

# TECHNICAL SPECIFICATION & WORK SPECIFICATIONS

## CONTENT

NO	DESCRIPTION	PAGE
1	General Specification & List of I.S. Codes	1 To 5
2	Specifications for Providing, supplying and installation of chlorination plant @ various SHW	6 To 16

## **GENERAL SPECIFICATION**

1. The Specification attached with this tender are in modification of the specification for the respective item as required for this work.
  2. All the petty items of this work shall be carried out in workman like manner.
  3. Work order book is maintained on work site as per present practice and the contractor shall sign and carry out promptly the order given by the Engineer-in-charge.
  4. The contractor shall maintain a regular account of receipt and use of controlled materials purchased by him and or supplied by the department.
  5. De-watering of trenches foundation etc. shall be done by the contractor at his own cost during execution of all items of this work till completion in all respect.
  6. The contractor shall provide his own arrangement conveyance and the carting of pipes specials etc. to be supplied by department and surplus excavated stuff from and to site of work.
  7. Extra charges or claims in respect of extra work shall not be allowed unless the work to which the rate are already distinguished from execution of the contractor. He shall have to keep the account of such materials in suitable book, which should be available for inspection by the Engineer- in- charge or his representative. The contractor shall be responsible for proper handling and safe custody of all materials issued to him by the department.  
The contractor shall have to provide necessary shoring, strutting arrangement for protecting the excavated portion of trench. Similar deep structure when excavation goes beyond 1.5 mt. from G.L. proper care shall to be taken to avoid due to falling of Kachcha wall portion. No extension in time limit will be considered due to such carelessness and delay. Contractors shall have to provide at his own cost all ways and means required for the excavation of the trench pit etc.
  8. **FINALISING ITEM OF WORK:**  
The details given in design plan section or specification schedule, general condition etc., shall be taken in the consideration and all these items shall have to be carried out. In case of any discrepancy of these the decision of the Project Director Urban Cell, G.W.S.S.B. shall be final and binding to the contractor.
  9. The contractor shall have to pay town duty and or octroi if any to the respective authorities for which no extra payment will be made to the contractor.
  10. The contractor shall be responsible to pay compensation to his staff and to his labor according to the labor compensation rules.
  11. The drawing prepared is for general guidance. However, during execution, if it is found necessary Engineer- in- charge will prepare working drawing showing details and supplied to the contractor for execution and it will be binding to the contractor to carry out work accordingly without claiming any extra cost.
  12. The work shall be executed on strict accordance with the plans and specifications. Only the best materials and the soundest construction shall be permitted and every portion of the work shall be executed in like manner to the satisfaction of the Engineer- in- charge whose decision shall be final and binding to the contractor. All the materials used in work shall be of the best quality and any materials rejected shall be removed from the site of work by the contractor at his own cost within 24 hours.
  13. The specification attached with this tender shall strictly apply and in addition following general conditions are also bound to the contractor.
- 
1. **WORK:**  
All petty items occurring in the work shall be carried out in workman like manner as per specifications given in P.W.D. Hand book vol.I & II and as per instruction of the Engineer- in-charge from time to time. The contractor shall have to clear the site of work before the work is commenced and also after the work allotted to him is completed for which separate claim cannot be made.
  2. **Other responsibilities:**
    - i) The contractor shall engage an experienced and qualified Engineer as his authorized agent for the work who shall be responsible for the work, and shall take from time to time such order as may be given by the Engineer- in- charge and carry out promptly.
    - ii) In addition to the requisite stores the contractor shall provide at his cost suitable temporary office with a cover area of about 37 sq.mt. With a particular sitting arrangement inside and necessary finished furnished for the use of owners staff while the work is in progress.
  1. The contractor shall provide at his own cost all laborers, pegs, strings, the other materials as may be required for lining and setting out and for taking measurement of the work. The contractor shall also provide at his own cost satisfactory and adequate facilities like scaffolding, ladders, etc. for checking, supervision and measuring the contractor's work by the Engineer. The contractor shall have to provide skilled and unskilled laborer free of cost for the above.
  2. The contractor shall responsible for proper handling and safe use of the materials delivered to him by owner for use of work and shall return all the surplus materials immediately after completion of the work along with account conforming the balance. If any material, returned is

found short or damaged or unserviceable the cost there of fixed by the Engineer-in- charge shall be recovered from the contractor.

3. The contractor shall provide at his own expense necessary housing accommodation, water supply and sanitary arrangement for his staff and laborers and shall pay direct to the authorities concerned all rates and taxes royalties and other charges.
4. Water required for the execution of the work shall be supplied by the contractor at his own cost in the manner satisfactory to the Engineer- in- charge. Water required for testing shall also be supplied by the contractor.
5. Contractor shall be responsible for any accident to work or any damage done to adjoining property in which case he shall have to make it good at his own expenses.

**3. Declaration:**

1. The contractor shall make declaration as under:  
'I am thoroughly conversant with the local cognition as regards the availability or otherwise of all construction materials, skilled and unskilled laborers on which I have based and tender my rates for this work. The specifications, drawing etc., of this work have been carefully studied and understood by me before the submission of this tender.'
2. In case of offer based on contractor's own design in acceptance then the contractor shall supply free of cost six copies of detailed plans and all relevant design calculation for scripting and record of work immediately on acceptance of tender. The design and drawing submitted by the contractor shall be got approved by the department before commencing execution of work.
3. In case of offer accepted based on contractor's own design and completion of work the contractor shall also have to supply free of cost six copies of detailed plans of work as executed for record.
4. In case of contractor's own design the tenderer shall have to furnish the details of design calculation, quantity of various items and all RCC and other structural details together and working drawing shall be supplied by the tenderer after the design got approved by the competent authority. The contractor shall be responsible for the technical soundness of the design submitted by him. The structure shall be designed as the best recognized engineering practice and as per current Indian Standard codes of practice and if any provisions are found to be inadequate or faulty necessary modification shall be made by the contractor at his entire cost in order to get required high soundness as well as performance etc., and no extra payment shall be made for such modification etc.
5. In case of departmental design the plans enclosed along with the tender may be further elaborated as and when necessary with details working design and drawing supplied to the contractor. He shall be bound to carry out the work as per the approved design, drawings, specifications and conditions for the accepted tender amount. In case of any discrepancy in plan and specification approved design will form the base for execution of work and decision of the competent engineer of the owner will be final for contractor for carrying out the work at the accepted tender amount.
6. Corrections, additions and declaration in form in English should be deemed to have been incorporated in Gujarati version of the corresponding clause irrespective of the fact that the Gujarati version is correct or otherwise for interpretation purpose also the meaning of English version shall be final.

**General Specification of Materials:**

Specification of materials will be as per PWD Hand book Vol –I & II and standard specifications (Material items) as adopted by Gujarat Water supply and Sewerage Board and as per latest revision of Indian Standard.

**General:**

- 1 All materials to be used shall conform to the relevant specifications as per the latest version of Indian Standard unless otherwise specified in the detailed specifications of item of work.
2. Wherever a reference to any Indian Standard appears in the specification, it shall be taken to mean as a reference to the latest version of the standard.
3. Tests for materials shall be got carried out by the contractor when the same are specified in the specifications. Tests shall also have to be carried out even though the same are not specifically mentioned in specifications, if it is specified by the Engineer-in-charge. If the Engineer-in-charge instruct the same are required to be carried out in Government laboratories and cost there of shall be entirely borne by the contractor.
4. No collection of materials shall be made before it is approved from the Engineer in charge.
5. The item includes the supply of materials at site of work or store as specified including railway freight, loading, carting, unloading, stacking as directed, insurance, local taxes etc.
6. Collection of approved materials shall be done at site of work in a systematic manner. Materials shall be stored in such a manner as to prevent deterioration on intrusion of foreign matter and to ensure the preservation of their quality and fitness for the work.
7. Materials if rejected by the Engineer-in-charge shall be immediately removed from the site of work. If they are not removed within twenty four hours of receiving such an intimation Engineer-

- in- charge shall get the same removed at contractor's cost. The Engineer- in -charge shall dispose off such materials in the manner as he choose and the contractor shall not be entitled to receive any cost of such materials.
8. Approval to the samples of various materials, given by the Engineer-in -charge will not relieve the contractor from the responsibility of replacing the defective materials brought on site or materials used in the work found defective at a later date. The contractor shall have no claim to any payment or compensation what ever on account of any such materials being rejected by the Engineer- in- charge.
  9. The contractor shall be responsible for observing the laws rules and regulations under the prevailing Act and the rules prescribed by the Government from time to time.
  10. All works shall be carried out as per instruction of Engineer-in-charge.
- GENERAL CONDITIONS:**
- 1 Tenderer may pay earnest money in form of demand draft of local bank on or before date of submission of tender. EMD by cash or cheque or Bank Guarantee shall not be accepted if not specified in condition.
  2. The tender should be filled with ink.
  3. In case of item rate tender i.e. B-1 tender the amount shown against each item in the tender must tally with product of its rate, and quantity on basis of unit given. If there is any error, than product of the rate and quantity or amount whichever is less shall be allowed to the tenderer and considered for preparing comparative statement and making payment.  
The tenderer should give correct total in figures as well as words after adding amounts of all items. In case there is any error the tenderer will be bound by the total given by him of the current total (of all the item) whichever is less.
  4. The contractor should attach the following documents with the tender.
    - i) Certificate of registration as approved contractor in respect of tenderer from registered contractor.
    - ii) Solvency certificate for an amount equal to 20% of amount put to tender.
    - iii) Income tax clearance certificate from income tax officer concerned.
    - iv) List of work on hand showing cost of work yet to be completed with certificate from the head of office concerned.
    - V) List of contract equipment available with him giving details of their capacity, present condition and location.
    - vi) Copy of power of attorney and partnership deed in case of firm tendering work.
  5. The contractor shall not be entitled for any claim due to natural calamities such as earth quake, heavy rain etc.
  6. Government shall not be responsible for any accidents. The contractor should take insurance for the work for accidents on work.
  7. The contractor shall have to take group insurance of laborers engaged for the work.

**List of Indian Standards to be followed where ever applicable**

<b>NO</b>	<b>DESCRIPTION</b>	<b>I.S. Code OR Latest Revision</b>
<b>1</b>	CODE OF PRACTICE FOR PLAIN AND REINFORCED CONCRETE	456-2000
<b>2</b>	CRITERIA FOR EARTH QUAKE RESISTANT DESIGN OF STRUCTURES: (GENERAL PROVISIONS AND BUILDINGS.)	1893-2002 (PART-I)
<b>3</b>	CRITERIA FOR EARTH QUAKE RESISTANT DESIGN OF STRUCTURES: (LIQUID RETAINING TANKS, ELEVATED AND GROUND SUPPORTED.) (DRAFT CODE)	1893-2002 (PART-II)
<b>4</b>	<i>CODE OF PRACTICE FOR DESIGN LOADS(OTHER THAN EARTH QUAKE) FOR BUILDINGS &amp; STRUCTURES WIND LOADS.</i>	875-1987 (PART-III)
<b>5</b>	CODE OF PRACTICE FOR DESIGN LOADS(OTHER THAN EARTH QUAKE) FOR BUILDINGS & STRUCTURES SPECIAL LOADS & LOADS COMBINATIONS LOADS.	875-1987 (PART-V)
<b>6</b>	DUCTILE DETAILING OF REINFORCED CONCRETE STRUCTURES SUBJECTED TO SEISMIC FORCES- CODE OF PRACTICE.	13920-1993
<b>7</b>	CODE OF PRACTICE FOR CONCRETE STRUCTURE FOR THE STORAGE OF LIQUIDS.	3370-1965 (PART-I & II) 3370-1967 (PART-III & IV) 3370-2009
<b>8</b>	CRITERIA FOR RCC STAGING FOR OVERHEAD WATER TANKS	11682-1985
<b>9</b>	SPECIFICATION FOR HIGH STRENGTH DEFORMED BARS & WIRES FOR CONCRETE REINFORCEMENT	1786-1985
<b>10</b>	SPECIFICATION FOR HOT ROLLED MILD STEEL ,MEDIUM STEELS & HIGH STRENGTH DEFORMED BARS FOR CONCRETE REINFORCEMENT	1139-1966

The tenderer should follow the I.S. codes which are not written above but in connection with the work which he will execute.

## **TECHNICAL SPECIFICATION**

Demolition of Old Barda 4.0 MLD Filter plant at Advana HW Under : M & R to  
Porbandar Group RWSS, Taluka : Porbandar District: Porbandar

## **GENERAL**

### **GENERAL NOTES:**

1. The specifications attached to this tender are modification to the specifications for respective items; all these items shall strictly apply to P.W.D. Hand Book Volume 1 and 2.
2. Quantities given in the schedule – B of tender are approximate. The contractor shall have no claim for rate in excess in his tendered rate for any variation in quantity.
3. The contractor shall have no claim for natural calamities e.g. earthquakes, storms, flood etc.
4. Due to modifications made in the project at the time of execution some item(s) may have to be deleted for which no claim shall be allowed.

## INDEX

NO	PARTICULARS
1	Demolition including stacking of serviceable material and disposal of unserviceable material with all lead and lift (i) RCC work
2	Demolition of brick work and stone masonry including stacking of serviceable material and disposal of unserviceable material with all lead and lift (ii) lime mortar



## **GENERAL SPECIFICATION**

All the items under this group shall conform to the detailed specifications given for each of the items, in addition to the bye-laws of the local bodies within whose jurisdiction the items are executed.

Where the bye-laws of the local bodies differ from the detailed specifications for an item, the bye-laws shall override these specifications.

All damage done to floors, walls, etc., during the process of fixing water supply drainage and sanitary installations shall be restored to their original condition.

All the pipes, fittings and appliances shall be free from cracks and other flaws before and shall be undamaged in all respects during and after fixing. Any damage shall be rectified satisfactorily.

All the pipes, fittings and appliances shall be thoroughly cleaned before fixing and particular care shall be taken to see that no extraneous material gets into them during fixing.

All items required for ensuring leak proof jointing and efficient functioning of the pipes and appliance should be carried out without extra claims,

All cutting and waste of pipes involved in fitting them shall be included in the rate.

## **MATERIALS AND WORKMANSHIP**

1. Introduction
  - 1.1. This part of the Specification sets out the general standards of materials to be supplied and the workmanship required to be ensured by the Contractor. All component parts of the Works shall, unless otherwise specified, comply with the provisions of employer's requirement or be subject to the approval of the Employer. Particular attention shall be paid to a neat, orderly and well-arranged installation carried out in a methodical competent manner.
2. Reference Specifications and Standards
  - 2.1. Where reference is made in the Specification to a British Standard Specification (hereinafter abbreviated to 'B.S') issued by the British Standards Institution of 2, Park street, London W.I., or to an Indian Standard Specification (I.S.) issued by the Bureau of Indian Standards, (earlier known as Indian Standard Institution), Manak Bhavan, 9 Bahadur shah Zafar Marg, New Delhi 110 002, or American Society for Testing and materials (ASTM) issued by ASTM 1916 Race Street, Philadelphia, P.A., 19103, U.S.A. or American national Standards Institute (ANSI) issued by ANSI 1430, Broadway, New York, N.Y., 10018, U.S.A. or Japanese Industrial Standards (JIS) issued by Japanese Standards Association, 4-1-24, Akasaka, Minato-Ku, Tokyo 107, Japan or to any other equivalent Standard it shall be to the latest revision of that Standard at the Tender opening date.
  - 2.2. The Contractor may propose at no extra cost to the Employer, the use of any relevant authoritative Internationally recognised Reference Standard.
  - 2.3. All details, materials and equipment supplied and workmanship performed shall comply with the specified Standards. If Tenderer offers equipment to other Standards, the equipment/material should be equal or superior to those specified and full details of the difference shall be supplied.
  - 2.4. In the event of conflict between this Specification and the Codes for equipment, provisions of this Specification shall govern. Certain specifications issued by national or other widely recognized bodies are referred to in this Specification. In referring to the Standard Specifications the following abbreviations are used:

IS	:	Indian Standard
ANSI	:	American National Standards Institute
API	:	American Petroleum Institute
ASME	:	American Society of Mechanical Engineers
ASTM	:	American Society of Testing and Materials
AWS	:	American Welding Society
AWWA	:	American Water Works Association
ISO	:	International Organization for Standardization
DIN	:	Deutsches Institute fur Normung
BS	:	British Standard
IEC	:	International Electrotechnical Commission
IEE	:	Institution of Electrical Engineers
IEEE	:	Institute of Electrical and Electronic Engineers

NEMA : National Electrical Manufacturers Association  
AGMA : American Gear Manufacturer's Association

3. Materials - General

- 3.1. All materials incorporated in the Works shall be the most suitable for the duty concerned and shall be new and of reputed make/approved quality, free from imperfections and selected for long life and minimum maintenance. Non-destructive tests, if called for in the Specification, shall be carried out. All submerged moving parts of the Plant, or shafts and spindles or faces etc. in contact with them shall be of corrosion resistant materials. All parts in direct contact with various chemicals, shall be completely resistant to corrosion, or abrasion by these chemicals, and shall maintain their properties without aging due to the passages of time, exposure to light or any other cause.

4. Workmanship - General

- 4.1. Workmanship and general finish shall be of first class quality and in accordance with best workshop practice.
- 4.2. All similar items of the Plant and their component parts shall be completely interchangeable. Spare parts shall be manufactured from the same materials as the originals and shall fit all similar items.
- 4.3. All parts, which can be worn or damaged by dust, shall be totally enclosed in dust proof housings. All materials incorporated in the Works shall be the most suitable for the duty concerned, free from imperfections and selected for long life and minimum maintenance. All necessary accessories required for satisfactory and safe operation of the Plant shall be supplied by the Contractor unless it is specifically excluded from his scope. Suitable provision by means of eyebolts or other means are to be provided to facilitate handling of all items that are too heavy or bulky for lifting and carrying by two men.

5. Welding

- 5.1. Welding shall comply with the latest revision of the BS 5135 Code.
- 5.2. Welders shall be qualified in accordance with the requirement of the appropriate section of BS 4871. The Engineer shall have the right to call for further qualification from time to time from any welder who in the opinion of the Engineer does not produce weld in accordance with the qualification. Each welder shall be assigned a number and letter. Each weldments shall clearly be identified as to its welder marking the welder's Code adjacent to the welds. A record chart shall be maintained for each welder showing the procedures for which he has qualified, the date of such qualification, the type of defects produced and their frequency. The Engineer shall disqualify the welder whose Work requires a disproportionate amount of repairs. All procedures where required shall be qualified as per BS EN 283-3.
- 5.3. Inspection and quality of surveillance shall not be limited to the examination of finished welds. The techniques employed shall be based on methods which are known to produce good results and which have been verified at Site by actual demonstration.
- 5.4. Haphazard striking of the electrodes for establishing an arc shall not be permitted. The arc shall be struck either on the joint or on a starting tag. The starting tag shall be of the same material or a material compatible with the base metal being welded. In case of any inadvertent strike on place other than the welding, the area affected shall be ground flushed and examined by liquid penetration method.
- 5.5. Generally, a stringer bead technique shall be used with a slight oscillation of necessary to avoid slag and to minimize the number of beads needed to fill exceed 3 times the wire diameter. Vertical welds shall be made in upward direction. For all pipes above 300 mm dia., welding shall be done whenever possible, by 2 welders working simultaneously along both sides of the pipe.
- 5.6. The root pass shall have less than 1.5 mm internal reinforcement. Defects like icicles, burn through and excessive "such back", etc. shall be cause for rejection of welds.
- 5.7. Final welds shall be suitable for appropriate fabrication of the non-destructive examination of the weld. If grinding is necessary, the weld shall be blended into the parent metal without gouging or thinning of the parent metal in any way. Uneven and excessive grinding may be a cause for rejection. Fillet weld shall preferably be convex and free from undercutting and overlap at the toe of weld. Convexity and concavity shall not exceed 1.5 mm. The leg lengths shall not exceed the specified size by more than 1.5 mm.
- 5.8. All attachments such as lugs, brackets and other non-pressure parts shall also be done by qualified welders in accordance with the design details and materials specifications. Temporary attachments shall be removed in a manner that will not damage the parent metal. Areas of temporary attachments shall be dressed smooth and examined by ultrasonic or liquid penetration methods.
- 5.9. All tack welds shall be made using qualified procedure and welders, the number of size of tack welds shall be kept as small as to consist of adequate strength and joint alignments. All tack welds shall be examined visually for defects and if found defective shall be completely removed. As welding proceeds, tack welds shall be either removed completely or shall be properly prepared by grinding or filling their starting ends so that they may be satisfactorily incorporated in the welds. Unacceptable defects shall be removed by grinding machine or chipping or gouging. Flame gouging may be permitted provided gouged surfaces are ground at least by 1.0 mm below the deepest indentation.
- 5.10. All weld repairs shall be carried out using the approved welding procedures and welders. Re-welded areas shall be re-examined by the methods specified for the original welds and the Engineer's Representative shall duly qualify repair procedures.

6. Pre-heating and Post-heating Treatment
  - 6.1. Pre-heating and post heating treatment shall conform to the relevant application Codes. Pre-heating not exceeding 121 deg. C for all carbon steel construction above 25 mm thickness would be mandatory. Such pre-heating would be maintained during flame cutting, flame or arc gouging, welding and repairs and may be done by gas heating by gas torches/gas rings with neutral flame. The temperature shall be checked by temperature indicating crayons. However, such pre-heating will not be necessary for welds less than 6 mm size. In large diameter pipe fabricated out of plate materials, production control test plates in accordance with the BS 4870 part 1 Table 6 to represent 30% of the long seams and each welder's performance would be mandatory.
7. Electrodes
  - 7.1. All electrodes shall be stored in their original sealed containers under dry conditions. Electrodes shall remain identified until consumed. All electrodes shall be dried before use. Drying ovens shall be provided in Work areas for drying purposes. Electrodes withdrawn from oven shall be promptly used and excess unused electrodes shall be promptly returned to oven.
8. Examination/NDT/Radiography
  - 8.1. The various stages of examination and types shall be as stipulated in the respective fabrication Codes. Radiographic examination shall be carried out as per provisions of BS 2600 or BS 2910; Ultrasonic tests where called for shall be carried out as per provisions of BS 3926; magnetic particle tests shall be carried out as per BS 6072. Liquid penetration tests shall be carried out as per BS 6443.
9. Stainless Steel Welding
  - 9.1. All welding consumable such as electrodes, filler weirs, argon gas for shielding and purging shall be of high quality and the proposed brand shall be furnished for approval of the Engineer. Weld deposits shall have similar or higher physical properties and similar chemical composition to the members joined.
  - 9.2. All electrodes shall be purchased in sealed containers only and stored in their packing intact. The packets opened shall be consumed as early as possible. The electrodes removed from the containers shall be kept in holding ovens at temperatures recommended by electrode manufacturer. Special care shall be taken in avoiding mixing of electrodes in the oven. The electrodes and filling wires shall be free from rust, oil, grease, earth and other foreign matter.
  - 9.3. Argon gas with purity 99.5% shall be used for shielding and purging. The purity of gas shall be certified by the gas manufacturers.
  - 9.4. Non-destructive examination of the welds shall be carried out to ensure quality of weld.
  - 9.5. The electric current for welding shall be direct current, straight polarity (electrode negative). The welding current shall be kept minimum possible to ensure minimum heat affected zone in the parent material. Other side of the weld joint shall be periodically flushed with argon gas.
10. Castings
  - 10.1. Cast iron shall be of standard grey close-grained quality. The structure of the castings shall be homogeneous and free from non-metallic inclusions and other injurious defects. All surfaces of castings, which are not machined, shall be smooth and shall be carefully fettled to remove all foundry irregularities.
  - 10.2. Minor defects in depth not exceeding 12.5 percent of total metal thickness and which will not ultimately affect the strength and serviceability of the casting may be repaired by approved welding techniques. The Engineer shall be notified of large defects and no repair welding of such defects shall be carried out without prior approval of the Engineer. If the removal of metal for repair should reduce the stress resisting cross section of the casting by more than 25 percent, or to such an extent that the computed stress in the remaining metal exceeds the allowable stress by more than 25 percent, then casting shall be rejected. Test coupons cast simultaneously with the main castings shall be identified to check physical, chemical analysis of casting. Major defects on casting are not acceptable. Castings repaired by welding for minor defects shall be stress-relieved after such welding. Non-destructive tests as directed by the Engineer will be required for any casting containing defects whose extent cannot otherwise be judged, or to determine where repair welds have been properly made.
11. Forging
  - 11.1. All major stress-bearing forging shall be made to a Standard Specification. Forging shall be subjected to magnetic particle testing or dye penetration test at the areas of fillets and change in section. The testing shall be conducted after rough machining (10 microns). Any defect, which will not machine out during the final machining, will be gouged out fully, inspected by dye penetration or magnetic particle inspection to ensure that the defect is fully removed and repaired using an approved repair procedure. Any indication, which proves to penetrate deeper than 2.5% of the finished thickness of the component, shall be reported to the Engineer giving the details like location, length, width and depth. For the magnetic particle inspection the choice of wet or dry particles shall be at the Contractor's discretion.
  - 11.2. All forging shall be demagnetized after test and shall be heat-treated for the relief of residual stresses.

12. Design Life
  - 12.1. The Works as a whole shall be new, of sound workmanship, robustly designed for a long reliable operating life and shall be capable of 24 hours per day continuous operation for prolonged period in the climatic and working conditions prevailing at the Site, and with the minimum of maintenance. Particular attention shall be given to temperature changes, the stability of paint finish for high temperatures, the rating of engines, electrical machinery, thermal overload services, cooling systems and the choice of lubricants for possible high and prolonged operating temperatures. The Contractor shall be called upon to demonstrate this for any component part either by service records, or evidence of similar equipment already installed elsewhere or relevant type tests. Routine maintenance and repair shall as far as possible not requires the services of highly skilled personnel.
  - 12.2. The Plant shall be designed to provide easy access to and replacement of component parts, which are subject to wear, without the need to replace whole units. No parts in contact with water shall have a life from new to replacement or repair of less than five years.
  - 12.3. Design features shall include the protection of Plant against damage caused by vermin, dirt, dust and dampness and to reduce risk of fire. Plant shall operate without undue vibration, and parts shall be designed to withstand the maximum stresses under the most severe condition of normal service. Materials shall have a high resistance to change in their properties due to the passage of time, exposure to light, temperature and any other cause, which may have a detrimental effect upon the performance or life of the Works.
  - 12.4. Plant located outside lockable areas/building shall have additional features to prevent un-authorized operation.
13. Name Plate
  - 13.1. Each item of the Plant shall have permanently attached to it in a conspicuous position, a nameplate and rating plate. Upon these shall be engraved or stamped, the manufacturer's name, type and serial number of Plant, details of the loading and duty at which the item of Plant has been designed to operate, and such diagrams as may be required by the Engineer. All indicating and operating devices shall have securely attached to them or marked upon them designations as to their function and proper manner of use.
  - 13.2. Nameplates, rating plates and labels shall be of a non-flame propagating materials, either non-hygroscopic or transparent plastic with engraved lettering of a contrasting colour. Fixing shall be by means of non-corrosive screws; drive rivets or adhesives shall not be used.
  - 13.3. Warning labels shall be provided where necessary to warn of dangerous circumstances or substances. Inscriptions or graphic symbols shall be black on a yellow background.
  - 13.4. Instruction labels shall be provided where safety procedures such as wearing of protective clothing are essential to protect personnel from hazardous or potentially hazardous conditions. These labels shall have inscriptions or graphic symbols in white on a blue background.
14. Nuts, Bolts, Studs and Washers
  - 14.1. Nuts, bolts, studs and washers for incorporation in the Plant shall conform to the requirements of the appropriate standard. Nuts and bolts shall be of the best quality of specified grade, machined on the shank and under the head and nut
  - 14.2. Fitted bolts shall be a light driving fit in the reamed holes they occupy, shall have the screwed portion of such a diameter that it will not be damaged in driving and shall be marked in a conspicuous position to ensure correct assembly at Site.
  - 14.3. Washers, locking devices and anti-vibration arrangements shall be provided where necessary. Jointing hardware for the entire Plant shall be provided with sufficient spares to cater for site losses.
  - 14.4. Where bolts pass through structural members taper washers shall be fitted, where necessary, to ensure that no bending stress is caused in the bolt. Where there is a risk of corrosion, bolts, nuts and studs shall be designed so that the maximum stress does not exceed half the yield stress of the material under any conditions. All bolts, nuts and washers that are subject to frequent adjustment or removal in the course of maintenance and repair shall be made of nickel-bearing stainless steel.
  - 14.5. The Contractor shall supply all holding down, alignment and leveling bolts complete with anchorages, nuts, washers and packing required to attach the Plant to its foundations, and all bed plates, frames and other structural parts necessary to spread the loads transmitted by the Plant to concrete foundations without exceeding the design stresses.
15. Allowances for Wastage
  - 15.1. The Contractor shall supply reasonable excess quantities to cover wastage of those consumable, which will be normally subject to waste during erection, commissioning and setting to Work.
16. Painting – General
  - 16.1. The Contractor shall be responsible for the cleaning, preparation for painting, and priming or otherwise protecting, as specified, all parts of the Plant at the place of manufacture prior to packing.
  - 16.2. Parts may be cleaned but surface defects may not be filled in before testing at the manufacturer's works. Parts subject to hydraulic test shall be tested before any surface treatment. After test, all surfaces shall be thoroughly cleaned and dried out, if necessary by washing with an approved de-watering fluid prior to surface treatment. Except where the specification provides to the contrary all painting materials shall be applied in strict accordance with the paint manufacturer's instructions.

- 16.3. All protective coatings shall be suitable for use in warm humid climates. All primers, under coats and finishes shall be applied by brush or airless spray, except where otherwise specified. Consecutive coats shall be in distinct but appropriate shades. All paints shall be supplied from the store to the painters, ready for application, and addition of thinners or any other material shall be prohibited.
17. Painting at Place of Manufacture
  - 17.1. Steel and cast iron parts shall be sand blasted to near white cleaning before painting. Edges, sharp covers etc. shall be ground to a curve before sand blasting. A primer coat of a zinc rich epoxy resin based coating with at least 75 microns dry film thickness is to be provided. In addition the parts are to be provided with adequate number of coats of coal tar epoxy polyamine coating to a dry film thickness of 175 microns including primer coating.
18. Painting at Site
  - 18.1. Immediately on arrival at the site, all items of Plant shall be examined for damage to the paint coat applied at the manufacturer's works, and any damaged portions shall be cleaned down to the bare metal, all rust removed, and the paint coat made good with similar paint.
  - 18.2. After erection, such items, which are not finish painted, shall be done so and, items that have been finish painted at the manufacturer's works shall be touched up for any damaged paintwork. For finish painting, two coats of synthetic enamel conforming to IS: 2932 shall be applied. Dry film thickness of each coat shall be at least 25 microns.
  - 18.3. The dry paint film thickness shall be measured by Electrometer or other instruments approved by the Employer. In order to obtain the dry film thickness specified the Contractor should ensure that the coverage rate given by the paint manufacturer would enable this thickness to be obtained. Strength of adhesion shall be measured with an adhesion tester and this value shall not be less than 10 kg/cm<sup>2</sup>. Painted fabricated steel work which is to be stored prior to erection shall be kept clear of the ground and shall be laid out or stacked in an orderly manner that will ensure that no water or dirt can accumulate on the surface. Suitable packing shall be laid between the stacked materials. Where cover is provided, it shall be ventilated.
19. Galvanizing
  - 19.1. Wherever galvanizing has been specified the hot dip process shall be used. The galvanized coating shall be of uniform thickness. Weight of zinc coatings for various applications shall not be less than those indicated below:
    - a) Fabricated steel  
Thickness less than 2 mm but not less than 1.2 mm 340 gms/sq.m  
Thickness 2 mm and above 460 gms/sq.m
    - b) Fasteners
    - c) Up to nominal size M10 270 gms/sq.m  
Over M10 300 gms/sq.m
  - 19.2. Galvanizing shall be carried out after all drilling; punching, cutting, bending and welding operations have been carried out. Burrs shall be removed before galvanizing. Any Site modification of galvanized parts should be covered well by zinc rich primer and aluminum paint.
20. Support for Pipe work & Valves  
All necessary supports, saddles, sling, fixing bolts & foundation bolts shall be supplied to support the pipe work. Valve and other facilities mounted in the pipe work shall be supported independent of the pipes to which they connect.

## **DETAILS ITEM WISE SPECIFICATION**

### **ITEM NO. 1 : Demolition including stacking of serviceable material and disposal of unserviceable material with all lead and lift (i) RCC work**

#### **1.1 Workmanship**

1.1. The relevant specifications of item No. 2 shall be followed except that demolition of RCC work to be done.

#### **2.0. Mode of measurements and payment**

2.1. The relevant specifications of item No. 2 shall be followed except that the wall and independent piers or columns, slab chhaja etc of RCC work shall be measured in cubic meters. All copings, corbels, comics and other projections shall be included with the wall measurements.

2.2. In measuring thickness of plastered walls, the thickness of plaster shall be included. The unserviceable materials shall be disposed off with all lead and lift. Ashlars face stones dressed stone etc., if required to be taken down intact shall be dismantled and measured separately in cubic meters.

2.3. The rate is exclusive of cleaning of rcc material Honey comb works or hollow block walling shall be measured as solid.

2.4. The rate shall be for a unit of one cubic meter.

All works shall be done as per instruction of engineer in charge and stacking of all scrap materials including Valves, Pipes., Angles, Railings, Electrical and Mechanical Equipment etc. shall be recorded and submitted to the field office mentioning details of all scraps. The scraps need

**\*\*The steel reinforcement like TMT Bar shall be scrapped off and disposed by the agency executing the demolition works as per instruction of engineer in charge.**

### **ITEM NO. 2 : Demolition of brick work and stone masonry including stacking of serviceable material and disposal of unserviceable material with all lead and lift (ii) lime mortar**

#### **1.0. Workmanship**

1.1. The demolition shall consist of demolition of one or more parts of the building as specified or shown in the drawings. Demolition implies taking up or down or breaking up. This shall consist of demolishing whole or part of work including all relevant items as specified or shown in the drawings.

1.2. The demolition shall always be planned before hand shall be done in reverse order to the one in which the structure was constructed. This scheme shall be got approved from the Engineer-in-charge before starting the work. This however will not absolve the contractor from the responsibility of proper and safe demolition.

1.3. Necessary propping, shoring and under pinning shall be provided for the safety of the adjoining work or property, which is to be left intact, before dismantling and demolishing is taken up and the work shall be carried out in such a way that no damage is caused to the adjoining property.

1.4. Wherever required, temporary enclosures or partitions shall also be provided. Necessary precautions shall be taken to keep the dust nuisance down as and where necessary.

1.5. Demolition shall be commenced in a systematic manner. All materials which are likely to be damaged by dropping from a height or demolishing roof, masonry etc. shall be carefully dismantled first. The dismantled articles shall be properly stacked as directed.

1.6. All materials obtained from demolition shall be the property of Government unless otherwise specified and shall be kept in safe custody until handed over to the Engineer-in-charge.

1.7. Any serviceable materials, obtained during dismantling or demolition shall be separated out and stacked properly as directed with all lead and lift. All unserviceable materials, rubbish etc., shall be stacked as directed by the Engineer-in-charge.

1.8. On completion of work, the site shall be cleared of all debris rubbish and cleaned as directed.

#### **2.0. Mode of measurements and payment**

2.1. Measurements of all work except hidden work shall be taken before demolition or dismantling and no allowance for increase in bulk shall be allowed. The demolition of lime concrete shall be measured under this item. Specification for deduction for voids, openings etc. shall be on same basis as that employed for construction of work,

2.2. All work shall be measured in decimal system as fixed in its place subject to the following limits; unless otherwise stated hereinafter : (a) Dimensions shall be measured to the nearest 0.01 mt. (b) Area shall be worked out to the nearest 0.01 sq. mt. (c) Cubical contents shall be worked out to the nearest 0.01 Cu.m.

The rate shall include cost of all labor involved and tools used in demolishing and dismantling including scaffolding. The rate shall also include the charges for separating out and stacking the serviceable materials properly and disposing the unserviceable materials with all lead and lift. The rate also includes for temporary shoring for the safety of the portion not required to be pulled down or of adjoining property and providing temporary enclosures or portions where considered necessary.

Important Note:

If the structure to be demolished is very old and may contain cement or lime in its masonry mortar, the Agency may visit the site and participate in the tender.

2.4. The rate shall be for a unit of one cubic meter.

All works shall be done as per instruction of engineer in charge and stacking of all scrap materials including Valves, Pipes., Angles, Railings, Electrical and Mechanical Equipment etc. shall be recorded and submitted to the field office mentioning details of all scraps. The scraps need

**\*\*The dismantled scrap shall be disposed off properly as per instruction of engineer in charge.**