TRADING CORPORATION OF PAKISTAN (PVT.) LIMITED
MINISTRY OF COMMERCE

No. TCP/T&R/Sugar/25-7/2025 September 27, 2025

PROCUREMENT OF 300,000 TO 500,000MT OF WHITE REFINED SUGAR BY GOVERNMENT OF PAKISTAN

TENDER NO. 7

INTERNATIONAL TENDER FOR IMPORT OF 100,000 MT (ONE HUNDRED THOUSAND METRIC TONS) +/- 5% MOLSO (MORE OR LESS AT SELLER'S OPTION) OF WHITE REFINED SUGAR (BAGGED CARGO) ON CFR KARACHI BASIS (IN BREAK BULK)

INVITATION FOR BIDS

Trading Corporation of Pakistan (Pvt.) Ltd. (TCP), Karachi, a state owned commercial organization working under the administrative control of Ministry of Commerce, Government of Pakistan, invites sealed bids under rule-21(A) of the Public Procurement Rules, 2004, from **the International White Refined Sugar Suppliers/Manufacturers, directly or through their local offices or representatives (registered with provincial and/or federal tax authorities) having capacity to supply 'White Refined Sugar' through worldwide sources, for supply of 100,000 MT White Refined Sugar (Bagged Cargo) with +/- 5% MOLSO, on CFR Karachi basis (in break bulk)**, against the following specifications subject to the terms and conditions specified in 'Tender Document':

(i) White Refined Sugar under specification of PSQCA Standard and Import Policy Order in force;
(ii) HS Code 1701.99;
(iii) Grade:

Sugar Grade	Grain Size
Small (Fine)	0.40 to 0.80 mm
Small	0.60-1.00 mm
Medium	1.00-1.70 mm

(iv) Bids less than 25,000 MT for CFR (Break Bulk) will not be accepted.

Note:
(i) Total quantity of White Refined Sugar must reach the designated ports in Pakistan in accordance with the shipment schedule given in the Tender Document.
(ii) Bids must be valid for One Hundred & Twenty (120) hours from submission of bids.

2. Tender document containing detailed terms & conditions, method of procurement, procedure for submission of bids, bid security, bid validity, opening of bids, bid evaluation criteria, clarification/rejection of bids, performance guarantee etc. are available for the interested bidders on payment of PKR 2,000/- (Pak Rupees Two Thousand only), which can be purchased during 0830 hours to 1630 hours from following offices (Except Saturday & Sunday), till **1210 hours on October 06, 2025, from**:

(i) Deputy Manager (Cash), Trading Corporation of Pakistan (Pvt.) Ltd, 4th Floor, Block-B, Finance & Trade Centre, Shahrah-e-Faisal, Karachi, Pakistan (Phone: 021-99202947-49 Ext.: 235);

Trading Corporation of Pakistan (Pvt.) Limited,
4th & 5th Floor, Block-B, Finance & Trade Centre,
Sharea Faisal, Karachi. 75530
(Pakistan)

www: tcp.gov.pk
Tel: (92-21) 99202947-9
Fax: (92-21)99202722, 99202595 & 99202731
Email: tcp@tcp.gov.pk

(ii) General Manager, Regional Office, Trading Corporation of Pakistan (Pvt.) Ltd., 2nd Floor, LDA Plaza, Edgerton Road, Lahore (Phone No.042-99206065-78); and

(iii) General Manager, Regional Office, Trading Corporation of Pakistan (Pvt.) Ltd., House No. 114, Street 11, PHAF Residencia, Kurri Road, Islamabad (Tel: 051-9450441- 42).

3. The tender documents can also be downloaded from official websites of TCP www.tcp.gov.pk and PPRA www.ppra.org.pk. However, the receipt of purchase of tender documents can be obtained from the cash section of TCP against the payment of PKR 2,000/- (Pak Rupees Two Thousand only) prior to dropping the bid envelope in the tender box within the specified time as mentioned at Para-2 above.

4. The bids, prepared in accordance with the instructions in the tender documents, must be dropped in the tender box placed at Reception Counter of TCP, 4th Floor, Block-B, Finance & Trade Centre, Shahrah-e-Faisal, Karachi, on or before **October 06, 2025, latest by 1240 hours. Bids will be opened on the same day at 1310 hours in the TCP's Board Room, in presence of the bidders or their authorized representatives who may wish to be present.**

5. The interested parties who have previously not fulfilled their contractual obligations with TCP shall not be eligible to participate in the Bids, unless they clear their dues along with penalties or fulfill their contractual obligations in services and commodities with TCP, as the case may be, before tender opening date. Furthermore, those firms against which black listing procedures have been initiated by TCP shall not be eligible to participate in the tender.

6. TCP reserves the right to accept or reject any or all offers wholly or partially or bifurcate or increase/decrease the tender quantity as per PPR-2004.

(ARIF GHANI)
GENERAL MANAGER (T&R)

Trading Corporation of Pakistan (Pvt.) Limited,
4th & 5th Floor, Block-B, Finance & Trade Centre,
Sharea Faisal, Karachi. 75530
(Pakistan)

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Tel: (92-21) 99202947-9
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TRADING CORPORATION OF PAKISTAN (PRIVATE) LIMITED

No. TCP/T&R/Sugar/25-7/2025 September 27, 2025

PROCUREMENT OF 300,000 TO 500,000 MT OF WHITE REFINED SUGAR BY GOVERNMENT OF PAKISTAN

TENDER NO. 7

INTERNATIONAL TENDER FOR IMPORT OF 100,000 MT (ONE HUNDRED THOUSAND METRIC TONS) +/- 5% MOLSO (MORE OR LESS AT SELLER'S OPTION) OF WHITE REFINED SUGAR (BAGGED CARGO) ON CFR KARACHI BASIS (IN BREAK BULK)

TERMS & CONDITIONS OF TENDER

1. INVITATION FOR BIDS:

Trading Corporation of Pakistan (Pvt.) Ltd. (TCP), Government of Pakistan, Karachi invites bids, under Rule No.21(A) of the PPRA Rules, 2004, for supply of 100,000 MT White Refined Sugar (bagged cargo) with +/-**5%** 'MOLSO' **ON CFR KARACHI BASIS (IN BREAK BULK). Where CFR stands for Cost and Freight as per Incoterms, 2020.**

2. The supply/import of White Refined Sugar, as above, shall be governed by the Imports and Exports (Control) Act, 1950, provisions of the Trade Policy in force, PPRA Rules, 2004 and the orders/notifications issued there under; and shall be in accordance with the requirements/ specifications laid down by Pakistan Standards Quality Control Authority (PSQCA), for imported White Refined Sugar, as reproduced hereunder:

"COMMODITY SPECIFICATIONS / REQUIREMENT":

i) HS Code, Granular Size & Minimum Bid Quantity:

a) HS Code 1701.99;

b) **Grade:**

Sugar Grade	Size (mm)
Small (Fine)	0.40-0.80
Small	0.6-1.0
Medium	1.00-1.70

c) Bids less than 25,000 MT for CFR Karachi (in Break Bulk) will not be accepted.

ii) Requirements for White Refined Sugar as prescribed by PS&QCA:

Sl. No.	Characteristics	Requirement	Methods of Test, Ref to Annex
i)	Loss on drying, percent by mass, Max	0.10	B
ii)	Polarization, Min	99.7°Z	C
iii)	Reducing sugar, percent by mass, Max	0.04	D
iv)	Colour in ICUMSA units, Max	60	E
v)	Conductivity ash, percent by mass, Max	0.04	F
vi)	Sulphur dioxide, mg/kg, Max	15	G
vii)	Lead, mg/kg, Max	0.5	AOAC 999.10 H (alternative method)
viii)	Chromium, mg/kg, Max	20	I
ix)	Copper, mg/kg, Max	2	AOAC 960.40 or AOAC 999.10
x)	Arsenic mg/kg, Max	1	AOAC 986.15 or ICUMSA, GS2/3-23 (2005)

Note: The relevant testing method of ISO, CAC and of other internationally recognized standard methods might be taken into account for analysis purpose.

iii) **SAMPLING**

"The procedure of sampling and testing of White Refined Sugar given in appendices A, B, C, D, E, F, G, H&I at **Annexure-I** are only for seller's information. However, it is the responsibility of the concerned PSIA to follow the given procedure while inspecting the offered stocks."

3. QUANTITY

i) One Hundred Thousand Metric Tons (100,000 MT) (+/-) 5% MOLSO on CFR Karachi Basis (in Break Bulk).

ii) Bids shall be made for minimum 25,000 MT (+/-) 5% MOLSO on CFR Karachi (Break Bulk) basis. Any bid less than 25,000 MT shall not be acceptable. Only firm offers/quantity will be considered.

iii) The Buyer (TCP) reserves the right to purchase, more or less than the advertised quantity.

iv) TCP also reserves the right to purchase sugar from the most advantageous (i.e. lowest evaluated) bidder or other bidders through price-matching, as per Rule-21(A) of the PPRA Rules, 2004, if the required quantity is not managed through the lowest evaluated bidder.

v) Part shipment is allowed subject to Clause-17.

vi) Only break bulk shipments are allowed.

vii) The port of arrival/discharge will be any port in Karachi, Pakistan as designated by TCP. TCP reserves the right to divert the Vessel (break bulk) to any specific port in Karachi, Pakistan.

4. PACKING:

i) In standard export packing as prescribed by PS&QCA in new polypropylene (PP) bags with an inner polythene lining. The contents of sugar in each bag should be 50 Kgs net. The bags should be as per specification given below:

S. No	CHARACTERISTICS	REQUIREMENTS	TOLERANCE	METHOD OF TEST
1.	Dimension in mm (inch) Outside length	950 (37)	± 15 mm	PS:ISO 22198
	Outside width	559 (22)	± 10 mm	
2.	Mass per sq. meter (gm)	94	± 5%	PS: ISO 3801
3.	Mass per bag (gm)	105	± 5%	
4.	Density/dm (inch) (Minimum) Ends	43(11)	XXX	PS: ISO 7211/2
	Picks	43(11)		
5.	Denier of tape (Minimum)	985	± 5%	PS: ISO 7211-5

ii) The suppliers will provide, with each consignment, 2% extra empty bags (with inner liner) of same specifications, free of cost.

REQUIREMENTS: -

Joint bags: The sacks shall not be made from joint pieces. Any glue or adhesive not allowed for pasting.

Mass: The mass of sack as given in above table.

UV –Resistance Test: It is desirable by buyer and seller that the sacks are stabilized for U/V light. The procedure is described in **Annexure – II**.

Drop test: It is desirable by buyer and seller that the drop test shall be carried accordance with PS: 4879 and the related parameter are prescribed in **Annexure-III**.

5. LABELING:

i) Each bag/pack shall bear legibly and indelibly the following particulars:

a) White Refined Sugar;
b) Guaranteed 50 kg Net.;
c) Month and year / season of manufacture;

d) The words “Best within 2 years of manufacture”; and
e) Name of Manufacturer.
f) The product may also be marked with the Standard Mark of conformity (PSQCA).

ii) It may be ensured that all the requirements and the standards prescribed by Pakistan Standards and Quality Control Authority shall be complied with strictly.

iii) It may also be ensured that the cargo shall have at least 66% (sixty six percent) of the shelf life at the time of arrival at Karachi, Pakistan. Where this condition is not printed on the packing, a certificate issued by the Manufactures or Principals in respect of these conditions shall be accepted by Customs Authorities.

6. COUNTRY OF ORIGIN:

i) “Country/ies of Origin of White Refined Sugar offered should be specifically mentioned in the Bid Form **Annexure-IV**.
ii) Bidder shall give a certificate confirming the availability of stock”.
iii) The cargo (White Refined Sugar) should not originate from Israel/India or any other banned/sanctioned country.
iv) If a bidder opts for origins that come under a War Zone, then the same bidder has to bid on multiple origins to substitute the origin under a war zone.

7. METHOD OF PROCUREMENT:

Single Stage – One Envelope.

8. VALIDITY:

Offers should be valid for **One Hundred & Twenty (120) Hours** from the time of submission of bids.

9. CLARIFICATION / REJECTION OF BIDS:

i) **BASIS OF OFFERS/ PRICE**

a) The price shall be quoted in US dollar per metric ton on CFR KARACHI (Break Bulk) basis as per Bid Form (**Annexure-IV**). Bid should not be less than 25,000 MT.

b) Afloat cargo shall not be accepted.

c) Rate to be quoted by the bidder for Karachi Ports, Pakistan. The discharge port will be subject to clause 3(vii).

ii) **SUBMISSION OF BIDS:**

a) The bid documents can be purchased from designated offices / downloaded from the website of TCP **till 1210 hours on October 06, 2025**. Interested foreign White Refined Sugar suppliers through their Local Representatives may submit their bids in sealed envelopes to be dropped in the Tender Box placed at Reception Counter of TCP at 4th Floor, Block “B”, Finance & Trade Centre, Shahrah-e-Faisal, Karachi on **October 06, 2025 latest by 1240 Hours**. Bids received through fax, cable, courier or any other means except as prescribed above shall not be considered. The bids received will be opened at **1310 Hours** on the same day (thirty minutes after deadline for submission of bid) in the TCP Board Room in presence of bidders or their authorized representatives who may wish to be present.

b) The bidders are required to furnish the following documents along with their bids:

i) Name and address of the firm with telephone and fax numbers and e-mail address **(Principal Seller)**.
ii) Certificate of membership of concerned recognized trade association or chamber as the case may be **(Principal Seller)**.
iii) Company’s profile and Name of all Directors/Partners/Proprietor **(Principal Seller)**.
iv) Name and address of Local Representative with telephone and fax numbers e-mail address, CNIC & NTN.

v) Proof of registration with tax authorities **(Local Representative)**.

vi) Proof of previous international supplies of white refined sugar for annual supply of 100,000 MT or more during last three years, in shape of Bills of Lading issued in Principal Supplier's name along with statement showing details of such B/L based supplies.

vii) An **Affidavit on judicial paper of PKR 100/-** to the effect that either the principal seller/company or his local representative had never been blacklisted by TCP or any Government department/autonomous body **(ANNEXURE-V)**. **However, international suppliers/producers having no local representation and bidding directly shall submit the same undertaking on their official letterhead.**

viii) An **Affidavit on judicial paper of PKR 100/-** to the effect that the principal seller/company or his local representative has fulfilled their previous contractual obligations with TCP before Tender opening date. The seller shall also disclose information relating to court cases of the bidders and their local agents against TCP or Government/Autonomous bodies **(ANNEXURE-VI)**. **However, international suppliers/ producers having no local representation and bidding directly shall submit the same undertaking on their official letterhead.**

ix) Financial status report about its financial standing and business integrity by the party's bank on its letter head **(Principal Seller)**.

x) Wherever applicable, copy of the agreement signed between the principal and the Local Representative. The foreign based manufacturer can participate through a local representative by providing copy of such agreement as mentioned above.

c) All bids must be submitted on the prescribed proforma given at **ANNEXURE-IV** along with original receipt of Rs.2000/- or ten (10) US Dollars on account of purchase of tender documents in the name of Bidder or his authorized Local Representative or Banker's Cheque in favor of TCP for the equivalent amount.

d) The tender documents can also be downloaded from official websites of TCP www.tcp.gov.pk and PPRA www.ppra.org.pk. However, in such case, cash receipt from TCP Cash Section or a Banker's Cheque for Rs.2,000 (Rupees Two Thousand Only) or ten (10) US Dollars in favor of Trading Corporation of Pakistan, Karachi must be submitted along-with the bid.

e) Bids must be submitted through Bidder's local agent or manufacturer directly or through his authorized agent and must accompany Bidder's (Principal's) authority letter in original on his letter head (or fax, to be replaced by original) duly signed and stamped, as per the attached Performa **(ANNEXURE-VII)**, a copy of which shall also be sent to G.M. (T&R), TCP directly by the Bidder through fax (before opening of bids) as well as courier.

f) The local agent of the bidder will be authorized to obtain tender documents, submit offers, negotiate and sign contracts and other documents on behalf of principal bidder. In case of litigation and/or arbitration between TCP & principal bidder, summons or any other legal process served on the local agent shall be admitted and held as valid as if served upon the principal bidder.

g) The Buyer reserves the right to accept or reject any or all bids wholly or partially.

h) The interested parties who have not fulfilled their contractual obligation with TCP shall not be eligible to participate in the Bids, unless they clear their dues along with penalties or fulfill their contractual obligations in services and commodities with TCP, as the case may be, before tender opening date. Furthermore, the sellers against whom blacklisting process has been initiated or they have been blacklisted by TCP/PPRA are not eligible to participate.

10. BLACKLISTING:

All the papers/documents and the information furnished by the Principal Seller and / or its Local Agent along with the bid and/or during the contract / tender execution must be genuine and true in the terms of their contents and that if established otherwise at any later stage during the processing of bid / execution of tender/contract, the Principal Seller and/or its Local Agent will be liable to blacklisting attracted under TCP's Public Notice No.1 of 2010 dated September 03, 2010, besides other action that the buyer might deem fit to take. The **affidavit on judicial paper of PKR 100/-** must be submitted along with the bid, on the prescribed proforma given at **ANNEXURE-VIII** of Tender Terms. **However, international suppliers/producers having no local representation and bidding directly shall submit the same undertaking on their official letterhead.**

11. BID EVALUATION CRITERIA AND ACCEPTANCE:

i) Bids shall be evaluated solely on the basis of individual offered bid price, subject to their conformity with tender terms and conditions.
ii) The Buyer (TCP) reserves the right to accept one or more offers received as per Clause No.4 of the Bid Form at **ANNEXURE-IV** of this tender.
iii) Letter(s) of Acceptance**/**award will be issued by e-mail to the successful Bidder(s) and/or their Agent(s) as well as by courier (to the successful Bidder(s) and/or their Agent(s) in Pakistan only), within the validity of offer/bid.
iv) Seller would be required to sign "Integrity Pact" immediately on award of contract as per the format at **ANNEXURE-IX**.
v) Seller would be required to submit Beneficial Ownership Information immediately after award of contract as per **ANNEXURE-X.**

12. BID SECURITY:

i) Bid shall be accompanied by an original Bid Security:

a) **FOR MANUFACTURERS:** Equivalent to **ONE percent (1%) of the CFR value of bid quantity,** in the form of a Banker's Cheque in PKR (equivalent to US Dollars at the exchange rate on or a day preceding the date of opening of the tender) or in the form of Bank Guarantee from a minimum "A" rated (PACRA/VIS) Bank in Pakistan (on prescribed form as at **ANNEXURE-XI**) in US Dollars on or before the date of opening of the tender.

b) **FOR SUPPLIERS OTHER THAN MANUFACTURERS:** Equivalent to **TWO percent (2%) of the CFR value of bid quantity,** in the form of a Banker's Cheque in PKR (equivalent to US Dollars at the exchange rate on or a day preceding the date of opening of the tender) or in the form of Bank Guarantee from a minimum "A" rated (PACRA/VIS) Bank in Pakistan (on prescribed form as at **ANNEXURE-XI**) in US Dollars on or before the date of opening of the tender.

ii) The bid security must be verifiable and en-cashable at the counter of issuing bank (in case Bid Security is issued by local banks) and verifiable and cashable at the counter of local confirming bank (in case Bid Security is issued by foreign bank) in Pakistan. TCP has right to request the confirmation and en-cashability from the confirming bank in writing at the time of bid evaluation.
iii) Bid Security of the unsuccessful Bidder(s), including those Bid(s) which is/are not accepted for any reason, shall be returned to them within ten (10) working days of award of the tender.
iv) **The Performance Guarantee shall be furnished within Five (05) working days from the award of contract.** However, the bid Security (refer clause-10 hereafter) of the successful bidder(s) would be considered as Performance Guarantee till submission of required Performance Guarantee within the stipulated period i.e. **Five (05)** working days (refer Clause-12).

13. DOCUMENTS CONSTITUTING CONTRACT:

The IFB (Invitation for Bids), the Terms & Conditions of Tender, the Letter of Acceptance**/**Award issued by the Buyer, Integrity Pact and Letter of Credit along with submission of the valid Performance Guarantee shall collectively constitute and be considered as the Contract between the Buyer and the Seller. The contract shall be valid till successful and complete delivery of the goods as per the terms and conditions of this contract and settlement of buyer's claims by the seller.

14. PERFORMANCE GUARANTEE:

i) Successful bidder shall be required to furnish a Performance Guarantee, for due and satisfactory performance of the contract, equal to **five percent (5%)** of the value of the contracted goods **(including +5% of MOLSO)** within **FIVE (05) working days** from award of contract, in the form of a Bank Guarantee in US Dollars from a minimum "A" rated (PACRA/VIS) Bank in Pakistan to be furnished in the prescribed form **(ANNEXURE-XII)** in favour of Trading Corporation of Pakistan (Pvt.) Limited or in the form of a Banker's Cheque in PKR (Equivalent to US dollars at the exchange rate on or a day preceding the date of opening of the tender).
ii) Satisfactory performance of the contract includes delivery of goods strictly according to the contract within the stipulated period of delivery to buyer and settlement of any/all claims under this contract/tender by both the seller and buyer.

iii) If the successful bidder fails to furnish the required performance guarantee as per sub clause-(i) above, Bid Security of the successful bidder shall be forfeited without any notice.

15. FORFEITURE/RELEASE OF PERFORMANCE GUARANTEE:

i) The Buyer shall forfeit / encash the Performance Guarantee if the Seller:

a) Fails to supply the goods within the specified period.
b) Commits any breach of contract or fails to fulfill any terms or conditions of the contract (refer Clause-13).
c) In case of any mis-declaration and / or if any earlier default / breach of contract is not disclosed by the seller.

ii) The Performance Guarantee shall be released to the sellers on successful and satisfactory execution of the contract (refer Clause-13) and its full performance. No claim shall lie against the Buyer in respect of interest on Performance Guarantee regardless of the time of its release.

iii) The seller shall be required to submit written request on principal seller's or local agent's letterhead along with **"No Claims Certificate"** on the principal seller's letterhead and documentary evidence / swift message(s) for payment of claims (if any), for release of Performance Bank Guarantee in respect of the relevant tender/contract.

16. LETTER OF CREDIT (DOCUMENTARY CREDIT):

i) Complete information required for opening of L/C (as per **ANNEXURE-XIII**) shall be furnished by the seller (e.g. name of Advising Bank and/or negotiating Bank and confirming bank, if applicable, with complete address and port of loading), through official email / dispatch to General Manager (T&R) at sheerazocp@gmail.com / gm.tr@tcp.gov.pk/ and copy to General Manager (Finance & Accounts) at gm.fa@tcp.gov.pk / cfo@tcp.gov.pk, immediately after award of contract. The delay in furnishing the L/C information and consequent delay in opening of L/C shall be on sellers' account.

ii) The Buyer shall establish, in favour of the Seller, an irrevocable Letter of Credit shipment/vessel wise in US Dollars or any other mutually acceptable currency, (conversion rate of State Bank of Pakistan (Weighted Average Exchange Rates of last working day) to apply for conversion of a bid in USD to another international currency at time of opening of L/C) for 105% of the value of contracted quantity through a scheduled bank in Pakistan after receipt of required Performance Guarantee along with the complete information required for opening of LC from the Seller. If Weighted Average Exchange Rates of last working day is not available for that specific currency, then closing inter-bank rate of last working day as per treasury of LC Opening Bank shall apply. The selection of L/C opening / issuing bank shall be sole discretion of the buyer. The seller must fulfill the requirements of L/C opening / issuing bank including compliance requirements for the purpose of L/C opening.

iii) The buyer would try to establish L/C before the start of specific shipment window. However, any delays in L/C opening due to banking compliance issues relating to war zone origins / ports / shippers / entities / individuals / incomplete information etc., there shall be no relaxation provided to the seller(s) in shipment schedule. If the L/C is delayed at buyer's end due to reasons other than specified herein, the buyer may consider relaxing the shipment schedule/ applicable penalty.

17. ARRIVAL / DELIVERY:

i) Arrival Schedule:

ARRIVAL WINDOW	SHIPMENT SIZE
As per Clause-17(ii)	Four (04) shipments of 25,000 MT (+/-5%) MOLSO each **OR** Two (02) shipment of 50,000 MT (+/-5% MOLSO).
TOTAL	**100,000 MT (+/-5% MOLSO)**

ii) The shipments shall be made as per above schedule and in such a way that the entire cargo must arrive in Pakistan by **15th November, 2025**.

iii) Any shipment beyond the arrival schedule at sr.(i)& (ii) above, shall be subject to tender terms and conditions including penalties under clause No.18, 27, and 28, as the case may be.

iv) Buyer has the right to change / revise the shipments schedule according to the awarded quantity and port availability / situation etc., at the time of issuing the Award Letter or within laycan time.

v) In case L/C is delayed due to any fault of seller, the corresponding delay caused in shipment, if any, would be on sellers' account and subject to penalty(s) under tender terms and conditions.
vi) For the purpose of determining shipment date/ arrival date, the "Sailing Advice" / "Notice of Readiness/Arrival", as applicable, shall be used as source document.
vii) Shipment meant from one to another load ports shall not be considered as shipment(s) to buyer, instead the shipment meant for final discharge port shall only be considered as shipments to buyer.
viii) Inordinate delay in the voyage time without any genuine reason of weather, duly notified to the buyer, would attract violation of tender term and would be subject to penalties under clause-18, 27 and 28, as the case may be.

18. LATE SHIPMENT PENALTY/LIQUIDATED DAMAGES:

If the goods do not arrive by the stipulated date as given in Clause-17(i) and Clause-17(ii) above, the Buyers may in its discretion accept the late arrival of shipment for a maximum period of **five (05)** days subject to payment by the sellers a penalty **@ US$ 0.50 per metric ton per day**. Any further extension shall be at the sole discretion of the buyer at seller's risk for acceptance of vessel and the penalty rate shall be @ US$ 1.00 PMT per day for next five (05) days. After 10 days, if the buyer accepts the cargo, the LD shall be charged @ US$ 5.00 PMT for each day. The late arrival penalty shall be calculated from the date of arrival as specified in Clause-17(i) & Clause-17(ii) as mentioned in Notice of Readiness/Arrival. The claim shall be sent to the seller by the buyer, which shall be settled by the sellers within 5 days or else the same shall be deducted from the L/C retirement for the relevant shipment.

19. PRE-SHIPMENT INSPECTION:

i) The Buyer shall nominate an independent pre-shipment inspection agency of international repute which shall inspect the cargo for its compliance with the tender T&C, quality and specifications, both at Load and Discharge Ports respectively. The cost of inspection, sampling, testing etc. and PSIA fee shall be borne by the seller.
ii) The PSIA shall be responsible for inspection of cargo at all three stages i.e. pre-loading, under loading at the load port and during unloading/discharging of cargo at discharge port. Copies of all such PSIA Inspections Reports shall be communicated to buyer immediately after issuing by the PSIA.
iii) The Seller shall offer to the Buyer's nominated PSIA, the stocks as per shipment schedule and also shall ensure PSIA accessibility to the stocks for inspection, sampling, testing, etc.
iv) The PSIA shall draw required number of representative samples jointly with the Seller and other attending agencies, in accordance with the international trade practice, prior to loading of cargo tendered by the seller for shipment. Seller will load the cargo on vessel after receipt of quality certificate duly supported with Lab test reports/results from PSIA. Guidelines for pre-shipment inspection are at **Annexure –XIV**.
v) PSIA shall also invariably, test the specifications of packing/PP bags. Besides the contents of sugar (**@ 50 KG net per bag**) are to be ensured by PSIA as well as by the supplier.
vi) The offered sugar or packing bags or both shall be rejected, if they don't meet any of the specification or characteristic prior to loading.
vii) PSIA shall issue specific certificate with regard to inspection of holds stating that holds have been inspected and examined prior to commencement of loading of the cargo holds found fully clean without any leakages of bottom, wet, oily, dirty and suitable for loading of cargo.
viii) The PSIA shall allow sailing in writing after ensuring that cargo is as per specifications provided in the tender along with a clear mention that the covers of the holds/hatches of the respective vessel are properly sealed / air tightened.
ix) The buyer reserves the right to send its representative as observer/witness at load port for which arrangements shall be made by the seller as and when such officers are sent for that purpose.

20. NOMINATION AND AGE OF VESSEL:

i) The seller shall ensure that the goods are shipped on a geared vessel. Class of nominated vessel(s) must not be lower than Lloyds 100 A1 or an equivalent class in the classification of any other recognized classification society. The vessel shall not be over fifteen (15) years of age. A vessel over 15 years of age but not exceeding twenty five (25) years would be acceptable provided it has established and maintained a regular pattern of trading to load and unload at specified ports. Proof of such regular pattern of trading should be dated prior to the date of shipment. In the event of vessel being over 15 years, Seller should pay overage insurance premium as per Lloyds of London scale or to be adjusted from the L/C, directly by the bank, at

actual, as per Insurance Company invoice. The vessel on its last voyage prior to ship-breaking will not be acceptable, under any circumstances**.**

ii) The seller shall prefer to engage PNSC g for supply of Sugar.

21. TERMS OF SHIPMENT FOR CFR (BREAK BULK):

i) Shipment from country of origin to prescribed Pakistan ports directly.

ii) The cargo to be discharged at the average rate of **Three Thousand (3,000) MT** at prescribed discharge Port, per weather working day (PWWD) of twenty four (24) consecutive hours based on minimum number of five (05) holds. **Sundays and holidays excluded (SHEX) even if used**. Time from noon Saturday or 1700 hours on a day preceding a legal or port holiday until 0800 hours next working day not to count even if used. If detained longer, receiver to pay demurrage at the rate of **USD Fifteen Thousand (15,000) PWWD** and proportionate of any part of the day. Dispatch money, if any, shall be paid by the Seller to Receiver at half of the demurrage rate for working time saved. Lay time shall commence after twenty four (24) hours of the acceptance of Notice of Readiness (NOR). NOR must be received in writing, in original, in the office of the Receiver during office hours (0830 hours to 1630 hours) from Monday to Friday. NOR through any other mode shall not be accepted. Notice of Readiness (NOR) must be tendered immediately after completion of voyage time/reaching Pakistan waters limit.

iii) Seller to notify to buyer immediately at least five (5) days prior to ETA at load port the nomination of carrying vessel along with the name of load port for getting it accepted by the buyer.

iv) Seller shall advise G.M. (D&POD), TCP by email address: gm.dpod@tcp.gov.pk, sheerazocp@gmail.com and gm.fa@tcp.gov.pk; and by fax no. **(0092-21) 99202722, 99202595**and the buyer's nominated insurance company about sailing of the ship from the load port, the quantity of cargo loaded, name of the ship and address of the Local Representative of vessel and ETA Karachi Port/Bin Qasim Port within twenty four (24) hours of sailing of vessel to Pakistan.

v) Trans-shipment not allowed.

vi) Vessel not to load any other cargo/consignment(s).

vii) Buyer's nominated vessel / shipping agent to be appointed by the sellers/ship-owners paying customary agency fee, together with port charges/ vessel expenses at discharge port.

viii) Delivery of cargo to be allowed against Indemnity Bond, as per P & I Club's format, on Buyer's letterhead in lieu of original Bill(s) of Lading.

ix) The Tally Room of the vessel shall be accessible to the Buyer and his Surveyor as well as his Handling Agent.

x) The vessel carrying the cargo should not have the flag of the Israel/India or any other banned/sanctioned country.

xi) The Bill(s) of Lading shall be issued by a person authorized by the Ship- owner/Master of the vessel. Any other bill(s) of lading will be considered null and void. Stale Bill of Lading is not acceptable.

xii) Buyer shall not be bound by the charter party if it is at variance with the terms of the contract between the Buyer and the Seller. In such case, the terms & conditions of tender and contract between Buyer and Seller shall prevail.

xiii) Geared vessels only bulk carrier is acceptable but twin Decker is not acceptable.

xiv) Seller will arrange ocean transportation through one or more bulk carrier vessels for awards made on the basis of minimum lot for the contracted quantity. Shipment(s) shall be on CFR Free Out basis.

xv) Seller must notify the Buyer promptly of vessel nomination. The Seller shall indicate and submit to the Buyer, upon nomination, the vessel's name, IMO Number, flag, age, P & I valid membership with full style of P & I, ISM certificate, classification society and registry certificate, number of hatches and holds, number and capacity of cranes/derricks and gears, full styles/contact details of head-owner, despondent owner & operator and also mention the name of load port and lay can (Laycan) should not be more than seven days).

xvi) The Seller or his agent in Pakistan will be required to coordinate with the Buyer for all matters relating to shipment(s) of commodity and will keep Buyer informed by fax about vessel's position and status of loading operations.

xvii) Seller to provide Buyer ten (10) days, seven (7) days, 96 hours, 72 hours, 48 hours and 24 hours pre advice of vessel ETA at discharge port where applicable.

xviii) Substitute of performing vessel to be accepted by the Buyer provided that the substitute vessel's ETA at discharge port is not later than that of the originally nominated vessel.

xix) Vessels to be in free pratique. Laytime will not commence till clearance and vessel comes in free pratique.

xx) Discharging at one or two safe berths at port with cost and shifting time on Shipowner's account, even if vessel is under demurrage. Time lost in shifting of vessel from berth(s) to berth(s), vessel adjustment time lost on the same berth as per requirement of Port Authority and shifting time from outer anchorage to berth will not be counted towards lay time even if vessel is under demurrage. Any/all dockage quay and/or port dues/charges are to be paid by Ship owner.

xxi) Master of the vessel and/ or local shipping agent shall notify Receiver (Buyer) by cable or fax and email at gm.dpod@tcp.gov.pk & sheerazocp@gmail.com ten (10) days, seven (7) days, 72 hours, 48 hours and 24 hours in advance confirming vessel arrival time of discharge port of Pakistan. Any variation of 12 hours or more in the arrival time requires an additional notification by fax/cable. All port charges including tax on vessel shall be paid by ship owner at the Discharge Port.

xxii) First opening of Holds/Hatches not to be counted towards lay time.

xxiii) The first port of discharge (after sailing of the vessel from load port) will be any port in Pakistan as designated by the buyer, after arrival and registration of vessel at designated port in Pakistan, the vessel shall not sail for any other port, prior to completion of discharge of buyer's cargo at the designated port.

xxiv) The vessel's voyage Log Book to be accessible to the Buyer's representative at discharge port.

xxv) Ship owner must fully abide by all regulations and orders of port authorities.

xxvi) The vessel to allow work at all times of the day or night. The owners to guarantee gear tested not more than one year prior to readiness.

xxvii) The vessel to supply, free of expense to the receiver, light for night work and power to drive winches, derricks or hydraulic cranes of **25 tons** capacity. Any time lost by reason of breakdown of the vessel winches, Power and/or derricks not to count.

xxviii) No cargo to be loaded in the deep tanks, alleys and inaccessible places. If loaded, unloading time not to count. All damages to ship due to discharging from deep tanks will be owner's liability. Damages, if any, to ship during course of discharge to be settled directly between owners and party concerned at port.

xxix) The Seller will airmail Charter Party before arrival of vessel at Karachi and also send the soft typed copy of charter party on email at gm.dpod@tcp.gov.pk & sheerazocp@gmail.com.

xxx) Owners will be responsible for meeting all specifications and port restrictions of LOA / beam / draft / flag / gear / ISPS.

xxxi) In case of damaged cargo, the cost of damaged cargo and resultant duties and plus extra cost, if any, will be at owners' cost and same be paid prior to sailing. Time used for discharging of damaged cargoes shall not be counted towards laytime. Only the time used for unloading of sound cargo will be counted towards laytime.

xxxii) In case of any slow discharge due to overage vessel or slow-moving cranes / gears, buyer reserve the right to reduce rate of discharge on the basis of joint survey report.

22. <u>INSURANCE</u>:

i) The goods shall be insured by the Buyer and the buyer shall communicate the contact details of its nominated Insurance Company to the Seller, once the arrangement is finalized.

ii) The Seller shall, immediately within twenty four (24) hours of sailing of the vessel to Pakistan**, through fax/e-mail inform the Buyer (Fax nos. (0092-21) 99202722 &99202595 and e-mail:** gm.dpod@tcp.gov.pk, sheerazocp@gmail.com and gm.fa@tcp.gov.pk**, the buyer's nominated Insurance Company and the opening bank,** the following details of shipment:-

a) Name of vessel.
b) Sailing date.
c) Port of shipment.
d) Invoiced quantity and value of the goods, Bills of Lading wise.

e) ETA of vessel at Discharge Port in Pakistan

iii) This shall be followed by airmail or courier advice accompanied by a copy of each of the related Invoices and Bills of Lading. Number of the open Policy Cover supplied to the Seller by the Buyer shall be quoted in commercial invoice.

iv) In addition to the overage insurance premium as mentioned in Clause-20, seller shall also pay any additional premium charged by insurance company in Pakistan over and above the normal rate due to the circumstances beyond the normal routine.

v) Origins wherefrom insurance is not provided by the buyer insurers, or provided at higher rates due to special circumstances of the origin such as war/conflict, the respective seller shall be responsible for payment of insurance premium to the extent of amount over and above buyer normal insurance rate of 0.05%, if insurance cover is provided by the buyer insurer at higher rates. The seller shall make the payment due from it at the time of insurance of the vessel. Any mark-up accrued due to delay/non-payment shall also be on the seller's account.

vi) If the seller is responsible only for arrangement/provision of War & SRCC cover, due to extraordinary circumstances, the seller shall arrange for insurance cover certificate from an international insurance company, with a Pakistani agent mentioned in the insurance certificate. The certificate shall be to the order of TCP, identifying TCP as the beneficiary. The seller shall send the original certificate to buyer along with proof of payment.

vii) In case buyer is required to arrange Marine Insurance cover only, and at a rate higher than its normal rate, the payment of insurance premium to the extent of amount over and above buyer normal insurance rate of 0.05%, shall be the seller's responsibility. The seller shall make the payment due from it at the time of insurance of the vessel. Any mark-up accrued due to delay/non-payment shall also be on the seller's account.

viii) The payment for goods, under cases mentioned at Clause 22(vi) & 22(vii) above, shall only be made upon arrival of shipment / delivery of goods at the discharge port, subject to clearance from commercial banks / SBP as explained in clause 24(x).

23. <u>POST LANDING SURVEY</u>:

i) In case of any damage to the cargo or any shortages found at discharge port during joint survey, the claim shall be lodged by the Buyer on the Ship-owner.
ii) The seller shall facilitate the settlement between Buyer and the Ship-owner.
iii) The discharging at port shall be allowed to commence by Buyer's Surveyor on completion of all Port formalities, under intimation to the General Manager (D&POD) TCP, Karachi.

24. <u>PAYMENT</u>:

i) The Irrevocable Letter of Credit shall be negotiable for hundred percent (100%) invoice value on presentation of following documents only within Ten (10) Pakistan banking working days after receipt of clean original documents at the counter of L/C issuing bank without discrepancy:

a) **Seller's Invoice**.

b) Full set of **Clean Shipped on Board Charter Party Bill of Lading** (comprising not less than three/03 originals) drawn or endorsed to the order of Opening Bank showing "**FREIGHT PREPAID"** and marked notified party (name of applicant party along with full address) and opening bank**.**

c) **Certificate of Quality** issued by the exporter/seller/prime-producer indicating the month and year of production.

d) **Certificate of Pre-Shipment Inspection** regarding quality, quantity/weight and packing by the PSIA nominated by the Buyer.

e) **Radioactivity Certificate** based on the composite sample drawn from the cargo during loading as per international standards, issued by the concerned / authorized government agency that the sugar is free from harmful Radioactivity or as per reporting standard of the exporting country.

f) **Human Consumption Certificate** issued by the manufacturer/exporter that sugar is fit for human consumption and free from any harmful substance.

g) **Certificate of Origin** issued by manufacturer/exporter as well as Chamber of Commerce or any other competent authority designated by the country of origin.

h) **Official Stowage Examination Certificate** Original, issued by the PSI stating that the vessel holds were duly examined prior to the commencement of loading and found fully clean, dry and suitable for sugar loading.

ii) Negotiation of documents under reserve is not acceptable by the Buyer.

iii) Bank charges outside Pakistan, if any, to be borne by the Seller.

iv) All bank charges in Pakistan connected with opening of the Letter of Credit, shall be on the Buyer's account. In case any amendment or extension in L/C is desired by Seller, the expenses shall be for Seller's account. If the L/C is required to be confirmed by the Sellers, such confirmation should be arranged through the counter of the bank where the L/C is negotiable, provided that the bank charges involved are paid by the Seller.

v) In case it is desired that the L/C be cabled/telexed to the beneficiary so as to reach them by a particular date, it can be done by the Buyer at the cost of the Seller.

vi) Shipping Documents presented within the validity period of L/C.

vii) Letter of Credit to be valid for negotiation for thirty (30) days from the date of Bill of Lading.

viii) Part shipment and part payment is allowed.

ix) Vessel of Israel/India flag or any other banned/sanctioned country excluded for transportation.

x) In case Clause-22(vi) & 22(vii) are applicable, the L/C shall be negotiable at sight for 100% invoice value upon arrival of ship / delivery of the goods at the discharge port.

25. DELIVERY OF DOCUMENTS:

i) The Seller shall send by e-mail the non-negotiable load port documents to General Manager (D&POD) Trading Corporation of Pakistan Limited at gm.dpod@tcp.gov.pk & sheerazocp@gmail.com, at least five days before the arrival of vessel in Pakistan.

ii) If the Original Bill(s) of Lading are not received by Pakistani bank concerned before the ship's arrival, the Seller would deliver the consignment to Buyer against Buyer's own guarantee(s) *as per clause 21(viii)* and instruct the Ship-owners and the Shipping Agents concerned accordingly.

26. FORCE MAJEURE:

i) Should any of the force majeure circumstances, namely Acts of God, natural calamity, fire, government restrictions, strikes or lock-outs by workmen, war, military operations of any nature and blockades preventing the Seller/Buyer from wholly or partially carrying out his contractual obligations, the period stipulated for the performance of the contract shall be extended for as long as these circumstances prevail, provided that, in the event of these circumstances continuing for more than Ten (10) Days, either party shall have the right to refuse to fulfill its contractual obligations without title to indemnification of any losses it may thereby sustain. The party unable to carry out its contractual obligations shall immediately advise the other party in writing at registered address, e-mail and/or fax of the commencement of force majeure of the same and circumstances preventing the performance of the contract.

ii) Seller is to be entirely responsible for obtaining and maintaining in force any necessary export licenses if required. Failure to obtain and to maintain in force such license shall not be sufficient grounds for Force Majeure.

iii) A certificate / Notification issued by the concerned Government Agency or Chamber of Commerce of the Seller or the Buyer's country shall be acceptable proof of the existence and duration of such circumstances.

iv) In case of origins situated under War Zone or origins falling under any international sanctions, any request for declaration for force majeure shall not be entertained.

27. DAMAGES:

i) If the goods are not shipped within the contracted period of shipment, the Seller shall be liable to pay to Buyer on demand without any question whatsoever, damages on account of extra expenditure, loss of revenue or loss of industrial / agri-production in the Buyer's country and loss of other benefits including goodwill and purchase of the same goods at a higher existing rate

and value, to the Buyer. The quantum of such damages shall be determined at the sole discretion of Buyer.

ii) The buyer reserves the right to reject the consignment / vessel or claim damages, if any contravention of the tender terms and conditions is found on the seller's part.

28. CANCELLATION OF CONTRACT:

If the Seller fails to ship the goods within the specified delivery period for any reasons other than Force Majeure, the Buyer shall be entitled, at his option, to cancel the contract and recover the damages, besides forfeiture/encashment of Performance Guarantee. The Buyer shall not be held liable to any risks and costs whatsoever in consequence of such cancellation of the contract.

29. ARBITRATION:

Any difference or dispute or liability of whatsoever nature arising out of the contract or in any way relating to the contract or to its construction or fulfillment should be settled as far as possible, amicably between the Buyer and Seller. Should the parties fail to come to an amicable settlement the same shall be referred to the award of Arbitrators to be nominated one each by the Seller and the Buyer within fifteen days of notice from either side or in the case of the said Arbitrators not agreeing, then to the award of an Umpire to be appointed by the Arbitrators in writing prior to proceeding with the arbitration. The decision of the Arbitrators or the Umpire, as the case may be, shall be final and binding on both the parties. The arbitration shall take place at Karachi, under Pakistan Arbitration Act, 1940.

30. CONFIDENTIALITY:

The terms and conditions of this contract shall remain strictly confidential to the parties unless both parties agree otherwise.

PS:1822/SARS 0007-2021
(ICS No. 67.180.10)

PAKISTAN STANDARD SPECIFICATION

FOR

REFINED SUGAR

only for research purposes
not for sale
copyright www.psqca.com.pk

COMPLETE DOCUMENT IS AVAILABLE AT THE END OF THIS DOCUMENT AFTER PAGE NO.29

ANNEXURE-II

TRADING CORPORATION OF PAKISTAN (PVT.) LIMITED, KARACHI

UV – RESISTANCE TEST

UV – resistance Test: The determination of the fluorescent of UV – radiation and weathering on the breaking strength of woven polypropylene fabric shall be carried out in accordance with ASTMG 53.

Test procedure: The test shall be carried out with fluorescent UV – Lamp type – B. The duration of the test shall be 144 hours (i.e. 6 days). The test cycle shall be 8 hours at +60˚C with UV – radiation, alternating with 4 hours +50˚C with consideration.

Criteria for passing the UV–resistance test: After the test, the breaking strength of the tested material shall be at least 50% of the original breaking strength.

TRADING CORPORATION OF PAKISTAN (PVT.) LIMITED, KARACHI

DROP TEST

The drop test shall be carried out on three sacks and shall comprise of following sequence.

Flat dropping: The sack shall be dropped from a height of 1800 mm twice one flat face and twice on the opposite flat face.

Criteria for passing the drop test: After each drop there shall be no rupture or loss of contents. A slight discharge e.g. from closures, upon impact shall not be considered a failure of the sack provided that no further leakage occurs after the sack has been raised clear from the ground.

TRADING CORPORATION OF PAKISTAN (PRIVATE) LIMITED

BID FORM FOR INTERNATIONAL TENDER NO.TCP/T&R/SUGAR/25-7/2025 DATED SEPTEMBER 27, 2025 FOR IMPORT OF 100,000 MT (ONE HUNDRED THOUSAND METRIC TONS) +/- 5% MOLSO (MORE OR LESS AT SELLER'S OPTION) OF WHITE REFINED SUGAR (BAGGED CARGO) ON CFR KARACHI BASIS (IN BREAK BULK)

1. **Name & Address of Bidder:** _____

   Telephone: _____

   Fax: _____

   Email: _____

2. **Name & Address of Local**

   Agent in Pakistan: _____

   Telephone: _____

   Fax: _____

   Email: _____

3. **Price & Quantity:**

SR. NO.	PARTICULARS	CFR (BREAK BULK) KARACHI
A. FOR SMALL (FINE) GRAIN SIZE		
I	**Price (in US$)**	
ii	**Quantity (in MT)**	
iii	**Country of Origin**	
iv	**Certificate of Stock Availability in the country of origin.**	***Certificate to this effect enclosed***

B. FOR SMALL GRAIN SIZE		
i	**Price (in US$)**	
ii	**Quantity (in MT)**	
iii	**Country of Origin**	
iv	**Certificate of Stock Availability in the country of origin.**	***Certificate to this effect enclosed***
C. FOR MEDIUM GRAIN SIZE		
i	**Price (in US$)**	
ii	**Quantity (in MT)**	
iii	**Country of Origin**	
iv	**Certificate of Stock Availability in the country of origin.**	***Certificate to this effect enclosed***

Note:

i) Price shall be quoted in USD/PMT on CFR Karachi Basis.

ii) Bid Security shall be submitted as per Clause-12.

iii) Bids shall be evaluated solely on the basis of offered bid price, subject to their conformity with terms and conditions of the contract (refer clause-13) and contract(s) would be awarded as per Clause-11, accordingly.

4. Amount of Earnest Money: USD _____

a. Banker's Cheque /Bank Guarantee (No. & Date): _____

b. Drawn at / issued by (BANK): _____

5. We shall abide by all the terms and conditions of the tender.

Signature: _____

Name: _____

Designation: _____

Date: _____

Stamp: _____

ANNEXURE-V

ON JUDICIAL PAPER OF PKR.100/-

A F F I D A V I T

I/We_____, resident of/having office at _____, Holding CNIC/National ID/Company Registration No. _____ and passport no. _____ (where applicable) do hereby affirm:

1. That either the principal seller/company or his local representative had never been black listed by TCP or any Government department/autonomous body.

2. That whatever is stated above is true and correct to the best of my/our knowledge and belief.

DEPONENT(S)

Messrs._____
_____
_____
Official Stamp

Solemnly affirmed before me on this _____day, by the deponent(s) named above with whose identity I am satisfied on the basis of his/her/their CNIC/passport.

COMMISSIONER FOR TAKING AFFIDAVITS

ANNEXURE-VI

ON JUDICIAL PAPER OF PKR.100/-

A F F I D A V I T

I/We_____, resident of/having office at _____, Holding CNIC/National ID/Company Registration No. _____ and passport no. _____ (where applicable) do hereby affirm:

1. That the principal seller/company or his local representative has fulfilled their previous contractual obligations with TCP before Tender opening date. The seller shall also disclose information relating to court cases of the bidders and their local agents against TCP or Government/Autonomous bodies.

2. That whatever is stated above is true and correct to the best of my/our knowledge and belief.

DEPONENT(S)

Messrs._____
_____
_____
Official Stamp

Solemnly affirmed before me on this _____day, by the deponent(s) named above with whose identity I am satisfied on the basis of his/her/their CNIC/passport.

COMMISSIONER FOR TAKING AFFIDAVITS

ANNEXURE-VII

(To be printed on the letterhead of the Bidder)

REPRESENTATIVE AUTHORITY LETTER

We hereby certify that M/s _____ with their head office located at _____ have been appointed to act as our Representatives for TCP Import Tender No. TCP/T&R/Sugar/25-7/2025 dated September 27, 2025 and given full authority to purchase tender documents, submit offers, negotiate and sign contracts and other documents on our behalf.

2. In case of any litigation and\or arbitration between TCP and us, summons or any other legal process served on the above Representative shall be admitted and held as valid as if served upon us.

_____	_____
<Name> Designation authorized One	<Name> Designation Authorized Signatory Two

ANNEXURE-VIII

ON JUDICIAL PAPER OF PKR.100/-

A F F I D A V I T

I/We_____ son/daughter/wife of (wherever applicable) _____, resident of/having office at _____, Holding CNIC bearing no. _____ and / or passport / or Chamber of Commerce Membership No. / or Company Registration No. _____ do hereby affirm:

1. That all the papers/documents and information furnished to the Trading Corporation of Pakistan (Pvt.) Limited, Shahrah-e-Faisal. Karachi (TCP) in Tender No. TCP/T&R/Sugar/ 25-7/2025 dated September 27, 2025 are true and genuine. If, at any time, any information or document is found false or incorrect, I/We shall be liable for blacklisting under TCP's Public Notice No. 1 of 2010 dated 3rd September 2010, besides any other action which the TCP may take under the law.

2. That whatever is stated above is on oath true and correct to the best of my/our knowledge and belief.

DEPONENT(S)

Messrs_____
_____
_____
Official Stamp

Solemnly affirmed before me on this _____day, by the deponent(s) named above with whose identity I am satisfied on the basis of his/her/their CNIC/passport.

COMMISSIONER FOR TAKING AFFIDAVITS

INTEGRITY PACT

Declaration of fees, commission and breakage etc. payable by the sellers of goods, services, and works.

[the Seller] hereby declares that it has not obtained or induced the procurement of any contract, right, interest, privilege or other obligation or benefit from Government of Pakistan or any administrative subdivision or agency thereof or any other entity owned or controlled by it (TCP, Ministry of commerce, Government of Pakistan) through any corrupt business practice.

Without limiting the generality of the foregoing, [the Seller] represents and warrants that it has fully declared the brokerage, commission, fees etc. paid or payable to anyone and not given or agreed to give and shall not give or agree to give to anyone within or outside Pakistan either directly or indirectly through any natural or juridical person, including its affiliate, Representative, associate, broker, consultant, director, promoter, shareholder, sponsor or subsidiary, any commission, gratification, bribe, finder's fee or kickback, whether described as consultation fee or otherwise, with the object of obtaining or including the procurement of a contract, right, interest, privilege or other obligation or benefit in whatsoever form from TCP, Ministry of commerce, Government of Pakistan, except that which has been expressly declared pursuant hereto.

[the Seller] certifies that it has made and will make full disclosure of all agreements with all persons in respect of or related to the transaction with TCP, Ministry of commerce, Government of Pakistan and has not taken any action or will not take any action to circumvent the above declaration, representation or warranty.

[the Seller] accepts full responsibility and strict liability for making any false declaration, not making full disclosure, misrepresenting facts or taking any action likely to defeat the purpose of this declaration, representation and warranty. It agrees that any contract, right, interest, privilege or other obligation or benefit obtained or procured as aforesaid shall, without prejudice to any other right and remedies available to TCP, Ministry of commerce, Government of Pakistan under any law, contract or other instrument, be voidable at the option of TCP, Ministry of commerce, Government of Pakistan.

Not with standing any rights and remedies exercised by TCP, Ministry of commerce, Government of Pakistan in this regard,

[the Seller] agrees to indemnify TCP, Ministry of commerce, Government of Pakistan for any loss or damage incurred by it on account of its corrupt business practices and further pay compensation to TCP, Ministry of Commerce, Government of Pakistan in an amount equivalent to ten time the sum of any commission, gratification, bribe, finder's fee or kickback given by [the Seller] as aforesaid for the purpose of obtaining or inducing the procurement of any contract, right, interest, privilege or other obligation or benefit in whatsoever form from TCP, Ministry of commerce, Government of Pakistan.

ANNEXURE – X

Declaration of Ultimate Beneficial Owners Information for Public Procurement Contracts (Required after Award letter)

1. Name
2. Father's Name/Spouse's Name
3. CNIC/NICOP/Passport No.
4. Nationality
5. Residential address
6. Email address
7. Date on which shareholding, control or interest acquired in the business.
8. In case of indirect shareholding, control or interest being exercised through intermediary companies, entries or other legal persons or legal arrangements in the chain of ownership or control, following additional particulars to be provided:

1	2	3	4	.5	6	7	8	9	10
Name	Legal form (company/limited liability Partnership/ Association of - Persons/Single Member Company/partnership Firm/Trust/Any other individual body corporate (to be specified)	Date of Incorporation/ registration	Name of registering authority	Business Address	Country	Email address	Percentage of shareholding, control or interest of BO in the legal person or legal arrangement	Percentage of shareholding, control or Interest of legal person or legal arrangement in the Company	Identify of natural person who ultimately owns or controls the legal person arrangement

9. Information about the Board of Directors (details shall be provided regarding number of shares in the capital of the company as set opposite respective names).

1	2	3	4	5	6	7	8
Name and Surname (In Block Letters)	CNIC No. (in case of foreigner, Passport No.)	Fathers / Husband's Name in full	Current Nationality (ies)	Any other Nationality (ies)	Occupation	Residential Address in full or the registered / principal office address for a subscribers other than natural person	Number of shares taken by cash subscriber (in figures and words)
			Total numbers of shares taken figures and words)				

10. Any other information incidental to or relevant to Beneficial Owner(s).

Name and signature
(Person authorized to issue notice on behalf of the company)

ANNEXURE-XI

BANK GUARANTEE FORM IN RESPECT OF BID SECURITY
(To be furnished on Stamp Paper of appropriate value)

The Trading Corporation of Pakistan (Pvt.) Limited,
Finance & Trade Centre,
Sharea Faisal,
Karachi.

M/s. _____through their Representative _____(hereinafter called the Tenderers) are submitting their offer against Tender No. TCP/T&R/Sugar/25-7/2025 dated September 27, 2025 and have requested us to issue a Bank Guarantee for an amount of USD._____in your favour as earnest money to ensure their compliance with conditions of the Tender.

2. Therefore, we hereby agree to make an unconditional payment of USD_____ (in words)_____ to you on demand without any further question or reference to the Tenderers on the Tender's failure to fulfill the terms of the tender. The sole judge for deciding whether the tenderer has failed to fulfill the terms of the tender shall be Trading Corporation of Pakistan (Pvt.) Limited.

3. This Guarantee is valid up to **__. In case the tenderers are awarded a contract for supply of goods as per Tender quoted above, the Guarantee shall remain in custody of TCP upto the date of furnishing of an acceptable performance bond on TCP's prescribed form.

4. Claim if any must reach us in writing on or before the expiry date after which we shall no longer be liable to make payment to you.

5. Our liability hereunder is limited to USD._____.

6. This guarantee is valid for 60 days.

Name of Bank_____
Address_____
_____

SIGNATURE
AUTHORIZED OFFICER OF THE BANK

** **Two** months from the date of opening of tender.

ANNEXURE – XII

TRADING CORPORATION OF PAKISTAN (PVT) LIMITED
4th Floor, Finance & Trade Centre, Sharea Faisal, Karachi

FORM OF PERFORMANCE BOND
(To be furnished on stamp paper of appropriate value)

Whereas the Trading Corporation of Pakistan (Pvt.) Limited, Block-B, 4th Floor, Finance & Trade Centre, Sharea Faisal, Karachi (hereinafter referred to as the "BUYER") has accepted offer for the supply of _____ metric tons of _____ Grain Size White Refined Sugar to be made by M/s._____ (hereinafter referred to as the "SELLER") on the terms and conditions governing the respective contract.

2. AND whereas the Seller has requested us **through the Bank** to issue a Guarantee for an amount of USD_____U.S. Dollars_____(in words)

3. NOW, therefore, in consideration aforesaid, we the _____ Bank Limited, hereby undertake and guarantee due performance of the contract by the Sellers and compliance with tender terms and conditions of the tender in all respects and we unconditionally and absolutely bind ourselves to the following:

i. To make payment of US Dollars _____ to the Buyer, or as directed by the Buyer on the date of their receipt of demand in writing without any question whatsoever.

ii. To keep this guarantee valid and in force for One (01) month after execution of contract including settlement of all claims.

iii. To extend this guarantee for such further period or periods as may be required by the Buyer at the Buyer's sole discretion, five days before the expiry of the validity date.

4. We understand that this guarantee is unconditional and that the sole judge for deciding whether the Seller has performed the contract No.TCP/T&R/Sugar/25-7/2025 dated September 27, 2025 and fulfilled the terms and conditions of the contract, shall be the Buyer.

5. We further understand that any grant of time or indulgence to the Seller without reference to us shall not in any manner absolve us from liability to make payment to the Buyer as stipulated under this Guarantee.

6. Our commitment under this guarantee is limited to an amount of USD_____ (US Dollars _____ --- in words).

7. This guarantee is valid for 180 days.

Also confirm the seller and shipper details for each counter party and country of shipment separately.

Complete Applicant Name –
Complete Applicant address –
Complete Beneficiary Name –
Complete Beneficiary address –
List of All Directors with their Passport numbers (copies to be attached) -
Name of the Country –
Port of shipment –
Port of discharge –
Complete information about the Shipper from port of shipment
In case shipment is to be made from country other than mentioned above
· Name of the country
· Complete information about the Shipper from port of shipment
· Port of shipment
All Banks involved (Applicant, Beneficiary, Accepting, Negotiating, Advising or any other banks involved etc.)
Trade Product
Description of goods and their usage & Origin
Amount and Currency

1. JOB DESCRIPTION OF PSIA:-

a. GENERAL:-

i) Upon receipt of award letter from TCP for supply of commodity, the seller shall require to coordinate immediately with TCP's nominated PSIA and offer/tender the cargo to PSIA for inspection well before arrival of the vessel.

ii) Seller shall be responsible to arrange the accessibility of PSIA to the cargo and seller shall provide the following documents to PSIA on immediate basis:-

1. Copy of TCP's import tender.
2. Copy of L/C.
3. Copy of Ship Particulars.
4. Copy of Vessel acceptance letter issued by TCP (break bulk).
5. Any other document, if required by PSIA or as instructed by TCP.

b. On completion of loading the PSIA will issue the following documents:-

i) Certificate of Quality against specifications as per TCP's import tender/contract.

ii) Certificate of Quantity by shore figures (i.e. as per no. of bags containing 50 KG net sugar per bag).

iii) Certificate of Quantity as per draught survey (break bulk).

2. INSPECTION OF CARGO: -

a. The cargo to be tested by PSIA under method as prescribed in the PSQCA standards or as prescribed in the TCP's relevant import tender. The sampling and testing of cargo / commodity should be done in accordance with the international standard, from internationally recognized foreign laboratory also approved from the Government, samples should be drawn in the presence of supplier/exporter and samples should be sealed by the supplier/exporter.

b. The results should be received by PSIA before the commencement of loading and after having entire satisfaction regarding quality in all respect, the PSIA shall allow to load the cargo in vessel. It must be noted that if the test analysis of bin / silo / godown referred above does not conform to the prescribed specifications, the loading of cargo / commodity is not to be permitted in any circumstances.

c. PSIA should draw five sets of samples jointly with the supplier / exporter from each bin / silo / godown separately from which the cargo/commodity to be loaded for analysis and for one set of sealed samples tested by a reputed, independent, government approved laboratory, one sample to be delivered to supplier / exporter, one sample to be dispatched to TCP through vessel and two samples to be kept in record for at least one year.

d. The PSIA should cover the points mentioned in the tender Terms & Conditions.

e. During loading, five representative samples of adequate weight / quantity of the cargo / commodity loaded into each hatch be drawn from a suitable location. These samples should be sealed and stamped and signed by the master of the vessel. Three sets each of sealed samples should also be handed over to the Master of the vessel against receipt for delivery to TCP at Karachi. One set of sealed samples should be handed over to the suppliers and one set be retained by them (Pre-shipment Inspectors) for subsequent test.

f. If required, the PSIA will instruct supplier/exporter for provision of craft paper before commencement of loading and seller shall be responsible to arrange the same as per PSIA's instructions.

g. The PSIA should ensure that the loading has been done directly from bins / silos / godowns into holds/hatches of the vessel. A **certificate to this effect** should be incorporated in the PSIA report.

h. If required, the PSIA will also check and certify the packing material in accordance with PSQCA method & standards or as prescribed in the import contract/tender.

i. PSIA shall ensure the sugar contents not less than 50 KG net per bag.

j. PSIA will seal the holds /hatches of the vessel after loading and issue Seal Certificate, duly endorsed by the Master of the vessel.

k. Any/all charges/expenses for testing/checking of rejected cargo shall be on account of seller.

3. INSPECTION OF VESSEL: -

a. The PSIA should carry out draught survey (break bulk), condition survey, holds inspection, holds tightness inspection / survey and all other necessary survey / inspections at berth. If vessel found ready in all respect than PSIA shall issue the fitness certificate that the vessel is fully fit and suitable to load the intended cargo. In case of any fault or substandard found, the vessel would never be allowed to load the cargo. In case PSIA feel that the vessel is not suitable to carry the TCP's cargo/consignment, PSIA can reject the vessel with sufficient justification/report.

b. The PSIA should check the Ship certificates, voyage book, age, and condition of the vessel, prior to issuance of the Fitness Certificate.

c. If PSIA need to check the vessel at off-port/outer, the extra charges for boat, permissions etc., shall be borne by the supplier/exporter.

d. PSIA will verify the age of the vessel in accordance with TCP's import tender/contract, class Lloyds 100 AI or equivalent class of any other internationally, recognized classification society.

e. Examine the ship's certificates to ensure their validity, and the validity / expiry dates to be stated in the PSIA report (break bulk).

f. Check the Cargo Gear Book for examination and validity and also check the last port control report (break bulk).

g. Examine the International Safety Manual and Report and ensure that the vessel's P&I cover is current and valid for any kind of damage in accordance with the Bill of Lading (break bulk).

h. All ballast tanks in way of the cargo holds to be tested, completely full, pressure tested by overflowing on deck (break bulk).

i. All bilges to be clean and dry and tested for their good working order (break bulk).

j. Get undertaking from Master of the vessel that the vessel is not on its last voyage prior to demolition and the vessel meets the parameters prescribed by the discharge port authority (break bulk).

k. All hatch covers to be properly battened down, in seaworthy condition, with all cleats closed, to be hose or ultrasonic tested for tightness (break bulk).

l. Carrying out a draught survey to confirm the quantity loaded by shore figures.

m. PSIA shall ensure and certify that all cargo spaces, overhead beams, frames and brackets to be:

i) Free from remains of last cargoes,

ii) Free from rust and loose scale

iii) Free from infestation,

iv) Dry, clean and free from odors,

v) Other certificates / confirmation as per requirement of import contract and as mentioned in this terms & conditions.

4. The vessel should allow sail after verification by PSIA that:-

i) Proper airtight sealing of the covers of the holds/hatches of the vessel.

ii) Vessel holds were duly examined prior to commencement of loading for being of the clearly clean, dry free from insects and infection and suitable to maintain quality of grain.

5. **Payment:-**

Payment of all PSI charges including testing charges shall be borne by the seller.

****

PS:1822/SARS 0007-2021
(ICS No. 67.180.10)

PAKISTAN STANDARD SPECIFICATION

FOR

REFINED SUGAR

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PAKISTAN STANDARDS AND QUALITY CONTROL AUTHORITY
Standards Development Centre,
PSQCA Complex, Standardization Wing II, 1st Floor, Plot - ST-7/A, Block-3,
Scheme No.36, Gulistan-e-Jauher, Karachi.

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0. FOREWORD

0.1 This Pakistan Standard Specification was adopted by the Pakistan Standards & Quality Control Authority on **03-03-2021** after the finalized by the Sugar Industries Technical Committee had been approved by the National Standards Committee for Agriculture & Food Products.

0.2 In order to keep abreast of the Progress in Industry the Pakistan Standards are subject to periodical review suggestions for improvement shall always be welcomed and put to the relevant committee for its consideration.

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SAARC STANDARD

SARS 0007:2017

First edition
01-03-2017

REFINED SUGAR — SPECIFICATION

ICS 67.180.10

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Reference number
SARS 0007:2017

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FOREWORD

The South Asian Regional Standards Organization (SARSO) is a Specialized Body of South Asian Association for Regional Cooperation (SAARC) aimed to achieve and enhance coordination and cooperation among SAARC Member States in the fields of standardization and conformity assessment and to develop harmonized Standards for the South Asian region to facilitate intra-regional trade and to have access in the global market. The Member States of SAARC are Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. The Agreement on the establishment of SARSO entered into force with effect from 25 August 2011 after ratification by all Member States of SAARC.

The National Standards Bodies of the SAARC Member States participate in the development of SAARC Standards (SARS) through the Sectoral Technical Committees (STCs). The SARS are developed through consensus and are drafted in accordance with the editorial rules of the SARSO Directives, Part 2.

The SARSO Secretariat is the guardian of the authoritative versions of the SAARC Standards and is responsible for keeping master texts of SAARC Standards, both in hard and soft form. The Member States are responsible for making SAARC Standards available for sale, distribution, etc, at the national level. In accordance with the 'SAARC Agreement on Implementation of Regional Standards', the approval of a SAARC Standard implies that Member States have an obligation to give it the status of a National Standard.

This SAARC Standard was considered by the Technical Management Board and approved by the Governing Board of SARSO on the recommendation of the STC-01: Food and Agricultural Products.

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INTRODUCTION

Refined sugar is manufactured from any type of sugar or sugar cane or sugar beet, in general by a process of purification, consisting broadly of affination, melting, chemical treatment, filtration, decolourization and subsequent recrystallization in vacuum pan, the treatment depending upon the nature of the initial material. It may be of any grain size (large, medium or small).

This Standard is aligned with the Codex Standard for Sugars, CODEX STAN 212 - 1999 and the methods of test have been aligned with the International Commission for Uniform Methods of Sugar Analysis (ICUMSA).

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 or analysis shall be rounded off, as per the relevant national Standards of the respective Member State. The number of significant places retained in the rounded off value should be the same as that of the specified value in the relevant referred Standard

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SAARC Standard

REFINED SUGAR — SPECIFICATION

1 SCOPE

This Standard specifies the requirements and the methods of sampling and test for refined sugar.

2 NORMATIVE REFERENCES

The Standards referred in the text, if any, 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 referred in the text.

3 TERMS AND DEFINITIONS

For the purposes of this Standard, the following term and definition apply.

3.1 Refined Sugar

Purified and crystallized sucrose (saccharose)

4 REQUIREMENTS

4.1 Description

Refined sugar shall be crystalline, white, odourless and free from dirt, iron fillings and other extraneous matter.

4.2 The product shall also comply with the requirements given in Table 1.

4.3 Refined sugar shall be manufactured, packed, stored and distributed under hygienic conditions as detailed in the respective National Standards. In case such National Standards are not available, the Codex Alimentarius Commission Standards on the hygienic conditions shall be followed.

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Table 1 - Requirements for Refined Sugar
(*Clause* 4.2)

Sl. No.	Characteristics	Requirement	Method of Test, Ref to Annex
(1)	(2)	(3)	(4)
i)	Loss on drying, percent by mass, *Max*	0.10	B
ii)	Polarization, *Min*	99.7°Z	C
iii)	Reducing sugar, percent by mass, *Max*	0.04	D
iv)	Colour in ICUMSA units, *Max*	60	E
v)	Conductivity ash, percent by mass. Max	0.04	F
vi)	Sulphur dioxide, mg/kg, *Max*	15	G
vii)	Lead, mg/kg, *Max*	0.5	AOAC 999.10 H (alternative method)
viii)	Chromium, mg/kg, *Max*	20	I
ix)	Copper, mg/kg, *Max*	2	AOAC 960.40 or AOAC 999.10

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x)	Arsenic mg/kg, *Max*	1	AOAC 986.15 or ICUMSA , GS2/3-23 (2005)

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5 PACKAGING

Refined sugar shall be packaged in clean, sound and new jute bags or bags made of polypropylene or bags made of high density polypropylene made of food grade material. The jute bags may be lined with polyethylene film. The mouth of each bag shall be either machine-stitched or rolled over and hand-stitched. If hand-stitched, the stitches shall be in two rows with at least 14 stitches in each row. In the case of smaller consumer packs, the product shall be packed in food grade plastics or any other suitable non-toxic material.

6 MARKING/LABELLING

6.1 Each bag/pack shall bear legibly and indelibly the following particulars:

a) name of the product;

b) brand name or Trade name, if any;

c) name and address of the manufacturer including the country of origin;

d) in case of imports, the name and address of importer;

e) net mass of sugar;

f) month and year of manufacture;

g) batch or Code number;

h) the words ‘Best before . . . .’ (month and year to be indicated); and

i) any other markings as specified as per respective national regulations.

6.2 Certification Marking

The product may also be marked with the Standard Mark of conformity.

7 SAMPLING

Representative samples of refined sugar shall be drawn and the criteria for conformity to this Standard shall be established, according to the method prescribed in Annex A. In case of consumer packs, samples of refined sugar shall be drawn and the criteria for conformity to this Standard shall be established.

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Annex A
(Normative)
(*Clause* 7)

SAMPLING OF REFINED SUGAR

A-1 General Requirements

A-1.0 In drawing, preparing, storing and handling samples, the following precautions and directions shall be observed.

A-1.1 The sample shall be taken in a protected place not exposed to damp air, dust or soot.

A-1.2 The sampling instrument shall be clean and dry when used.

A-1.3 Precautions shall be taken to protect the samples, the material being sampled, the sampling instrument and the containers for samples from adventitious contamination.

A-1.4 The samples shall be placed in clean, dry and moisture-proof containers.

A-1.5 The sample containers shall be sealed air-tight after filling and marked with full details of sampling, that is, name of the material, the date of sampling, month and year of manufacture, name of the producer, name of the person carrying out the sampling and such other particulars as considered necessary.

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A-2 Scale of Sampling

A-2.1 Lot

All the bags in a single consignment of the material drawn from a single batch of manufacture shall constitute a lot. If a consignment is declared to consist of different batches of manufacture, the batches shall be marked separately and the group of bags in each batch shall constitute separate lots.

A-2.1.1 Each lot shall be tested for ascertaining the conformity of refined sugar to the requirement of this Standard.

A-2.2 The number of bags to be selected for sampling shall be in accordance with column 2 and 3 of Table 2.

Table 2 - Number of Bags to be selected for Sampling
***(Clause* A-2.2)**

Sl. No.	No. of Bags in each Lot	No. of Bags to be Selected
(1)	(2)	(3)
i)	2-25	2
ii)	26-100	3
iii)	101-500	5
iv)	501-1000	7
v)	1001 and above	8

A-2.3 These bags shall be selected at random from the lot.

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A-3 Test Samples and Referee Sample

From the top, middle and bottom portions of each of the selected bags (*see* A-2) approximately equal quantity of the sugar shall be taken with the help of a suitable sampling instrument. The sample collected from each of the bags shall be mixed thoroughly to constitute a composite sample of 600 g. The composite sample thus prepared shall be divided approximately into three equal parts; one for the purchaser, one for the supplier and the third for the referee; and sealed air-tight with the particulars as given in A-1.5.

A-4 Number of Tests

The composite sample prepared as under A-3 shall be tested for the characteristics as prescribed in Table 1.

A-5 Criteria for Conformity

The lot shall be declared as conforming to this Standard when the test results on various characteristics obtained on the composite sample satisfy the corresponding requirements as specified in clause 4 and Table 1. When examined each pack shall conform packaging and marking/labeling requirements.

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Annex B
(Normative)
[*Clause* 4.2, Table 1, Sl. No. (i)]
DETERMINATION OF LOSS ON DRYING

B-1 Field of Application

The method is applicable to various types of sugar and sugar products.

B-2 Definition

B-2.1 Loss on Drying — Because water represents the primary heat-volatile liquid in both cane and beet processing it is certainly the main volatile component lost on drying sugar. The matter lost on drying in this method is referred to as 'moisture' or water. Moisture in sugar is considered to be present in three forms:

a) Free moisture, being that contained on the surface of the crystal which is easily and quickly removed on drying.

b) Bound moisture, being that contained in the glassy layer on the surface and in the reentrant angles which is only released slowly as the glass crystallizes.

c) Inherent moisture, this being moisture included within the crystal structure and only released in general by grinding.

B-3 Principle

The principle of the method is oven drying using the atmospheric pressure oven technique (105°C) followed by standardized conditions for cooling after oven drying. It is mainly free moisture which is estimated by this method.

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B-4 Apparatus

B-4.1 Forced Draught Atmospheric Pressure Oven, maintained at a temperature of 105°C ± 2°C as measured at a distance of 2.5 cm ± 0.5 cm above the dishes in the test. The oven is to be ventilated and the circulation fan faced with an inter-lock switch which opens when the oven door is opened.

B-4.2 Desiccator, containing self-indicating silica gel.

B-4.3 Dishes with Tight Fitting Lids — These should have a diameter of 6cm to 10cm and a depth of 2 cm to 3 cm. Although they may be made of glass, platinum or nickel, aluminum is recommended. The thickness of the dishes is optional except that due regard should be paid to the weight of the dish in relation to the weight of the sample and to the loss to be determined.

B-4.4 Clean Dry Duster

B-4.5 Surface Pattern Dial Thermometer — An electronic thermometer may be used provided it is fitted with a surface probe.

B-4.6 Analytical Balance — Capable of weighing to the nearest 0.1 mg.

B-5 Procedure

B-5.1 Drying

Carry out the determination in duplicate and preheat the oven to 105°C. Place the empty dishes with lids open in the oven for not less than 30 min. using the duster for handling them, remove the dishes from the oven,

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replace the lids and place in the desiccator. Place the contact thermometer on top of one of the dishes. When the temperature of the dishes has fallen to ambient ± 2°C, weigh them as rapidly as possible to an accuracy of ± 1 mg. As rapidly as possible, place 20 g to 30 g of the sample into each dish, replace the lids and weigh the dish and contents to an accuracy of 0.1 mg. Return the dishes with the lids open to the oven. Their position in the oven will be governed by the requirements of B-4.1. Dry the sample for 3 h exactly. Ensure that there are no other materials in the oven during the drying period.

NOTE: The depth of the sugar in the dish must not exceed 1 cm.

B-5.2 Weighing to Determine Loss on Drying

Replace the lids, remove the dishes from the oven and place in the desiccator with the contact thermometer on one of them. Cool the dishes, until the thermometer indicates a temperature of ambient ± 2°C. Weigh the dishes to an accuracy of 0.1 mg.

NOTE: No attempt should be made to dry to constant weight and care must be taken to ensure that there is no physical loss of sugar at any stage. Dishes should always be held with a clean, dry duster.

B-6 Expression of Results

B-6.1 Calculation of Loss on Drying

Loss in mass is expressed as a percentage or the original Loss in mass is expressed as a percentage of the original mass of the sample, that is:

$$\text{Loss on drying, percent by mass} = \frac{100(m_2\text{-}m_3)}{m_2\text{-}m_1}$$

where

m_1 is the mass of dish, in g;
m_2 is the mass of dish with sugar before drying, in g; and
m_3 is the mass of dish with sugar after drying, in g.

Duplicate results are acceptable if neither is outside the limits of ± 10 percent of the mean value for the test. Tests in which either duplicate exceeds this limit should be repeated.

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Annex C
(Normative)
[*Clause* 4.2, Table 1, Sl. No. (ii)]

DETERMINATION OF POLARIZATION

C-1 Field of Application

The method is applicable to plantation white sugar and refined sugar. The method is used in statutory analysis and is applicable to white sugars and other white refined products of low colour and turbidity, not needing clarification and having a loss on drying of not more than 0.1 percent. White sugars, the polarization of which cannot be measured without clarification, are to be measured according to method prescribed for raw sugars (*see 6*).

C-2 Apparatus and Glassware

C-2.1 Analytical Balance

C-2.2 Normal Weight, 26.000 g (brass weight) as weighed in air at 20°C.

C-2.3 Basin, made of nickel or German silver, large enough to hold the normal weight of sugar.

C-2.4 Volumetric Flask, of capacity 100 ml, calibrated at 20°C.

C-2.5 Long-Stemmed Funnel, with a stem long enough to extend below the neck of the volumetric flask.

C-2.6 Stemless Funnel, capable of holding 100 ml.

C-2.7 Glass Cylinder, capable of holding 100 ml.

C-2.8 Watch-Glass, large enough to cover the stemless funnel.

C-2.9 Saccharimeter, graduated in International Sugar Scale and provided with a 200 mm tube. The saccharimeter should be sheltered in a cabinet, the inside of which is maintained at 20°C. Where this is not possible, necessary corrections shall be applied, based on the characteristics of the particular instrument.

C-2.9.1 Standardization of saccharimeter scale — Saccharimeter scale must be graduated in conformity with International Sugar Scale adopted by ICUMSA. Rotations of this scale are designated as degrees sugar (^{o}S).To convert values in ^{o}S to values in ^{o}Z, multiply the ^{o}S value by the factor 0.999 71. Basis of calibration of 100^{o} point on international sugar scale is polarization of normal solution of pure sucrose (26.000 g/100 ml) at 20^{o}C in 200 mm tubes. This solution, polarized at 20^{o}, must give saccharimeter reading of exactly 100^{o}S.

C-2.9.2 Standardization of polarimeter scale – Polarimeter will be calibrated with traceable quartz plates for 100^{o}Z.

C-3 Reagent

C-3.1 Alumina Cream — Dilute 500 ml of 30 percent (w/v) aluminium sulphate solution to 2 litres. Add gradually 10 percent (w/v) ammonia solution to the above with constant stirring until no precipitate is formed. Allow the precipitate to settle and decant off the clear liquid. Shake the precipitate with 1 litre of distilled water and allow it to settle again for decantation of the clear liquid. Repeat the process of washing and decantation till the supernatant liquid is neutral to litmus and does not precipitate with barium chloride solution. Make the precipitate of the aluminium hydroxide into a thick paste with water and store it in a stoppered bottle.

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C-3.2 Lead Acetate

Dissolve 560 g of basic lead acetate powder in 1 litre of freshly boiled distilled water, which has been previously cooled in a sealed container. Boil for 30 minutes and allow to settle overnight in a sealed container. Decant the supernatant liquid and dilute with freshly boiled distilled water to 1.25 specific gravity (56° Brix).

C-4 Test Temperature

The polarization of the normal solution of sugar shall be carried out at 20°C, as far as possible.

C-5 Procedure

C-5.1 Preparation of the Solution

Weigh accurately on the analytical balance the normal weight of the sugar (*see* C-2.2) in the basin. Transfer this quantity to the volumetric flask with the aid of the long-stemmed funnel. Rinse the basin and the funnel with water, and transfer the washings to the volumetric flask taking care that the volume of the contents of the flask does not exceed 80 ml. Bring the sugar into solution by gently swirling the flask and clarify the solution by adding 1 ml to 2 ml of alumina cream until nearly all the impurities have been precipitated. Make up the volume to 100 ml at the test temperature (*see* C-4) with water. If difficulty in clarification is experienced, repeat the experiment using anhydrous lead sub-acetate in small quantities in place of alumina cream (about 0.6 g of lead sub-acetate is usually required; any excess of lead sub-acetate should be avoided).

C-5.2 Polarization of the Solution

Place the stemless funnel over the glass cylinder and fix a cone of dry filter paper, large enough to hold 100 ml, in the funnel. Pour the whole of the defecated solution on to the cone of dry filter paper and cover it immediately with a watch-glass large enough to cover the funnel. Reject the first 10 ml to 15 ml of the filtrate. Rinse the glass cylinder with a little quantity of the filtrate; discard the solution used for rinsing. Collect the remainder of the filtrate into the rinsed cylinder. Polarize the filtrate in the saccharimeter at 20°C, as far as possible (*see also* C-2.1), using a 200 mm tube. The reading gives the polarization percent of the sugar.

C-5.2.1 If the polarization is done at a temperature other than 20°C, the saccharimeter reading shall be corrected using the following formula (*see* Note):

$$P^{20} = P^{t}[1+0.0003\ (t - 20)]$$

Where

P^{20} is saccharimeter reading, at 20°C,
P^{t} is saccharimeter reading, at t°C, and
t is temperature in °C at which the polarization is carried out.

NOTE: The formula is applicable only up to 30°C

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Annex D
(Normative)
[*Clause* 4.2, Table 1, Sl. No. (iii)]

DETERMINATION OF REDUCING SUGARS BY THE MODIFIED OFNER TITRIMETRIC METHOD

D-1 Field of Application

The method measures the reducing power of solutions of white sugar containing reducing substances, for example, invert sugar in a weak alkaline solution of a Cu^{++} complex with tartrate. The method is applicable to various types of sugar and sugar products.

D-2 Definition

D-2.1 Reducing Sugars — Mono and oligosaccharides containing a free aldehydic or ketonic group which show a reducing effect on certain oxidizing agents.

D-2.2 Invert Sugar — Equi-molar solution of glucose and fructose.

D-2.3 Reducing Substances — The sum of reducing sugars and other substances in sugar products defined by their reducing power on reagents which are used for the determination of reducing sugars. Like reducing sugars their amount is in most cases expressed as the equivalent amount of invert sugar, that is the amount of invert sugar which shows the same reducing power under the conditions of the reaction.

D-3 Principle

The complex formed between Cu^{++} ions and potassium sodium tartrate is reduced by reducing sugars to univalent Cu^{+} which is precipitated as Cu_2O. The precipitated Cu_2O is then determined by iodometric titration.

The Cu_2O is oxidized by an excess is back-titrated with sodium thiosulphate. The reaction between the reducing sugars and the Cu^{++} complex is not stoichiometric. The amount of Cu_2O formed depends upon the prescribed reaction conditions which therefore must be strictly followed. It has been determined that 1 ml of 0.016 15 mol/l iodine solution is equivalent to 1mg of reducing sugars, once the correction for the reducing effect of sucrose has been taken into account.

D-4 Reagents and Materials

Use only distilled water or water of similar quality. All reagents should be of analytical grade of better unless stated.

D-4.1 Activated Carbon, powdered.

D-4.2 Small Pumice Pieces

D-4.3 Disodium Hydrogen Phosphate, $Na_2HPO_4.12H_2O$

D-4.4 Glacial Acetic Acid, M_{20} = 1.05 g/ml.

D-4.5 Acetic Acid Solution, approximately 5 mol/l.

D-4.6 Potassium Sodium Tartrate (Rochelle or Seignette Salt)

D-4.7 Copper Sulphate Pentahydrate, $CuSO_4.5H_2O$.

D-4.8 Sodium Carbonate, anhydrous.

D-4.9 Soluble Starch

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D-4.10 Hydrochloric Acid, approximately 1 mol/l.

D-4.11 Hydrochloric Acid, approximately 2 mol/l.

D-4.12 Ofner Solution, modified — Weigh out 7.0 g copper sulphate pentahydrate (*see* D-4.7*)* 10.0 g sodium carbonate (*see* D-4.8), 300 g potassium sodium tartrate (*see* D-4.6) and 50 g disodium hydrogen phosphate (*see* D-4.3) in a 1000 ml flask. Dissolve in approximately 900 ml water (heating slightly to dissolve if necessary). Heat the solution for 2 h in a boiling water bath. Cool down to room temperature and fill up to the mark. Add approximately 10 g activated carbon (*see* D-4.1) and stir for 5-10 min. Filter the solution (*see* D-5.11).

D-4.13 Potassium Iodate Solution, 0.016 67 mol/l — Weigh out 3.566 7 g potassium iodate, KIO_3. Transfer to a 1000 ml volumetric flask, dissolve in water and fill to the mark.

NOTE: Dry the potassium iodate for 3 h at 100°C before use.

D-4.14 Starch Solution Indicator for Iodine — Dissolve 1 g of soluble starch in 100 ml saturated sodium chloride solution. Bring the solution to the boil for few minutes.

D-4.15 Potassium Iodide, KI

D-4.16 Sodium Thiosulphate Solution, 0.033 3 mol/l — Dilute a 0.1 mol/l sodium thiosulphate solution three fold with water and standardize with potassium iodate. Dissolve 2 g of potassium iodide in 10 ml water. Add 5 ml of approximately 2 mol/l hydrochloric acid (*see D*-4.11) and 10 ml of 0.016 67 mol/l potassium iodate solution (*see D*-4.13). Cover the flask with a watch glass, shake gently and leave the solution in the dark for approximately 30 min. Titrate the iodine formed with the sodium thiosulphate solution to complete decolonization, adding 1 ml of starch indicator (*see D*-4.14) immediately before the end point. Calculate the factor f_{Th} of the thiosulphate solution:

$$f_{Th} = \frac{30.96}{V_{Th}}$$

where

V_{Th} is ml of sodium thiosulphate solution titrated.

NOTE: f_{Th} corrects the used iodine solution to the experimentally determined value of 0.016 15 mol/l, for which 1 ml corresponds to 1 mg reducing sugars.

D-4.17 Iodine Solution, 0.016 67 mol/l - Dilute a 0.05 mol/l iodine solution three-fold with water and standardize with the 0.033 3 mol/l sodium thiosulphate solution (*see* D-4.16). Pipette 25.0 ml of the iodine solution into a 300 ml Erlenmeyer flask. Add 5 ml of 5 mol/l acetic acid (*see* D-4.5) and, after gently shaking the mixture, titrate back with the 0.033 3 mol/l sodium thiosulphate solution (*see* D-4.16). Add 1 ml of starch indicator (*see* D-4.14) just before the endpoints is reached. Calculate the factor, f_1 of the iodine solution:

$$f_1 = \frac{V_{Th} \times f_{Th}}{25}$$

where

V_{Th} is ml of sodium thiosulphate solution titrated, and
f_{Th} is Correction factor for the sodium thiosulphate solution.

D-5 Apparatus and Glassware

D-5.1 Analytical Balance, capable of weighing to the nearest 0.1 mg.

D-5.2 Precision Balance, capable of weighing to the nearest 0.1 g.

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D-5.3 Burettes, capacity 50 ml,

D.5.4 Erlenmeyer Flasks, capacity 300 ml.

D-5.5 Volumetric Flasks, 1 000 ml and 200 ml.

D-5.6 Pipettes, capacities 1 ml, 15 ml and 50 ml.

D-5.7 Watch Glasses, to cover Erlenrneyer flasks.

D-5.8 Bunsen Burner, Tripod and Wire Gauze

D-5.9 Boiling Water Bath

D-5.10 Water Bath with Cold Running Water

D-5.11 Filter Paper

D-6 Procedure

D-6.1 Preparation of the Sample

The solution prepared for the determination should contain no more than 25 mg invert sugar in 50 ml. This requires that 40 g of white sugar be made up with water to 200 ml.

D-6.2 Hot Value

Mix 50.0 ml of the prepared solution (*see* D-6.1) with 50.0 ml of the Ofner solution (*see* D-4.12). Add some pumice pieces (*see* D-4.2) to the mixture. Bring the mixture to the boil within 4 to 5 min using the Bunsen burner, the tripod and the wire gauze. Boil for exactly 5 min. Note the start of boiling is once numerous steam bubbles break over the whole surface. Cool the mixture down in a water bath with cold running water. After approximately 10 min. the mixture should have reached room temperature. Add 1 ml concentrated acetic acid (*see* D-4.4). Add iodine solution (*see* D-4.17) until the colour of the mixture turns a typical iodine colour. This procedure dissolves the formed Cu_2O with an excess of iodine. The surplus iodine should be so high that between 10 ml and 15 ml of sodium thiosulphate (*see* D-4.16) are consumed on back titration. Add 15 ml of the 1 mol/l hydrochloric acid (*see* D-4.10) by pouring it down the inner side of the flask so that the residual droplets are washed down into the solution. Cover the flask with a watch glass and move it gently for 2 min until the precipitate of Cu_2O is completely dissolved. Titrate the sample with 0.033 3 mol/l sodium thiosulphate (*see* D-4.16). Add 1 ml of starch solution immediately before the endpoint is reached. Repeat the above procedure with another prepared solution mixed with Ofner solution and record the average of the two replicated V_1, and V_2 for iodine and thiosulphate respectively.

D-6.3 Cold Value

Mix 50.0 ml of the prepared sample (*see* D-6.1) with 50.0 ml of the Ofner solution (*see* D-4.12). Leave the mixture at room temperature for 10 min. Repeat the procedure outlined in D-6.2. Record values V_3 and V_4.

D-6.4 Blank Value

Mix 50 ml of water with 50 ml of the Ofner solution (*see* D-4.12). Repeat the procedure outlined in D-6.2. Record the values V_5 and V_6.

NOTE: It is essential that the time between addition of iodine solution and beginning of the back titration is equal for the hot value and the cold value.

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D-7 Expression of Results

D-7.1 Calculation of the Results

Added amount of iodine for hot value = V_1

Added amount of thiosulphate for hot value = V_2

Added amount of iodine for cold value = V_3

Added amount of thiosulphate for cold value = V_4

Added amount of iodine for blank value = V_5

Added amount of thiosulphate for blank value = V_6

Corrected consumption of 0.016 67 mol/l iodine solution:

Calculated hot value, $A = (V_1 \times f_1) – (V_2 \times f_{Th})$

Calculated cold value, $B = (V_3 \times f_1) - (V_4 \times f_{Th})$

Calculated blank value, $C = (V_5 \times f_1) - (V_6 \times f_{Th})$

where

f_1 is the factor of the iodine solution. Calculated in D-4.17 and

Sucrose correction, D, is 0.1 ml iodine solution/g of sucrose in the reaction mixture.

$$\text{Invert sugar, mg/kg} = \frac{(A - B - C - D) \times 1000}{s}$$

where

s is the amount of sample in 50 ml of prepared solution (*see* D-6.1)

D-7.2 Example Calculation

100 g white sugar is weighed out and diluted to 200 ml. 50 ml of this solution contains 25 g sucrose.

Amount of iodine solution added to hot value is 25.00 ml.

Amount of sodium thiosulphate consumed is 21.71 ml.

Amount of iodine solution added to cold value is 25.00 ml.

Amount of sodium thiosulphate consumed is 24.72 ml.

Amount of iodine added to the blank value is 25.00 ml.

Amount of sodium thiosulphate consumed is 25.00 ml.

f_{Th} is calculated to be 1.029

f_1 is calculated to be 1.031

$B = (25.0 \times 1.031) – (24.72 \times 1.029) = 0.34$

$A = (25.0 \times 1.031) – (21.71 \times 1.029) = 3.43$

$C = (25.0 \times 1.031) – (25.0 \times 1.029) = 0.05$

$D = 25.0 \times 0.1 = 2.50$

$$\text{Reducing sugar} = \frac{(3.43-0.34-0.05-2.50) \times 1000}{25} = 21.9 \text{ mg/kg}$$

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Annex E
(Normative)
[*Clause* 4.2, Table 1, Sl. No. (iv)] DETERMINATION OF SUGAR SOLUTION COLOUR

E-1 Field of Application

This method is used for the determination of sugar solution colour. The method can be applied to all crystalline or powdered white sugars provided that a filtered test solution can be prepared by the procedure specified in the method. The method is not suitable for those sugars which contain colouring matter, turbidity or additives to an extent that filtration is not practical.

E-2 Definitions

E-2.1 Transmittance of a Solution

If I_1 represents the radiant energy incident upon the first surface of the solution and I_2 represents the radiant energy leaving the second surface of the solution.
Then

$$\text{Transmittance of the solution, } T = \frac{I_2}{I_1}$$

where

100 *T* is percentage transmittance

E-2.2 Transmittancy

Let T_{soln}, represent the transmittance of a cell containing the solution and let T_{solv} represent the transmittance of the same or duplicate cell containing the pure solvent.
Then

$$\text{Transmittancy of the solution, } T_S = \frac{T_{soln}}{T_{solv}}$$

E-2.3 Absorbency (Extinction), *As*

$$\text{Absorbancy of the solution, } \blacksquare = -\log_{10} T_s$$

E-2.4 Absorbance Index (Extinction Index)

Let b represent the length, cm, of the absorbing path between the boundary layers of the solution and let *c* represent the concentration, g/ml, of the sugar solution.
Then,

$$\text{Absorbance index of the solution, } \blacksquare = \frac{\blacksquare}{\blacksquare\blacksquare}$$

E-2.5 International Commission for Uniform Methods of Sugar Analysis (ICUMSA) Colour

The value of the absorbance index multiplied by 1000 is reported as ICUMSA Colour. The resulting values are designated as ICUMSA Units (IU).

E-3 Principle

White sugar is dissolved in a distilled water to give a 50 percent sugar solution. The solution is filtered through a membrane filter to remove turbidity. The absorbance of the filtered solution is measured at a wavelength of 420 nm and the solution colour is calculated.

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E-4 Reagents

Use only distilled water or water of equivalent purity.

E-5 Apparatus

E-5.1 Instrument — Spectrophotometer or calorimeter capable of light transmission measurements at a wavelength of 420 nm with the narrowest practical bandwidth, for example ± 10 nm. The instrument should be fitted with a grating, prism or interference filter monochromator. Coloured glass of gelatin filters are not satisfactory.

E-5.2 Associated Optical Cells — Use a cell of at least 4 cm in length. A cell length of 10 cm or more is to be preferred for low colour white sugars. A second or reference cell may be used provided that a test with distilled water has shown that the two cells are within 0.2 percent of being identical.

E-5.3 Membrane Filters — Pore size 0.45 mm of cellulose based material.

E-5.4 Membrane Filter Holder — Preferably fitted with a stainless steel support.

E-5.5 Vacuum Oven, Vacuum Desiccator or Ultrasonic Bath, for de-aeration of the filtered sugar solution.

E-5.6 Refractometer

E-5.7 Laboratory Balance — Capable of weighing to the nearest 0.1 g.

E-6 Procedure

E-6.1 Sample Preparation

Mix the sample of sugar thoroughly. Weigh 50.0 ± 0.1 g of the sample into a 250 ml conical flask and add 50.0 ± 0.1 g of distilled water and dissolve by swirling at room temperature. Filter the sample solution under vacuum through a membrane filter (*see* E-5.3) into a clean dry conical flask. De-aerate the filtered solution for 1 hour at room temperature in a vacuum oven or an evacuated desiccator. Alternatively de-aerate by immersing the conical flask, containing the sugar solution, in an ultrasonic bath for 3 min. Measure the refractometric dry substance (RDS) of the solution, to an accuracy of ± 0.1 g/100 g by the method given in Annex J.

E-6.2 Colour Measurement

Set up the colour measuring instrument (*see* E-5.1) according to the manufacturer's instructions and adjust the wavelength to 420 nm. Rinse the measuring cell with sugar solution and then fill. Determine the absorbancy (*As* or $-\log_{10}Ts$) of the solution using filtered de-aerated distilled water as the reference Standard for zero colour.

E-7 Expression of Results

E-7.1 Calculation

Calculate the concentration of sample solids from the RDS measured in E-6.1 using Table 3.

$$\text{ICUMSA Colour} = \frac{1000 \times As \quad \text{IU}}{bc}$$

where

As is absorbance,
b is cell length in cm, and
c is concentration

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Table 3- Concentration of Sample Solids from the RDS Percentage

RDS percent	cg/cm^3	RDS percent	cg/cm^3
(1)	(2)	(1)	(2)
45.0	0.541 178	50.1	0.616 333
45.1	0.542 621	50.3	0.619 348
45.2	0.544 064	50.4	0.920 857
45.3	0.545 509	50.5	0.622 368
45.4	0.546 955	50.6	0.623 880
45.5	0.548 402	50.7	0.625 393
45.6	0.549 851	50.8	0.626 907
45.8	0.552 752	50.9	0.628 423
45.9	0.554 204	51.0	0.629 940
46.0	0.555 657	51.1	0.631 459
46.1	0.557 112	51.3	0.634 500
46.2	0.558 568	51.4	0.636 022
46.3	0.560 025	51.5	0.637 546
46.4	0.561 483	51.6	0.639 070
46.5	0.562 943	51.7	0.640 597
46.6	0.564 404	51.8	0.642 124
46.8	0.567 330	51.9	0.643 653
46.9	0.568 794	52.0	0.645 183
47.0	0.570 260	52.1	0.646 715
47.1	0.571 728	52.2	0.648 248
47.2	0.573 196	52.3	0.649 782
47.3	0.574 666	52.4	0.651 317
47.4	0.576 137	52.5	0.652 854
47.5	0.577 609	52.6	0.654 392
47.6	0.579 082	52.7	0.655 932
47.8	0.582 033	52.8	0.657 472
47.9	0.583 510	52.9	0.659 015
48.0	0.584 989	53.0	0.660 558
48.1	0.586 469	53.1	0.662 103
48.2	0.587 950	53.2	0.663 649
48.3	0.569 432	53.3	0.665 196
48.4	0.590 916	53.4	0.666 745
48.5	0.592 401	53.5	0.668 295
48.6	0.593 887	53.6	0.669 846
48.7	0.595 374	53.7	0.671 399
48.9	0.598 353	53.8	0.672 953
49.0	0.599 844	53.9	0.674 509
49.I	0.601 337	54.0	0.676 065
49.2	0.602 83 I	54.1	0.677 624
49.3	0.604 326	54.2	0.679 183
49.4	0.605 822	54.3	0.680 744
49.5	0.607 320	54.4	0.682 306
49.6	0.608 819	54.5	0.685 434
49.7	0.610 319	54.6	0.687 000
49.8	0.611 821	54.7	0.688 568
49.9	0.613 324	54.8	0.688 568
50.0	0.614 828	54.9	0.690 137

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Annex F
(Normative)
[*Clause* 4.2, Table 1, Sl. No. (v)]
DETERMINATION OF CONDUCTIVITY ASH

F-1 Field of Application

The conductivity ash in solutions gives measure of the concentration of ionized soluble salt present in solutions of low conductivity. This method is applicable to plantation white sugar, refined sugar and other types of sugars.

F-2 Definition

F-2.1 Conductivity Ash — The ash determined conductimetrically, known as conductivity ash cannot be directly compared with the gravimetric ash determined by incineration and weighing of the ash. Conductivity ash has its own individual significance. The factors for converting conductivity to ash are chosen in such a way that the conductivity ash value corresponds approximately to values for sulphated ash. This coefficient is conventional and cannot be experimentally verified.

F-3 Principle

The specific conductivity of a white sugar solution at a concentration of 28 g/100 g is determined. The equivalent ash is calculated by the application of a conventional factor.

F-4 Reagents

F-4.1 Purified Water — For preparation of all solutions (sugar and potassium chloride) use twice-distilled or deionized water with a conductivity of less than 2 µS/cm.

F-4.2 Potassium Chloride, 0.01 mol/l — Weigh out 745.5 mg after first dehydrating by heating to 500°C (dull red heat). Dissolve in water in a 1 litre volumetric flask and make up to the mark.

F-4.3 Potassium Chloride, 0.000 2 mol/l — Dilute 10 ml of potassium chloride solution, 0.01 mol/l (*see* F-4.2) and make up to the mark in a 500 ml volumetric flask. This solution has a conductivity of (26.6 ± 0.3) µS/cm at 20°C (after deduction of the specific conductivity of the water used).

F-5 Apparatus and Glassware

F-5.1 Sugar Ash Bridge, Null Balance Bridge or Conductivity Meter

F-5.2 Volumetric Flasks, 100, 500 and 1 000 ml.

F-5.3 Pipettes, 10 ml

F-5.4 Analytical Balance - Capable of weighing to the nearest 0.1 mg.

F-6 Procedure

Dissolve 31.3 g ± 0.1 g of sugar in water in a 100 ml volumetric flask and make up to volume at 20°C (or dissolve 28.0 g ± 0.1 g of sugar in water to give a solution of mass 100.0 g). In the case of liquids, the amount taken must be such that the test solution contains 31.3 g of solids/100 ml, or 28.0 g solids/100 g of solution. After thorough mixing, transfer the solution into the measuring cell and measure the conductivity at 20°C ± 0.2°C. Check the measurement using the reference solution (*see* F-4.3).

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F-7 Expression of Results

F-7.1 Calculation of Results

If C_1 is the measured conductivity in µS/cm at 20°C and if C_2 is the specific conductivity of the water at 20°C, then the corrected conductivity (C_{28}) of the 28 g/100 g solution is:

$$C_{28} = C_1 - 0.35\, C_2$$

and

$$\text{Conductivity ash, percent} = 6 \times 10^{-4}{}_{28} \times C$$

F-7.2 Temperature Correction

If the determination cannot be made at the standard temperature of 20°C make a temperature correction to the final result provided that the range of ± 5°C is not exceeded.

The correction is: $\dfrac{C_T}{1+ 0.026\,(T- 20)}$

where

$C_{20°} =$

C_T is conductivity at temperature T°C

NOTE: The conductivity of the potassium chloride standard solution (see F-4.3) is given for a temperature of 20°C. If the measurement cannot be made at the standard temperature of 20°C then the conductivity of the potassium chloride standard solution has to be determined by the formula;

Conductivity of KCI (see F-4.3) at T°C = 26.6 [1+0.021 (T- 20)] in the range 20°C ± 5°C.

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Annex G
(Normative)
[*Clause* 4.2, Table 1, Sl. No. (vi)]

DETERMINATION OF SULPHUR DIOXIDE BY THE ROSANILINE CALORIMETRIC METHOD

G-1 Field of Application

This method is based on the calorimetric determination of sulphur dioxide and is applicable to plantation white sugar, refined sugar and sugar products.

G-2 Principle

The colour of a sulphite/rosaniline complex is measured photometrically, at a wavelength near to 560 nm, after reaction with formaldehyde.

G-3 Reagents

G-3.1 Rosaniline Hydrochloric Solution (Saturated)

Suspend 1 g of rosaniline hydrochloride in 100 ml of distilled water, heat to 50°C and cool with shaking. After standing for 48 h, filter the solution.

G-3.2 Decolourized Rosaniline Solution — Transfer 4 ml of saturated rosaniline hydrochloride solution to a 100 ml volumetric flask. After addition of concentrated hydrochloric acid (6 ml) make the mixture up to the mark. Decolourization takes places in short time but allows the solution to stand for at least 1 h before use.

G-3.3 Formaldehyde Solution (approximately 0.2 g/ 100 ml) — Dilute 5 ml of analytical reagent grade formaldehyde solution, p^{20} = 1.070 – 1.080 to 1 000 ml.

G-3.4 Pure Sucrose Solution — Dissolve 100 g of analytical reagent grade sulphite-free sucrose in water and make up to 1 000 ml.

G-3.5 Sodium Hydroxide Solution, 0.1 mol/l.

G-3.6 Iodine Solution, 0.05 mol/l - Dissolve 20 g of analytical reagent grade iodate-free potassium iodide in 40 ml of distilled water in a 100 0 ml volumetric flask. After the addition of 12.69 g of analytical reagent grade iodine shake the flask until all the iodine is dissolved and then make up to the mark with distilled water.

G-3.7 Concentrated Hydrochloric Acid, p^{20} = 1.18 g/ml.

G-3.8 Hydrochloric Acid Solution, approximately 1 mol/l.

G-3.9 Iodine (Starch) Indicator, ready-made, or a starch solution.

G-3.10 Sodium Thiosulphate Solution, 0.1 mol/l — Dissolve 24.817 g of analytical reagent grade sodium thiosulphate pentahydrate in 200 ml of distilled water in a 1 000 ml volumetric flask and then makeup to the mark.

G-3.11 Standard Sulphite Solution — Dissolve approximately 2.5 g of general purpose reagent grade sodium sulphite heptahydrate in sucrose solution (*see* G-3.4) and make up to 500 ml with this pure sucrose solution (*see* G-3.4). Determine the titre of this solution as follows. Place 25 ml of the 0.05 mol/l iodine solution in a 300 ml conical flask and add 10 ml of the 1 mol/l hydrochloric acid solution (*see* G-3.8) followed by approximately 100 ml of distilled water.

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Pipette 25 ml of standard sulphite solution into this flask while swirling the flask. Then titrate the excess iodine with the 0.1 mol/l sodium thiosulphate solution (*see* G-3.10) until the contents of the flask area pale straw colour. Then add the iodine (starch) indicator (*see* G-3.9) (0.2 g to 0.5 g) to the flask and continue the titration until the blue colour disappears. Record the titre, *t*.

G-3.12 Dilute Standard Sulphite Solution — Dilute 5 ml of standard sulphite solution (*see* G-3.11) to exactly 100 ml with pure sucrose solution (*see* G-3.4). The exact value of the sulphite content, *c* is calculated as follows from the titre, *t*, found in G-3.11:

$$c = (25 - t) \times 3.203 \times 2 \text{ mg } SO_2/\text{ml}$$

NOTE: Users of this method are advised to consult their national health and safety legislation and chemical suppliers before handling rosaniline hydrochloride, formaldehyde and the other reagents here mentioned.

G-4 Apparatus and Glassware

G-4.1 Spectrophotometer or Colorimeter, for use at approximately 560 nm.

G-4.2 Volumetric Flasks, 10 ml, 500 ml and 1 000 ml.

G-4.3 Graduated Pipette, 10 ml.

G-4.4 Pipettes, 2 ml,10 ml and 25 ml.

G-4.5 Burette, 10 ml, graduated by 0.05 ml.

G-4.6 Test Tubes

G-4.7 Analytical Balance - Capable of weighing to the nearest 0.1 mg.

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G-5 Procedure

G-5.1 Colour Development

Dissolve 10-40 g of a sample of white sugar in distilled water in a 100 ml volumetric flask. After addition of 0.1 mol/l sodium hydroxide solution (4 ml) make the contents of the flask up to the mark and mix: For levels

0-5 mg SO_2/kg use 40 g of sample

5-15 mg SO_2/kg use 20 g of sample

15-30 mg SO_2/kg use 10 g of sample

Transfer a 10 ml aliquot to a clean, dry test tube. Add 2 ml of decolourized rosaniline solution and 2 ml of formaldehyde solution and allow the tube to stand at room temperature for 30 min. Measure the absorbance in a 1 cm cell in a spectrophotometer (*see* G-4.1) at about 560 nm using distilled water as a reference.

G-5.2 Standard Curve

Pipette aliquots of the dilute standard sulphite solution (*see* G-3.12) (1 ml, 2 ml, 3 ml, 4 ml, 5 ml and 6 ml) into a series of 100 ml volumetric flasks. Take an empty flask as well for the zero sulphite level. To each flask add 4 ml of 0.1 mol/l sodium hydroxide and make the contents up to the mark with pure sucrose solution (*see* G-3.4) and mix. From each flask transfer a 10 ml aliquot to a clean, dry test tube. Add 2 ml of decolourized rosaniline solution and 2 ml of formaldehyde solution and allow the tubes to stand at room temperature for 30 minutes. Measure the absorbance as in G-5.1 and plot the results on a graph.

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$$\text{The amount of } SO_2 \text{ in each test tube} = \frac{c \times n}{10} \mu gSO_2$$

where

c is concentration of sulphite
n is the number of ml of dilute sulphite added to each 100 ml flask and *c* is from G-3.12.

G-6 Expression of Results

G-6.1 Calculation

Calculate the concentration of sulphite by reference to the standard curve and express the result as mg SO_2/kg white sugar as follows:

$$\frac{\mu gSO_2 \text{ from graph} \times 10}{\text{Mass of sugar used in G-5.1}} \text{ mg } SO_2 \text{ /kg sugar}$$

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Annex H
(Normative)
[*Clause* 4.2, Table 1, Sl. No. (vii)]
(Alternate Method)
DETERMINATION OF LEAD BY COLORIMETRIC METHOD

H-1 Field of Application

The method is based upon a colorimetric procedure and is suitable for white and raw sugar, as well as low grade products with lead contents not exceeding 0.5 mg Pb/kg. A dry ashing step for raw sugar and wet ashing for low-grade products is first required to eliminate organic matter. However, this pre-treatment is not necessary for white sugar.

H-2 Principle

H-2.1 For White Sugar

Lead is extracted directly from the prepared solution by shaking with a solution of dithizone in chloroform and discarding the aqueous layer. Dithizone forms a distinctive red, chloroform-soluble complex with lead in solution. Complete extraction from the aqueous phase is possible when the pH is between 9 and 11.5. Interference from other ions is prevented by the addition of ammonium citrate and potassium cyanide. A final colour matching is carried out by adding a known amount of lead in solution to a dithizone blank.

H-2.2 For Raw Sugar

Organic constituents cause emulsification of the dithizone in chloroform, resulting in poor separation of the aqueous and chloroform phases. Removal of the organic constituents is achieved by ashing the sugar, after addition of magnesium nitrate at a temperature not exceeding 500°C.

H-2.3 For Low-Grade Products

A wet-ashing procedure is recommended, as dry ashing methods have not been found to be convenient for routine analysis. This procedure involves the use of a sulphuric/perchloric/nitric acid mixture and is particularly suited to liquid products. When calcium is known to be present a slightly modified two-acid procedure, based upon using nitric and perchloric acid, is preferred.

H-3 Reagents

Although traces of lead in the reagents are allowed for by carrying a blank through the entire procedure, it is desirable that solutions be prepared from analytical grade reagents or those specified as suitable for trace metal analysis.

H-3.1 Dithizone Solution, Approximately 0.1 g/100 ml — Prepare this stock solution by dissolving 0.1 g of diphenylthiocarbazone in 100 ml of analytical reagent grade chloroform.

H-3.2 Dithizone Solution, Approximately 20 mg/l — Prepare a fresh solution daily, or as required, by diluting 2 ml of the stock solution (*see* H-3.1) to 100 ml with analytical reagent grade chloroform. Store the solution in an amber bottle and in a cupboard away from the light.

H-3.3 Ammonia Solution, p_{20} ~ 0.88 g/ml.

H-3.4 Ammonium Citrate Solution — Dissolve 62.5 g of tri-ammonium citrate in 200 ml of lead-free water. Add 5 ml of the ammonia solution and dilute to 250 ml with distilled water at 20°C. Extract the solution with successive volumes of the 0.1 g/100 ml dithizone solution (*see* H-3.1**)** to ensure complete removal of heavy metals, a state indicated by the green colour persisting in the chloroform layer. Remove excess dithizone from

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the aqueous phase by successive extractions with small amounts of chloroform until the aqueous solution is colorless.

H-3.5 Potassium Cyanide — Dissolve 5 g of analytical reagent grade potassium cyanide in distilled water and dilute to 100 ml at 20°C. Allow to stand for 2 days before use, to allow for the oxidation of traces of sulphur.

H-3.6 Concentrated Nitric Acid, p_{20} = 1.42 g/ml.

H-3.7 Concentrated Hydrochloric Acid, p_{20} = 1.18/ml.

H-3.8 Concentrated Sulphuric Acid, p_{20} = 1.84/ ml.

H-3.9 Concentrated Perchloric Acid, p_{20} =1.54/ml.

H-3.10 Nitric Acid, Approximately 1 Percent (v/v) — Dilute 10 ml of concentrated nitric acid (*see* H-3.6) containing less than 0.005 mg Pb/kg to 1 litre with lead-free water at 20°C.

H-3.11 Nitric Acid, Approximately 1 mol/l — Dilute 15.6 ml of concentrated nitric acid (*see* H-3.6) to 250 ml with lead-free water.

H-3.12 Bromothymol Blue Indicator — Dissolve 0.04 g in 20 percent ethanol and make up to 100 ml with 20 percent ethanol.

H-3.13 Standard Lead Solution — Prepare a stock standard solution A by dissolving 0.160 g of previously dried analytical reagent grade lead nitrate in 100 ml of 1 mol/l nitric acid (*see* H-3.11). Solution B is freshly prepared by diluting 10 ml of the stock solution A to 1 litre with distilled water.

H-3.14 Hydroxylamine Hydrochloride Solution — Dissolve 20 g of analytical reagent grade hydroxylamine hydrochloride in 100 ml of distilled water.

H-3.15 Sodium Hexametaphosphate Solution — Dissolve 10 g in 100 ml of distilled water.

H-3.16 Magnesium Nitrate Solution — Dissolve 10 g in 100 ml of distilled water.

H-3.17 Chloroform, p_{20} = 1.49 g/ml.

NOTE: Users of this method are advised to consult their national health and safety legislation before handling potassium cyanide, lead nitrate, perchloric acid and other reagent a here listed. Users of the wet digestion method are also advised that indiscriminate use of perchloric acid can result in an explosion hazard. Carry out the wet digestion in a fume cupboard behind an arrnoured glass screen.

H-4 Apparatus and Glassware

Wash all apparatus, including separating funnels, microburettes, pipettes and new glassware in 10 percent sodium hydroxide, followed by dilute nitric acid and finally rinse in distilled water.

H-4.1 Pipettes — 5 ml and 10 ml, conforming to Class A.

H-4.2 Graduated Pipettes — 10 ml, conforming to Class A.

H-4.3 Volumetric Flasks — 100 ml and 1 000 ml**,** conforming to Class A.

H-4.4 Separating Funnels — 100 ml.

H-4.5 Microburettes — 2 ml and 5 ml (graduated 0.05 ml) and 25 ml.

H-4.6 Nessler Tube — 25 ml.

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H-4.7 Test Tubes — Pyrex glass, 200 mm × 24 mm, marked at 10 ml and 25 ml.

H-4.8 Platinum Dish

H-4.9 Muffle Furnace

H-4.10 Water Bath, boiling

H-4.11 Erlenmeyer Flasks — 100 ml.

H-4.12 Analytical Balance — Capable of weighing to the nearest 0.1 mg.

H-4.13 Electrical Hot-Plate

H-5 Procedure

H-5.1 White Sugar

a) Sample preparation — Dissolve a 10 g sample in 20 ml of distilled water contained in a beaker and transfer the solution to a 100 ml separating funnel, using only 5 ml for rinsing. Add 2.5 ml of concentrated hydrochloric acid, stopper the funnel and shake for 5 min. Prepare a blank by adding the same volume of hydrochloric acid (2.5 ml) to 25 ml of distilled water contained in another funnel.

b) Extraction of lead — Add 5 to 6 drops of the bromothymol blue indicator to the solution for extraction, and neutralize with ammonia solution (*see* H-3.3) added drop wise from a burette until a blue colour is obtained. Add an additional 1.5 ml of ammonia solution followed by 1.0 ml of ammonium citrate solution (*see* H-3.4) and 1.0 ml of potassium cyanide solution (*see* H-3.5). Where it is known that iron is present in significant concentrations 1.0 ml of hydroxylamine hydrochloride solution (*see* H-3.14) should be added before the cyanide. Stopper the separating funnel and mix the content and well by shaking. Add between 5 and10 ml of the 20 mg/l dithizone solution (*see* H-3.2) incrementally from a 10 ml burette and repeat the mixing. If necessary, add more dithizone solution and continue the extraction until the lower chloroform layer has changed from the brick red colour of lead dithizone to a green, blue or purple colour indicating the extraction of lead from the aqueous phase. Add an equal volume of dithizone solution to the blank and mix in the same manner.

Transfer the chloroform phase to a second clean separating funnel and add about 2 ml of 20 mg/l dithizone solution to the aqueous phase remaining in the original funnel. Shake and transfer the chloroform layer to the original chloroform extract in the second funnel and treat the combined chloroform extract with 10 ml of 1 percent (v/v) nitric acid (*see* H-3.10). Shake vigorously so that the lead is transferred to the aqueous phase as indicated by the restoration of a pure green colour in the chloroform phase. Add more dilute nitric acid if the green colour is not obtained. Discard the exhausted chloroform phase, taking care to avoid any loss of the nitric acid solution. Treat the blank similarly.

c) Determination of lead — Treat the nitric acid solutions from the sample and blank with 0.2 ml ammonium citrate solution, 5 drops of ammonia solution and 0.2 ml potassium cyanide solution. Mix the solutions and add enough 20 mg/l dithizone solution to the sample funnel to change the brick red colour with shaking, to green, blue or purple. Add an equal amount of dithizone to the blank funnel, followed by shaking.

Transfer the complete contents of the separating funnels to Nessler tubes. Slowly add the dilute standard lead solution B from a 2 ml microburette to the blank tube until, on shaking, the colour matches the colour of the solution in the sample tube. Note the volume of solution B needed for matching.

H-5.2 Raw Sugar

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a) Sample Preparation by dry ashing — Weigh 5 g of the sample in a clean platinum dish or silica crucible and treat with 10ml magnesium nitrate solution (*see* H-3.16). Evaporate to dryness and ash the residue in a muffle furnace set at a temperature not greater than 500°C. It is essential that the temperature does not

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exceed 500°C, as it is known that some lead compounds are volatilized above this temperature. When the ash has been completely decarbonized, remove the dish or crucible and allow to cool. Dissolve the ash in 1 ml of concentrated hydrochloric acid (*see* H-3.7) and dilute with lead-free water to 25 ml.

b) Determination of lead — Heat the solution on a water bath for 15 min and determine the lead by following the procedure described in H-5.1 (Extraction of lead and Determination of lead).

H-5.3 Low-grade Products, Liquids and Solids

a) Sample preparation by wet ashing (calcium absent) — Conduct all digestion operation in fume cupboard. Refer to the note under H-3. Transfer the sample, equivalent to not more than 2 g of dry matter, to one of the marked test tubes and add 1 ml of distilled water. Carefully add 1 ml of concentrated sulphuric acid (*see* H-3.8) and 3 ml perchloric acid (*see* H-3.9) together with 3 glass beads. If necessary, warm gently to initiate charring. Treat slowly with 2 to 3 ml concentrated nitric acid (H-3.6) added drop-wise from a burette. Heat gently to boiling and continue the digestion until die solution is clear and almost colourless. Carefully add a few more drops, dropwise until Charring ceases. Continue heating to drive off excess perchloric acid, leaving a final volume of between 1 ml and 2 ml.

b) Sample preparation (when calcium is present) — Carry out all digestion operations in a fume cupboard (*see* Note under H-3). Transfer the sample, equivalent to not more than 2 g of dry matter, to a 100 ml Erlenmeyer flask. Add 1 ml of distilled water, followed by 3 ml of nitric acid (*see* H-3.6) and 2 ml of perchloric acid (*see* H-3.9). Heat from cold on an electrical hot-plate, using a layer of asbestos sheet to moderate the heat. When the liquid turns brown, add more nitric acid drop-wise (not more than 3 ml) and warm until the white fumes of perchloric acid are given off. A colourless solution indicates completion of the digestion phase .

c) Determination of lead — Boil the solutions prepared under the above sections for about 30s to dissolve any solid material present. Add 6ml of ammonium citrate solution (*see* H-3.4) and 10ml of sodium hexa meta - phosphate solution (*see* H-3.15) If not clear, boil again. Dilute the solution to 25 ml with distilled water and quantitatively transfer the solution to a separating funnel for extraction using the procedure described under 15.5.1(a) and (c).

H-6 Expression of Results

H-6.1 White Sugar Calculation

The lead content is expressed as mg Pb/kg white sugar. Where the sample mass used is 10 g, then 1 ml of solution B is equivalent to 1 mg Pb/kg of white sugar. Where the sample mass differs from 10 g the lead content may be calculated as follows:

$$\frac{10\,V}{M} \text{ mg Pb/kg}$$

Where

V is volume, in ml, of the dilute standard lead solution used in matching, and
M is mass, in g, of the original sample.

H-6.2 Raw Sugar Calculation

Where the sample mass used is 5 g then 1ml of solution B is equivalent to 2 mg Pb/kg of raw sugar. Use the formula given in H-6.1 for other sample masses.

H-6.3 Low-Grade Products, Liquid and Solids Calculation

Where the sample mass used is 2 g then 1ml of solution B is equivalent to 5 mg Pb/kg of product, liquid or solid. Use the formula given in H-6.1 for other sample masses

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Annex I
(Normative)
[*Clause* 4.2, Table 1, Sl. No. (viii)]
DETERMINATION OF CHROMIUM CONTENT

I-1 Principle

Metals in solution are determined directly by atomic absorption spectrophotometry. Suspended metals are separated by membrane filtration or suspension is dissolved and analyzed.

I-2 Apparatus

I-2.1 Atomic Absorption Spectrophotometer

Spectrophotometer capable of operating at conditions as given under

Wavelength nm	Flame	Optimum Range mg/l
(1)	(2)	(3)
357.9	Reducing air — acetylene	1 to 200

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I-3 Reagents

I-3.1 De-ionized Distilled Water — Distilled, ammonia free. Pass through ion exchange column of mixed strongly acidic cation and strongly basic anion exchange resins. Regenerate resins according to mixed strongly acidic cation and strongly basic anion exchange resins.

I-3.2 Nitric Acid — Dilute 500 ml re-distilled nitric acid to 1 000 ml with water.

NOTE: Perform distillation in hood with protective ash in place.

I-3.3 Hydrochloric Acid — Dilute 500 ml hydrochloric acid to 1 000 ml with water and distill in all-Pyrex or equivalent glass apparatus.

I-3.4 Chromium Solution

I-3.4.1 Chromium stock solution — Accurately weigh amount of metal specified in Table 4 into a beaker and add dissolving medium. When metal is completely dissolved, transfer quantitatively into 1 000 ml volumetric flask and dilute to volume with water.

Table 4 - Preparation of Chromium Standard Solution
***(Clause* I-3.4.1)**

Weight	Compound	Dissolving Medium (1 litre Total)
(1)	(2)	(3)
1.923	Chromium oxide(Cr_2O_3)	Water + 10 ml redistilled nitric acid

I-3.4.2 Chromium Working Solution — Prepare daily. Dilute aliquots of stock solutions with water to make more than or equal to 4 standard solutions within the range of detection as given in I-2.1. Add 1.5 ml nitric acid

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per litre to all working standard solutions before diluting to volume. Add 1 ml lanthanum chloride for every 10 ml making the working standard solution.

I-3.5 Lanthanum Stock Solution — Slowly add 250 ml hydrochloric acid to 58.65 g lanthanum oxide (La_2O_3), purity 99.9 percent by mass, dissolve and dilute to 1 000 ml.

I-3.6 Ammonium Pyrrolidine Dithiocarbamate Solution — Dissolve 1 g ammonium pyrrolidine dithiocarbamate in 100 ml water. Prepare fresh daily.

I-4 Preparation of Sample

Take 5 g of sample and dissolve in distilled water and make up the volume to 100 ml with water in a 100 ml volumetric flask. Transfer an aliquot of well mixed sample to the beaker and add 3 ml nitric acid. Heat and evaporate to dryness (do not boil). Cool and add 3 ml nitric acid and heat until digestion is complete, generally indicated by light coloured residue. Add 2 ml hydrochloric acid (1:1, v/v) and heat gently to dissolve the residue. Wash the watch-glass and beaker with water and filter. Wash the filter and discard. Dilute the filtrate with water to such a concentration that it is within the range of the instrument.

I-5 Determination

Transfer an aliquot of the sample to a 250 ml beaker and dilute to 100 ml with water. Prepare blank and standard solution in the same manner. Adjust the pH of the sample and standard solutions to 2.5 with hydrochloric acid using a pH-meter. Transfer quantitatively to a 200 ml volumetric flask, add 2.5 ml of ammonium pyrrolidine dithiocarbamate solution and mix. Add 10 ml methyl iso-butyl ketone and shake vigorously for 1 min. Let the layers be separated and then add water until the ketone layer is in the neck of the flask. Centrifuge, if necessary. Aspirate the ketone layer and record readings of standards and samples against blank. The fuel-to-air ratio should be adjusted to as blue flame as possible since organic solvents add to fuel supply. Prepare the calibration curve from the average of each standard and read the sample concentration.

I-6 Calculation

Chromium content, mg/l = Chromium, in mg, in the aliquot/litre.

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Annex J
(Normative)
[*Clause* E-6.1]

DETERMINATION OF REFRACTOMETRIC DRY SUBSTANCE (RDS Percent)

J-1 Scope and Field of Application

The method is used in trading for the determination of the refractometric Brix or the refractometric dry substance (RDS percent) of sugar solution.

J-2 Principle

The refractive index of aqueous sugar solutions depends upon the amount of dissolved material and can therefore serve as a measure of the sugar content. This is valid only for pure sugar solutions; however, the non-sugars present in sugar products influence the refractive index in a similar way to sucrose. For these reasons, the measurement of refractive index can be utilized for an approximate determination of the dry substance content of solutions containing mainly sucrose.

Measurements are generally carried out with sugar refractometer graduated in percent sucrose (g/100 g); alternatively this result may be obtained from refractive index tables for pure sucrose solutions.

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J-3 Apparatus and Glassware

J-3.1 **Refractometer**, for example, Abbe type, calibrated at 20°C and having a water-jacketed prism.

J-3.2 **Light Source**, for example, tungsten lamp.

J-3.3 **Plastic Rod**, approximately 3 mm diameter.

NOTE: A plastic rod for example perspex or polypropylene, is preferred for this duty. When using a glass rod there is a possibility of inadvertently scratching the prism faces. Scratched prisms yield an indefinite boundary line and will eventually call for an expensive repolishing operation. Scratching may also occur during prism cleaning, therefore care should be exercised when removing molasses from the prism faces. When cleaning the prism faces, use cool water and soft tissues; do not use hot water for this purpose.

J-3.4 **Thermometer**, 150 mm, range 0°C - 50°C.

J-3.5 **Beaker**, capacity 50 ml.

J-3 6 **Water Bath and Pump**, Thermostatted generally at 20°C.

J-4 Procedure

J-4.1 Reading the Refractometer

Ensure that the instrument has been set up and checked according to the manufacturer's instructions and that the prism faces are clean and dry. The following apply to the Abbe type.

With the prisms closed, allow temperature controlled water (20°C) to flow through the prisms jacket for a period long enough for equilibrium to be reached; 5 min is usually sufficient.

NOTE: When operating at temperature other than 20°C refer Table 5 for corrections to be applied

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Table 5- Temperature Correction
[*Clause* J-4.1]

Temperature	Measured Sucrose (Mass Fraction)		
	45	50	55
(1)	(2)	(3)	(4)
15	− 0.38	− 0.38	− 0.38
16	− 0.30	− 0.31	− 0.31
17	− 0.23	− 0.23	− 0.23
18	− 0.15	− 0.15	− 0.15
19	− 0.08	− 0.08	− 0.08
20	0.00	0.00	0.00
21	+ 0.08	+ 0.08	+ 0.08
22	+ 0.16	+ 0.16	+ 0.16
23	+ 0.24	+ 0.24	+ 0.24
24	+ 0.32	+ 0.32	+ 0.32
25	+ 0.40	+ 0.40	+ 0.40
26	+ 0.48	+ 0.48	+ 0.48
27	+ 0.56	+ 0.56	+ 0.56
28	+ 0.65	+ 0.65	+ 0.64
29	+ 0.73	+ 0.73	+ 0.72
30	+ 0.82	+ 0.81	+ 0.80
31	+ 0.90	+ 0.90	+ 0.89
32	+ 0.99	+ 0.99	+ 0.98
33	+ 1.08	+ 1.07	+ 1.07
34	+ 1.16	+ 1.16	+ 1.15
35	+ 1.25	+ 1.25	+ 1.24
36	+ 1.34	+ 1.34	+ 1.33
37	+ 1.43	+ 1.43	+ 1.41
38	+ 1.53	+ 1.52	+ 1.50
39	+ 1.62	+ 1.61	+ 1.59
40	+ 1.71	+ 1.70	+ 1.68

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Transfer a drop of water to the refractometer prism to first determine whether a reading of zero is obtained or if a correction needs to be applied.

Transfer a small amount sugar solution from the container to the beaker and adjust the sugar solution temperature to approximately that of the instrument, 18°C - 28°C is suitable.

Open the refractometer prism and apply a drop of sugar solution to the fixed prism face by means of the plastic rod. Extend the sugar solution quickly as a line along the face without touching the prism surface with the rod, taking care to avoid the formation of air bubbles. Close the prisms quickly.

Take the refractometer reading according to the instrument manufacturer's handbook. Apply any scale correction to the reading to obtain a corrected reading.

J-5 Expression of Results

J-5.1 Express results to the nearest 0.1°Brix (0.1 percent RDS).

J-5.1.1 Calculation

Where the Refractometer is calibrated in refractive index, read the nearest 0.000 05 units and determine the °Brix (RDS percent) from Table 6.

Table 6 - International Refractive Index Scale for Pure Sucrose Solution at 20°C [*Clause* J-5.1.1]

This Table gives values of refractive index against air with sucrose mass fraction.

Sucrose G/100 g	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
46	1.411 808	1.412 011	1.412 215	1.412 420	1.412 624	1.412 828	1.413 033	1.413 238	1.413 443	1.413 648
47	1.413 853	1.44 059	1.414 265	1.414 470	1.414 676	1.414 882	1.415 089	1.415 295	1.415 502	1.415 708
48	1,415 915	1.416 122	1.416 330	1.416 537	1.416 744	1.416 952	1.417 060	1.417 368	1.417 576	1.417 785
49	1.417 993	1.418 202	1.418 411	1.418 620	1.418 829	1.419 038	1.419 247	1.419 457	1.419 667	1.419 877
50	1.420 087	1.420 297	1.420 508	1.420 718	1.420 929	1.421 140	1.421 351	1.421 562	1.421 774	1.421 985
51	1.422 197	1.422 409	1.422 621	1.422 833	1.423 046	1.423 258	1.423 471	1.423 684	1.423 897	1.424 110
52	1.424 323	1.424 537	1.424 750	1.424 964	1.425 178	1.425 393	1.425 607	1.425 821	1.426 036	1.426 251
53	1.426 466	1.426 681	1.426 896	1.427 112	1.427 328	1.427 543	1.427 759	1.427 975	1.428 192	1.428 428
54	1.428 625	1.428 842	1.429 059	1.429 276	1.429 493	1.429 711	1.429 928	1.430 146	1.430 364	1.430 582
55	1.403 800	1.431 019	1.431 238	1.431 456	1.434 675	1.431 894	1.432 114	1.432 333	1.432 553	1.432 773

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