STANDARD METHOD OF MEASUREMENT
FOR THERMAL INSULATION

DECEMBER, 1973

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INTRODUCTION

It is my pleasure as the President of the Thermal Insulation Contractors Association to introduce this document which is designed to facilitate the basis of calculation of measurement for future projects between ourselves and our clients.

The document has been prepared by professional advisers and a working party of the clients themselves and now has the full approval of the Governing Council of T.I.C.A.

We have therefore taken all possible steps to ensure that the document should be acceptable to clients and we shall now ask all our members to use it as the basis for their calculations and we invite clients and clients' professional advisers or agents to quote this document in their tender details.

Additional copies are available from the Thermal Insulation Contractors Association, Alderman House, 37 Soho Square,, London, W.1. price 50p each including postage, and we trust that the widest possible application of the document by clients, specifiers and the thermal insulation contracting industry will result and that it will be to our mutual benefit.

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December 1973
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ACKNOWLEDGEMENTS

With acknowledgement to

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PR 1 CONTRACT DOCUMENTS

the Contract Document shall fully describe and accurately represent the works and services to be executed, and the following shall be stated:

i) the form and type of contract

ii) the edition of the Conditions of Contract and schedule of clause headings

iii) appendix and schedule of alterations

iv) programme of work

v) that the Works shall be measured in accordance with the Standard Method of Measurement.

PR 2 NAMES OF PARTIES

the names and addresses of the Employer and his representatives shall be stated.

PR 3 DESCRIPTION OF SITE

the following details shall be stated:

i) the location of the site shall be so described stating the means of access

ii) areas for the use of the Contractor shall be so described

iii) arrangements for visiting the site and inspection of drawings, models and other information

iv) where stage by stage possession of the site is to be given to the Contractor.

PR 4 PLANT, TOOLS AND TACKLE

the Contractor shall provide all plant, tools, tackle and consumables for the complete execution of the Works.

any plant, tools, tackle or consumables to be supplied by the Employer shall be listed.

PR 5 SCAFFOLDING

scaffolding for the works shall comply with the relevant statutory regulations for the time being in force.

the responsibility for the provision of scaffolding shall be defined.

PR 6 GENERAL REQUIREMENTS

general requirements covering but not limited to the following, shall be given:

i) safety, health and welfare

ii) notices and fees including rates and taxes to local authorities, public undertakings and other bodies

iii) site management, staff and establishment

iv) use and maintenance of public and private roads

v) drawings and sketches

vi) bye-laws and other statutory regulations.

PR 7 SPECIAL RESTRICTIONS AND OBLIGATIONS

any obligation or restriction that may be imposed on the Contractor whether in the way that the works are to be carried out or restrictions on site personnel shall be given as an item stating all relevant particulars. where site agreement is in operation this shall be stated and copies issued by the Employer.

PR 8 WORKS REGULATIONS

works regulations which may affect the whole, parts or any part of the works such as arising from the Petroleum Act, safety requirements, fire hazards and such like, shall be fully described and given separately.
work failing to pass inspection shall be remedied at the Contractor’s own expense to the complete satisfaction of the Employer.

all temporary services for the Works such as water, lighting and power, compressed air, shall be given as items and fully described.

where these services are to be supplied free of cost to the Contractor the source and location of the point of supply shall be given.

items shall be given of any temporary works to be provided either by the Contractor or Employer such as:

i) temporary foundations, roads, tracks, hard-standings, crossings and the like

   where special hard-standings are necessary for lifting equipment this shall be stated

ii) temporary sheds, offices, mess rooms, sanitary accommodation and other buildings for the use of the Contractor

iii) temporary offices for the use of the Employer’s representative(s) particulars of accommodation requirements shall be given

iv) temporary telephone facilities shall be described and included as an item

   the cost of calls shall be included with the item

v) temporary screens, hoardings, fencing, guard rails, gantries and the like shall be fully described and included as an item

vi) the dismantling, demolition and clearing away of temporary works and making good the site shall be included with each item of temporary works.

protecting the Works from damage, inclement weather, dust or any other factors, including work carried out under clean conditions, shall be given as an item

removing rubbish, surplus materials and debris, and cleaning the Works throughout the period of the Contract and on completion, shall be given as an item.

the Contractor’s liability for risk of injury to persons and property and of damage to the Works, new or existing, shall be given as an item

where the Employer requires the Contractor to effect insurance in respect of the Contractor’s liability for any such risk, the relevant particulars shall be given consequential loss shall be given as an item, if included in the Conditions of Contract

where the Employer intends to relieve the Contractor of liability for any such risk the relevant particulars shall be given

where the cost of insuring any liability of the Employer is required to be included in the Contract Sum such cost shall be given as a ‘provisional sum’ in the Contract Document at the time of enquiry.

general attendance on Nominated Sub-Contractors shall be given as an item in each case and shall include the use of standing scaffolding and hoists, providing space for accommodation, storage of plant and materials, temporary lighting and water, and clearing away rubbish

special attendance on Nominated Sub-Contractors shall be given as an item in each case giving particulars of unloading, hoisting, placing in position, providing power, special scaffolding, and like items

where attendance is required on other Contractors employed directly by the Employer, full details shall be given.

requirements for commissioning the works shall be fully described.
GENERAL RULES

Section GR

GR 1  DESCRIPTION OF THE WORKS

the Works shall be fully and adequately described.
overall linear measurement of pipework and schedule of vessels and
equipment shall be given.
where this is not available and the Contractor is required to extract
the information from drawings, this shall be stated.
working heights or depths shall be stated relative to defined levels.
the Contract Period dates shall be stated, particulars shall be given
where the Works are required to be executed or completed in any specific
order, sections or phases.

GR 2  EXISTING WORKS

new work affected by the proximity of or carried out in existing plants
shall be so described.
details shall be given of procedures and restrictions required by the
Employer to be observed by the Contractor before or during occupation
of the existing works and on leaving the site including the issue of
various statutory and other certificates of authorisation and requirement.

GR 3  SPECIFICATIONS AND DRAWINGS

specifications and drawings required and applicable at the time of
enquiry shall be listed and provided.
in the absence of a detailed specification reference must be made to
British Standards.

GR 4  QUANTITIES

the total quantities shall be calculated to the first place of decimals.
where the application of this clause would cause an entire item to
be eliminated, such items shall be enumerated stating the size or
weight as appropriate.
the order of stating the dimensions shall be consistent and in the
sequence of length, width and height, where ambiguity could arise
the dimensions shall be specifically identified.

GR 5  DESCRIPTIONS

unless otherwise specifically stated in the Contract Documents, the
following shall be deemed to be included with all items:—
i)  labour and all costs in connection therewith
ii)  consumables
iii)  use of plant
iv)  temporary works
v)  establishment and overhead charges and profit
in addition where materials are to be supplied by the Contractor, the
following shall be included:—
i)  materials and all costs in connection therewith
ii)  allowance for waste of materials.

GR 6  ORDERING OF MATERIALS

a bill of quantities shall not be used for the ordering and purchasing
of materials or services.

GR 7  WELDED JOINTS

where welded joints are required to be un-lagged until after testing
pipework, the work involved shall be the subject of a variation order
unless otherwise stated in the specification at the time of tendering.

GR 8  DAYWORK

where it is agreed between the Engineer and the Contractor that the
work cannot be measured in accordance with the Standard Method of
Measurement, it shall be carried out on an agreed 'Daywork' basis.
THERMAL INSULATION

TH 1 GENERAL

TH 1a unit of measurement

the unit of measurement shall be as follows:—

i) metre

ii) number

TH 1b measurement

insulation shall be measured from Contract information
such as marked up isometrics, general arrangements,
models, or where agreed, as installed.

the measurement of insulation to pipework shall be on
square to the centre line over all in-line fittings such as
bends, branches, elbows, reducers and tees, but
excluding items of in-line equipment such as bellows
units, flow-meters and valves, consequently no adjust-
ment shall be made to the measured pipe lengths for
enumerated items of in-line fittings. (see sketches)
insulation to equipment, machinery and ducting shall
be measured on the outside surface of the insulation.

TH 1c scope of work

the scope of work shall be given such as:—

i) supply and fix

ii) supply only

iii) fix only

TH 1d classification of insulation

insulation shall be classified and given separately
according to type of service, material to be insulated,
composition and type of insulant and specified finish
such as:—

a) insulants

i) calcium silicate

ii) mineral wool

iii) magnesia

iv) polyurethane

v) cork

vi) glass fibre

vii) polystyrene

viii) foamed glass

b) finishes

i) cement

ii) bitumen or mastic

iii) bitumen felt

iv) metal cladding

v) tape wrapping

vi) plastic cladding

work divisions

the work shall be grouped and the items adequately
described as follows:—

i) pipework

ii) ducting

iii) equipment and machinery

iv) filling voids

TH 1e location of insulation

each classification of insulation shall be described
according to location as follows:—

a) pipework and ducting

i) trenches, pipe tracks and generally at ground
level
ii) pipe bridges
iii) plant structures
iv) isolated plant items and special locations

b) equipment and machinery shall be fully described according to type and location as follows:
   i) generally at ground level
   ii) plant structures
   iii) special locations

TH 1f work groups
the work shall be grouped and the items adequately described and arranged under appropriate headings as follows:
   i) work operations
   ii) ancillary works

TH 1g thickness and temperature
nominal thickness of insulation shall be given. working temperatures shall be stated.

TH 1h tube sizes
the outside diameter of tubes shall be given.

TH 1j pipe line equipment
nominal size and outside diameter of adjacent pipework shall be given.

TH 1k pipe treatments
treatment to pipework, ducting or equipment and machinery such as painting, cleaning or wrapping prior to application of insulation shall be given separately and included under ancillary works.

TH 1l weather protection
where temporary weatherproof structures are required for the execution of the work these shall be fully described and the responsibility for its provision shall be defined.

TH 2 MATERIALS

TH 2a free issue materials
where materials are to be supplied as free issue to the Contractor this shall be stated together with details of:
   i) specifications
   ii) points of delivery and collection, and responsibilities for handling

TH 2b materials fixed by others
where materials are to be supplied by the Contractor for fixing by others this shall be stated together with details of:
   i) specifications
   ii) requirements for waste or spare materials
   iii) points of delivery
   iv) responsibilities for carriage and charges for packaging and like charges
   v) test certificates

TH 2c materials by Contractor
where materials are to be supplied and fixed by the Contractor this shall be stated together with details of:
   i) specifications
   ii) selected suppliers or manufacturers
   iii) test certificates

TH 2d measurement of materials
materials shall be measured nett in accordance with the
units of measurement applied to Work Operations—sub-section TH 3.

TH 2a special storage
requirements for special storage and protection facilities shall be given separately.

TH 3 WORK OPERATIONS

measurement of items in each classification of insulation indicated in clause TH 1c shall generally conform to the items in sub-section TH 3a-g inclusive.

all Insulation shall be measured in accordance with items of measurement indicated in each of the following sub-sections.

items shall be deemed to include all cutting and fitting of insulation around hangers, supports, anchors, slippers and the like and the specified methods of jointing of insulants and finishes.

TH 3a pipework

a1 insulate tubing linear
measure through all fittings
joints (other than welded joints) measured separately
curved pipework in loops only shall be given separately

a2 in addition measure number DE 5
insulate bend
state radius
where the information is not available bends shall be grouped together as not exceeding 5 diameter radius or over 5 diameter radius

a3 in addition measure number DE 5
insulate reducer
state sizes

a4 in addition measure number DE 5
insulate branch or tee
in all finishes (except metal cladding) where branch size is two thirds or more of the size of parent pipe
all branch sizes in metal cladding shall be measured
joints (other than welded joints) measured separately

a5 insulate flanged joint number
excluding joints on valves and in line items of equipment

a6 insulate proprietary joint number
state type

a7 form expansion joint number
fully describe state size

a8 insulate valve or similar in line item of equipment number
including joints
state type of valve or equipment
removable covers shall be given separately and fully described

TH 3b trace pipework
shall be measured in accordance with sub-section TH 3a complete
state type of tracing, size, number of tracers and orientation on parent pipe
spirally wound tracing shall be given separately

TH 3c jacketed pipework
shall be measured in accordance with sub-section TH 3a complete
state size of jacket tube and type of closure (special items shall be given separately and enumerated)

TH 3d circular ducting
shall be measured in accordance with sub-section TH 3a complete as applicable

d1 transition pieces from circular to rectangular section number
shall be fully described stating sizes
rectangular ducting

insulate rectangular ducting

measure through all fittings

state outside section sizes

in addition measure

bends (state radius), tapers, angles and the like

TH 3f

equipment and machinery

state whether insulation is applied to flat, curved or domed surfaces

no deductions shall be made for opening less than 0.5m²

(labour finishing insulation around openings shall not therefore be measured)

the following shall be given separately:

i) curved surfaces not exceeding 1.5m diameter

ii) items not exceeding 6m²

iii) work in excess of 30m above ground grouped in 10m stages

iv) flanged, riveted or lapping plate structure

v) ends of items of equipment fully describe (see sketches)

vi) method of support and attachment/reinforcement and/or anchorage to be given

vii) where welding of studs, lugs, support rings, etc., are involved, the responsibility for this shall be defined

f1

insulate equipment and machinery

superficial

f2

additional work to manholes, pockets, blanked off branches and the like shall be fully described

removeable items shall be given separately

f3

additional insulation to support rings, rib flanges and the like shall be fully described

f4

form expansion joints

fully describe, state size

f5

finish insulation around openings exceeding 0.5m²

f6

fabricate metal cladding finish to domed ends, removable end covers and the like

fully describe

f7

fabricate metal cladding finish around projections support rings and the like

superficial

f8

fabricate metal cladding finish to manhole covers, pipe collars and the like

fully describe, state size

TH 3g

filling voids

fully describe stating dimensions and density

superficial/volume

number DE 5
DEFINITIONS

GENERAL

the clauses hereunder in this Section are provided to PR 1 (ii) to define the phraseology used within the context of this Standard Method of Measurement and are not intended to invalidate any particular edition of a Conditions of Contract included in the Contract documents, but may be used in conjunction with or supplementary to them.

DE 1 CONTRACT DEFINITIONS

the following words and expressions shall be interpreted in the manner shown except where the context otherwise requires:

i) the 'contract documents' mean:
   a) Contractor's tender
   b) Memorandum of Contract, letter of acceptance or official order
   c) Technical Specification and Drawings
   d) General Conditions of Contract
   e) Special Conditions of Contract
   f) Site Regulations

ii) the 'Works' means the Plant to be provided and the works and services to be executed in accordance with the contract.

iii) the 'Employer' means the person, firm or company named in the contract and includes the Employer's representatives or successors.

iv) the 'Engineer' means the person, firm or company named in the contract for the purpose of either design and/or supervision of the works to be executed by the Contractor.

v) the 'Contractor' means the person, firm or company whose tender has been accepted by the Employer and includes the Contractor's representatives, successors and permitted assigns.

vi) the 'Site' means the area to be made available to the Contractor for the works other than merely for access.

DE 2 NOMINATED SUB-CONTRACTOR

a nominated sub-contractor means the person, firm or company designated by the Employer to carry out part or parts of the works as ordered and generally supervised by the principal Contractor in accordance with the terms and conditions of the main contract.

DE 3 NOMINATED SUPPLIER

a nominated supplier means the person, firm or company designated by the Employer from whom the principal Contractor is required to obtain specified materials or services of the quality and workmanship previously approved by the Employer and in accordance with the terms and conditions of the main contract.

DE 4 LOCATION

a location shall mean the area, place or position within which the pipework is contained:

i) trenches (open or supported)
   open or timber and/or sheet supported trench excavations to receive single or multiple pipe lines below ground level.
ii) pipe tracks
prepared reservations generally at ground level or
in open excavation to receive single or multiple
pipe lines and associated equipment.

iii) generally at ground level
includes for erecting pipework on independent
supports, blocks, plinths or similar.
the height to underside of pipe shall not exceed
1m/3ft. above ground or defined level.

iv) pipe bridges
includes for pipework on or supported from single
or multi-decked bridges generally of rigid con-
struction erected above ground level to support
single or multiple pipe lines and associated
equipment.

v) plant buildings and structures
single or multi-storey cladded buildings or open
type framed structures to receive vessels and
equipment with inter-connecting pipework.

vi) isolated plant items and the like
plant items such as distillation columns, stacks
or similar requiring independent scaffolding to
provide working platforms and access for the
erction of pipework.

vii) other locations
locations not listed in (i) to (vi) above shall be
given separately and fully described such as ducts,
conduits or similar.

DE 5 IN ADDITION MEASURE

TH3a 2, 3 & 4
TH3e 2

in addition measure indicates additional labour and
material (if any) overall in-line fittings measurement as
described in TH 1b.

DE 6 SIZE OF REDUCER

TH3a 3

diameter of reducer, the largest diameter shall be
applied to the length of the reducer.
BEND
TH16
MEASURE LENGTH
AROUND CENTRE LINE

TEE
TH16
MEASURE LENGTH
ALONG CENTRE LINES

ELBOW
TH16
MEASURE LENGTH
AROUND CENTRE LINE

REDUCER
TH16
MEASURE LENGTH
ALONG CENTRE LINE

BRANCH
(SWEEP TEE)
TH16
MEASURE LENGTH
ALONG CENTRE LINES

CONE
TH3f
\( \frac{\pi R_1^2 + \pi R_2^2}{2} \times h \)

ENCLOSED CYLINDER
TH3f
\( 2 \times \pi R^2 + \pi D \times h \)

CYLINDER
TH3f
\( \pi D \times h \)