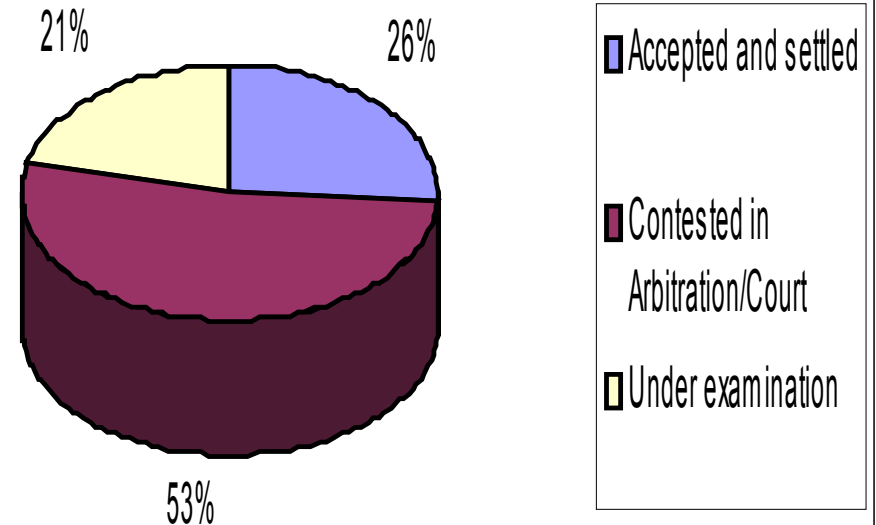
■ REJECTED

■ AWARDED IN FAVOUR OF CONTRACTORS

ANALYSIS OF DRB DECISIONS



In terms of numbers



In terms of amount

LESSONS LEARNT FROM NATHPA JHAKRI HYDRO-ELECTRIC PROJECT



**and suggestions for better
Contracting Practices**

EQUITABLE CONTRACT CONDITIONS ESSENTIAL FOR UNDERGROUND WORKS

- **Entire risk on the contractor**
 - Discourages responsible contractors
 - Bidders tend to include higher contingency
 - Results into more disputes & litigation
- **Sharing of risks fairly**
 - Fewer law suits and delays
 - Better quality
 - Competitive price

CONTRACT DOCUMENTS

■ Essential elements

- Complete and unambiguous specifications.
- Accurate plan.
- Geological and sub-surface information.
- Bill of quantities
- Complete commercial conditions.
- Adopt some tested model conditions.
- **Avoid disclaimer clauses – share risks**

CONTRACT DOCUMENTS

- **Should contain provisions to deal**
 - **Changes**
 - **Differing site conditions**
 - **Suspension of works**
 - **Variation in estimated quantities**
 - **Time extensions**
 - **Bonus for early completion and LD for delay**
 - **Claims**
 - **Disputes**

CONTRACT DOCUMENTS

- **Provisioning of**
 - **Documentation and record keeping.**
 - **Photographs**
 - **Cost records – overhead records**
 - **Job Schedule and actual progress**
 - **Daily Reports – Weather, Time Cards**
 - **Minutes of Meeting, Delay Records**
 - **Material and Equipment Records**
 - **Accident Records**
 - **Claim handling**
 - **Mechanism for formal dispute resolution**

CLAIM HANDLING

- **Approach to claim settlement**
 - Acknowledgement
 - Presentation
 - Review and evaluation
 - Negotiation

ALTERNATIVE DISPUTE RESOLUTION MECHANISM

- Provide alternate to conventional methods for dispute resolution. It's:
 - Less time consuming
 - Resolves disputes during the course of contract execution.
 - Is involved since commencement of contract.
 - Understands technical problems.
 - Bid prices are reduced.
 - Time and cost over runs are minimized.

LAST BUT NOT THE LEAST

- Contractor and owner should be on equal footing.
- Good faith essential.
- Understand the opponent.
- Build confidence in each other.
- Evaluate contractors' demands objectively.
- Trust your contractor.
- Don't make agreements which are harsh and difficult to follow. Consider contractor as our partner in project building

LAST BUT NOT THE LEAST

- Ministry of Power has set up a Committee under Chairman CEA to prepare model Contract documents for the use of all the hydro sector developers.
- The task force will get the following documents:
 - Standard bidding documents Guidelines.
 - Works Manual Guidelines
 - Arbitration Manual Guidelines
 - Schedule of rates and construction cost indices Guidelines
 - Guidelines for grading of construction agencies
- Construction Industry Development Council (CIDC) is appointed as Consultant for drafting the document.

Thank you