**IS 10777 : 2024**

***भारतीय मानक***

***Indian Standard***

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***खुले उत्खनन के लिए विस्फोटन सहित याांत्रिक साधनों द्वारा चट्टान उत्खनन की इकाई दर विश्लेषण के लिए प्रोफार्मा***

*(* दूसरा *पुनरीक्षण )*

**Proforma for Analysis of Unit Rate of Rock Excavation by Mechanical Means Including Blasting for Open Excavation**

*( Second Revision )*

ICS 93.160

@ BIS 2024



भारतीय मानक ब्यूरो

BUREAU OF INDIAN STANDARDS

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**October 2024 Price Group X**

Measurement and Cost Analysis of Works for River Valley Projects Sectional Committee, WRD 23

FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards after the draft finalized by the Measurement and Cost Analysis of Works for River Valley Projects Sectional Committee was approved by the Water Resources Division Council.

Excavation of foundations of various structures such as canals, dams, powerhouses, etc. in rock is done generally by mechanical means. The excavated rock may or may not be used in aggregate processing, depending on its quality. The mode of excavation depends on the site conditions, type and use of machinery and equipment and the use of ordinary or controlled blasting. Where controlled blasting is resorted to, a separate analysis is required for the same. Underground and tunnel excavation requires to be considered separately and where dewatering is involved, the excavation needs to be dealt with separately as well.

This standard was first published in 1983. The first revision of the standard was brought out in 1994 to cover the excavation by blasting means and update the standard based on experiences gained from the field over time. The second revision of this standard has been brought out to bring the standard in sync with the latest field practices observed while using the standard and to bring it in the latest style and format of the Indian Standards. The major changes incorporated in this second revision of the standard are:

1. Relevant taxes and duties, wherever applicable, have been added to the calculation of unit rates;
2. Provisions for contractors’ overheads and profits have been indicated; and
3. Provisions to account for swell factor and bulk volume in case of earthwork by machinery have been indicated.

The composition of the Committee responsible for the formulation of this standard is given in Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS 2 : 2022 'Rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded-off value should be the same as that of the specified value in this standard.

**IS 10777 : 2024**

*Indian Standard*

PROFORMA FOR ANALYSIS OF UNIT RATE OF ROCK EXCAVATION BY MECHANICAL MEANS, INCLUDING BLASTING FOR OPEN EXCAVATION

*( Second Revision )*

**1 SCOPE**

This standard lays down proforma for analysis of unit rate of rock excavation by mechanical means inclusive of blasting for open excavation.

NOTE – The unit cost of dewatering has not been accounted for in this standard and should be dealt with separately. The proforma for unit rate analysis of dewatering is covered in IS 14590.

**2 REFERENCES**

The standards listed given below contain provisions, which through reference in this text constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

|  |  |
| --- | --- |
| *IS No.* | *Title* |
| IS 11590 : 1995 | Guidelines for working out unit rate cost of the construction equipment used for river valley projects (*first revision*) |
| IS 14590 : 1998 | Proforma for analysis of unit rate of dewatering |

**3 CLASSIFICATION**

**3.1** The excavation may be classified into the following two classes:

1. Excavation in rock requiring blasting; and
2. Excavation in rock without blasting.

**3.2** The proforma recommended for use, in the analysis of the unit rate of rock excavation by mechanical means including blasting for open excavation, is given in Table 1. Where controlled blasting is resorted to, separate analysis should be made for the same. Tunnels and underground excavation should also be considered separately and where dewatering is involved, should be covered separately as well.

**Table 1 Proforma for Analysis of Unit Rate of Rock Excavation**

(*Clause* 3.2)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sl No.** | **Item** | **Unit** | **Quantity** | **Rate** | **Amount** | **Remarks** |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| i) | *Drilling* |  |  |  |  |  |
| 1. Drilling machinery and equipment | h |  |  |  |  |
| 1. Drill rod | m |  |  |  |  |
| ii) | *Blasting* |  |  |  |  |  |
| 1. Gelatine and/or gunpowder | kg |  |  |  |  |
| 1. Detonators | Nos. |  |  |  |  |
| 1. Lead wire | m |  |  |  |  |
| 1. Stemming including exploder charges | 40 percent of detonators cost |  |  |  |  |
| iii) | *Ripping and Dozing* |  |  |  |  |  |
| 1. Machinery | h |  |  |  |  |
| iv) | *Mucking, Haulage and Disposal* |  |  |  |  |  |
| 1. *Machinery and equipment* | h |  |  |  |  |
| 1. Loading equipment |  |  |  |  |
| 1. Haulage equipment |  |  |  |  |
| 1. Disposal equipment |  |  |  |  |
| 1. Labour | Man days |  |  |  |  |
| v) | *Scaling* |  |  |  |  |  |
| 1. Machinery and equipment | Nos. |  |  |  |  |
| 1. Labour | Man days |  |  |  |  |
| vi) | *Ancillaries and Incidentals*1) | Percentage |  |  |  |  |
| 1. Proportional cost of the following job facilities: 2. Labor and staff quarters 3. Service roads 4. Electric power supply system 5. Water supply system 6. Sanitation system 7. Drainage system 8. Surveying 9. Other amenities including first aid and   medical facilities   1. Safety operation charge 2. Explosive magazine 3. Stores |  |  |  |  |
| 1. Maintenance and operation of items mentioned at vi (a) |  |  |  |  |
| 1. Supervisory works establishment |  |  |  |  |
| vii) | *Contingencies* | Percentage |  |  |  |  |
| viii) | *Overheads and profits*2) | Percentage |  |  |  |  |
| ix) | *Taxes and duties*: |  |  |  |  |  |
| 1. Tax on works |  |  |  |  |  |
| 1. Services tax |  |  |  |  |  |
| 1. Labour Cess |  |  |  |  |  |
| 1. VAT |  |  |  |  |  |
| x) | *Total Rate*, |  |  |  |  |  |
| xi) | *Total quantity of Excavation, Q* | m3 |  |  |  |  |
| xii) | *Cost,* | Per m3 |  |  |  |  |
| NOTE:  **1** Care should be taken that items under this clause should not be included in analysis of unit cost of construction equipment (*see* IS 11590)  **2** Contractors’ overheads and profit may be decided suitably in the project.  **3** The overheads shall include establishment, office stationery, general tools and plant, staff cars and their running and maintenance, insurance, workman’s compensation, telephones and telecommunication facilities, security arrangements, etc., In case of earthwork by machines, swell factor and bulk volume shall be accounted. | | | | | | |

**ANNEX A**

(*Foreword*)

**COMMITTEE COMPOSITION**

Measurement and Cost Analysis of Works for River

Valley Projects Sectional Committee, WRD 23

|  |  |
| --- | --- |
| *Organization* | *Representative(s)* |
| National Hydroelectric Power Corporation, Faridabad | Executive Director  Shri Nadeem Hasan **(*Chairperson*)** |
| Bhakra Beas Management Board, Chandigarh | Shri Rajesh Gupta |
| Central Electricity Authority, New Delhi | Shri Shivcharan Chhirolia  Shri Bharat Gupta (*Alternate*) |
| Central Water Commission, New Delhi | Shri Kiran Pramanik  Shri Ajay Shivlal Banode (*Alternate*) |
| Energy Infratech Private Limited, Gurugram | Shri Manoj Kumar Gupta  Shri Pramod Chand Tewari (*Alternate* I)  Shri Sudheer Kumar Singh (*Alternate* II) |
| Ferro Concrete Construction (India) Private Limited, Indore | Dr. Mahavir Bidasaria  Shri Anupam Bidasaria (*Alternate*) |
| Indian Institute of Technology, Roorkee | Prof Gopal Chauhan |
| Irrigation Department, Govt. of Kerala, Thiruvananthapuram | Shri K. A Joshy |
| Irrigation Research Institute, Roorkee | Shri Dinesh Chandra  Shri Shankar Kumar Saha (*Alternate*) |
| Karnataka Power Corporation Limited, Bangaluru | Shri Chinnasomaiah |
| Larsen & Toubro Construction India Ltd., New Delhi | Shri Sanjay Pajni  Shri Sravan Kumar Meghavarupu (*Alternate*) |
| National Hydroelectric Power Corporation, Faridabad | Ms. Swati Garg  Ms. Renu Bhadrasen (*Alternate* I)  Shri Anil Singh Bhandari (*Alternate* II) |
| National Thermal Power Corporation Limited, Noida | Shri Shailendra Kumar Pandey  Shri Jagat Singh Yadav (*Alternate*) |
| Sardar Sarovar Narmada Nigam Limited, Gandhinagar | Shri K B Parmar  Shri V.K. Gupta (*Alternate*) |
| Satluj Jal Vidyut Nigam Limited, Shimla | Shri M.C. Verma |
| Tehri Hydro Development Corporation India Ltd., Rishikesh | Shri J. S. Rawat  Shri Atul Kumar Singh (*Alternate*) |
| Water and Power Consultancy Services Limited, New Delhi | Shri Anupam Mishra  Shri Amitabh Tripathi (*Alternate*) |
| Water Resources Department, Govt of Madhya Pradesh, Bhopal | Chief Engineer, Bodhi |
| Water Resources Department, Govt of Punjab, Chandigarh | Chief Engineer Design |
| Water Resources Development Organization, Bangalore | Shri Satish M |
| In Personal Capacity *(Flat No-207, Bhagirathi Apartment, B-9/14, Sector-62, Noida)* | Shri H. L. Arora |
| BIS Directorate General | Shri Dushyant Prajapati, Scientist ‘E’/Director And Head (Water Resources) [Representing Director General (*Ex*-*officio*)] |

*Member Secretary*

Shri Vaibhav Yadav

Scientist ‘B’/Assistant Director

(Water Resources), Bis