

FORMAT NO. : HSE-23 REV 0

Hydraulic Rig Inspection Checklist

Name of Contractor:

Project:

Name of Work:

Job No:

Vehicle Identification/Registration No:

Date:

Sr. No.	Description	Observation	Remarks & Suggestions
1	Control panel is clean & all buttons/switches are clearly visible (no paint over spray, etc.)		
2	All switch & mechanical guards are in good condition and properly installed		
3	All Safety Indicator lights work		
4	Drive controls function properly & accurately labelled (up, down, right, left, forward, back)		
5	Motion alarms are functional		
6	Safety decals are in place and readable		
7	Any defects such as cracked welds, fuel leaks, hydraulic leaks, damaged control cables or wire harness, etc.		
8	Braking devices are operating properly		
9	Winches, pulleys and wire ropes are in good working condition.		
10	Function of interlocks and limit switch		
11	The manufacturer's operations manual (in all languages of the operators)		
12	Oil level, Hydraulic Oil Level, Fuel Level, Coolant Level		
13	Battery Charge		
14	Outriggers in place or functioning. Associated alarms working		
15	Moving & rotating parts guarded		

16	Load chart provided		
17	Fire Extinguisher		
18	Spark Arrestor, if operated by using fuel(For Running Refinery/ Petrochemical/Chemical Plant)		
19	Serial number plate		
20	SLI		
21	TPI Certificate		
22	Colour Coding		
23	Insurance		
24	Pre Medical Check-up& Periodic Medical check-up (every 6 months) including vision test for Operator		
25	Safety Induction for Operator		
26	Others		

**Signature & Name
of Operator:**

**Signature & Name of Contractor's Concern
Engineer**

Signature & Name of Contractor's Safety Officer

FORMAT NO. : HSE-24 REV 0

Boom Lift Inspection Checklist

Name of Contractor:

Project:

Name of Work:

Job No:

Vehicle Identification/Registration No:

Date:

Sr. No.	Description	Observation	Remarks & Suggestions
1	Operating and emergency controls are in proper working condition, EMO button or Emergency Stop Device		
2	Functional upper drive control interlock (i.e. foot pedal, spring lock, or two hand controls)		
3	Emergency Lowering function operates properly		
4	Lower operating controls successfully override the upper controls		
5	Both upper and lower controls are adequately protected from inadvertent operation.		
6	Control panel is clean & all buttons/switches are clearly visible (no paint over spray, etc.)		
7	All switch & mechanical guards are in good condition and properly installed		
8	All Safety Indicator lights work		
9	Drive controls function properly & accurately labelled (up, down, right, left, forward, back)		
10	Motion alarms are functional		
11	Safety decals are in place and readable		
12	Guardrails and anchor points are in place, and in good condition		
13	Work platform & extension slides are clean, dry, & clear of debris		
14	Work platform extension slides in and out freely with safety locking pins in place to lock setting on models with extension platforms.		
15	Any defects such as cracked welds, fuel leaks, hydraulic leaks, damaged control cables or wire harness, etc.		
16	Braking devices are operating properly		
17	The manufacturer's operations manual is stored on AWP (in all languages of the operators)		
18	Oil level, Hydraulic Oil Level, Fuel Level, Coolant Level		

19	Battery Charge		
20	Outriggers in place or functioning. Associated alarms working		
21	Tyres and wheels are in good condition, with adequate air pressure if pneumatic		
22	Wheel chokes are present and are used whenever required		
23	Moving & rotating parts guarded		
24	Load chart provided		
25	Fire Extinguisher		
26	Spark Arrestor, if operated by using fuel(For Running Refinery/ Petrochemical/Chemical Plant)		
27	Serial number plate with Load capacity		
28	TPI Certificate		
29	Colour Coding		
30	Insurance		
31	Pre Medical Check-up& Periodic Medical check-up (every 6 months) including vision test for Operator		
32	Safety Induction for Operator		
33	Others		



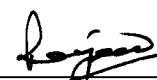

**Signature & Name of
Operator:**

**Signature & Name of
Contractor's Concern
Engineer**

Signature & Name of Contractor's Safety Officer

सीमलैस पाइपों के लिए
निरीक्षण एवं परीक्षण योजना

INSPECTION AND TEST PLAN
FOR
SEAMLESS PIPES

6	23.12.2021	REVISED AND RE-ISSUED	 HKM	 CS	 RK	 S Majumdar
5	19.09..2016	REVISED AND RE-ISSUED	TKK	HP	RKS	RN
4	17.06..2013	REVISED AND RE-ISSUED	TKK	RKS	SCG	DM
3	15.07.2011	REVISED AND RE-ISSUED	TKK	SCG	AKC	DM
2	30.06.2010	REVISED AND RE-ISSUED	RK	VKJ	SKP	ND
Rev. No.	Date	Purpose	Prepared By	Checked By	Standards Committee Convenor	Standards Bureau Chairman
Approved By						

Abbreviations:

CEIL	:	Certification Engineers International Limited	MRT	:	Mechanical Run Test
CIMFR	:	Central Institute of Mining & Fuel Research	NDT	:	Non Destructive Testing
CE	:	Carbon Equivalent	NPSH	:	Net Positive Suction Head
DFT	:	Dry Film Thickness	PO	:	Purchase Order
DPT	:	Dye Penetrant Testing	PESO	:	Petroleum Explosive Safety Organization
DHT	:	De-hydrogen Heat Treatment	PQR	:	Procedure Qualification Record
ERTL	:	Electronics Regional Test Laboratory	PR	:	Purchase Requisition
FCRI	:	Fluid Control Research Institute	PMI	:	Positive Material Identification
HT	:	Heat Treatment	RT	:	Radiography Testing
HIC	:	Hydrogen Induced Cracking	SSCC	:	Sulphide Stress Corrosion Cracking
ITP	:	Inspection and Test Plan	TC	:	Test Certificate
IP	:	Ingress Protection	TPI or TPIA	:	Third Party Inspection Agency
IHT	:	Intermediate Heat Treatment	UT	:	Ultrasonic Testing
IC	:	Inspection Certificate	VDR	:	Vendor Data Requirement
IGC	:	Inter Granular Corrosion	WPS	:	Welding Procedure Specification
MPT/MT	:	Magnetic Particle Testing	WPQ	:	Welders Performance Qualification
MTC	:	Material Test Certificate			

Inspection Standards Committee

Convenor : Mr. Rajeev Kumar

Members: Mr. Rajesh Sinha Mr. Himangshu Pal Mr. R. Muthuramalingam (RPO Representative)
 Mr. Chandrashekhar Mr. Avdhesh Agrawal Mr. P V Satyanarayana (Engg. Representative)
 Mr. Mahendra Mittal

1.0 SCOPE

This Inspection and Test Plan covers the minimum testing requirements of Seamless Pipes.

2.0 REFERENCE DOCUMENTS

PO/PR/Standards referred therein/ Job specifications /Approved documents.

3.0 INSPECTION AND TEST REQUIREMENTS

SL. NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/ TPIA
1.0	Procedure						
1.1	Hydrostatic Test, Heat Treatment, NDT and Other Procedures	Documented Procedures	100%	Procedure Documents	-	H	R
2.0	Material Inspection						
2.1	Raw Material Inspection	Review of MTC for Chemical, Mechanical Properties, size & steel making process, etc.	100%	Test Certificates	-	H	R
3.0	In Process Inspection						

**INSPECTION AND TEST PLAN
 FOR
 SEAMLESS PIPES**

SL. NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/ TPIA
3.1	Heat Treatment	Normalizing, Tempering, Solution Annealing, Stabilization Heat Treatment etc. as applicable	100%	HT chart	-	H	R
3.2	NDT As applicable	Surface & Internal Imperfections	PR / Purchase Specification	NDT Reports	-	H	R
3.3	TPM (Identification of Test Samples)	Product analysis, Tensile ((0.2 Offset/0.5% extension under load),), Hardness, Impact, IGC and Other test as applicable	Lot as per specification	Test Reports	-	H	H (Note-1)
3.4	Product Analysis	Chemical Composition	Lot as per specification	Test Reports	-	H	R
3.5	Destructive Testing	Tensile, Hardness, Impact, IGC and Other test as applicable	Lot as per specification	Test Reports	-	H	H (Note-1)
3.6	Galvanizing (If Applicable)	Integrity of Galvanised Coating	100%	Inspection Report	-	H	R
4.0	Final Inspection						
4.1	Hydrostatic Testing	Leak Check	100%	Test Report	-	H	RW (Note 1)

**INSPECTION AND TEST PLAN
 FOR
 SEAMLESS PIPES**

SL. NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/ TPIA
4.2	Visual and Dimensional Inspection (VDI)	Surface Condition, Straightness, End Finish, Bevel Angle, Root Face, Outer Dia., Thickness, Length, End Finish, Marking, End Caps etc	100%	Inspection Report	-	H	RW (Note 1)
4.3	Weight Checking as applicable	Weight	100% By Supplier	Inspection Report	-	H	-
4.4	PMI Check	Chemical Check	As Per EIL Spec. 6-81-0001	Inspection report	-	H	RW
4.5	Final Stamping	Stamping of Accepted Pipes	Stamping of Pipes which are witnessed by EIL/TPIA..Other pipes to have suppliers identification	Inspection Report	-	H	H

**INSPECTION AND TEST PLAN
FOR
SEAMLESS PIPES**

SL. NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/ TPIA
5.0	Painting						
5.1	Rust Preventive Coating & Color Coding (As applicable)	Visual & Color Coding as applicable	100%	Inspection Report	-	W	-
6.0	Documentation & IC						
6.1	Documentation & Inspection Certificate(IC)	Review of Stage Inspection Reports / Test Reports & Issue of IC	100%	Supplier TC & IC	-	H	H

Legend: H- Hold (Do not proceed without approval), P-Perform, RW - Random Witness (As specified or 10% (min.1 no. of each size and type of Bulk item)), R-Review, W-Witness (Give due notice, work may proceed after scheduled date).

NOTES (As applicable):

- Carbon Steel Pipes (Other than LTCS & Pipes for special services like NACE, H2, HIC, etc.) up to size 12" will be accepted on review of Supplier Test Certificates. Supplier Test Certificate to be reviewed by EIL/TPIA.
- This document describes the generic test requirements. Any additional test or Inspection scope if specified in contract documents shall also be applicable (Unless otherwise agreed upon).
- Acceptance Norms for all the activities shall be as per PO/PR/STANDARDS referred therein /Job Specification /Approved Documents.
- For orders placed on stockist, items shall be accepted based on manufacturer's TC with EN10204 type 3.2 certification from EIL approved suppliers.

फोर्ज्ड, सीमलेस एंड वेल्डेड फिटिंगों के लिये
निरीक्षण व परीक्षण योजना

INSPECTION AND TEST PLAN
FOR
FORGED, SEAMLESS & WELDED FITTINGS

8	01 06 2019	REVISED AND RE-ISSUED	AA	RS	RKS	RKT
7	14 11 2018	REVISED AND RE-ISSUED	KC	NM	RKS	RKT
6	19 09 2016	REVISED AND RE-ISSUED	TKK	HP	RKS	DM
5	17 06 2013	REVISED AND RE-ISSUED	TKK	RKS	SCG	DM
4	15 07 2011	REVISED AND RE-ISSUED	TKK	SCG	AKC	DM
Rev. No.	Date	Purpose	Prepared by	Checked by	Standards Committee Convener	Standards Bureau Chairman
						Approved by

INSPECTION AND TEST PLAN
FOR
FORGED, SEAMLESS & WELDED FITTINGS

Abbreviations:

CEIL	:	Certification Engineers International Limited	MRT	:	Mechanical Run Test
CIMFR	:	Central Institute of Mining & Fuel Research	NDT	:	Non Destructive Testing
CE	:	Carbon Equivalent	NPSH	:	Net Positive Suction Head
DFT	:	Dry Film Thickness	PO	:	Purchase Order
DPT	:	Dye Penetrant Testing	PESO	:	Petroleum Explosive Safety Organization
DHT	:	De-hydrogen Heat Treatment	PQR	:	Procedure Qualification Record
ERTL	:	Electronics Regional Test Laboratory	PR	:	Purchase Requisition
FCRI	:	Fluid Control Research Institute	PMI	:	Positive Material Identification
HT	:	Heat Treatment	RT	:	Radiography Testing
HIC	:	Hydrogen Induced Cracking	SSCC	:	Sulphide Stress Corrosion Cracking
ITP	:	Inspection and Test Plan	TC	:	Test Certificate
IP	:	Ingress Protection	TPI or TPIA	:	Third Party Inspection Agency
IHT	:	Intermediate Heat Treatment	UT	:	Ultrasonic Testing
IC	:	Inspection Certificate	VDR	:	Vendor Data Requirement
IGC	:	Inter Granular Corrosion	WPS	:	Welding Procedure Specification
MPT/MT	:	Magnetic Particle Testing	WPQ	:	Welders Performance Qualification
MTC	:	Material Test Certificate			

Inspection Standards Committee

Convener: Mr. R.K. Singh

Members:

Mr. Rajesh Sinha	Mr. Himangshu Pal	Mr. Chandrashekhar
Mr. Muthuramalingam	Mr. Avdhesh Agrawal	Mr. Deepak Gupta- Project
Mr. Mahendra Mittal		

INSPECTION AND TEST PLAN
FOR
FORGED, SEAMLESS & WELDED FITTINGS

1.0 SCOPE

This Inspection and Test Plan covers the minimum testing requirements of Forged, Seamless & Welded Fittings.

2.0 REFERENCE DOCUMENTS

PO/PR/Standards referred therein/ Job specifications /Approved documents.

3.0 INSPECTION AND TEST REQUIREMENTS

SL NO.	STAGE/ ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA
1.0	Procedure						
1.1	Heat Treatment / NDT	Documented Procedures	100%	Procedure Documents	-	H	R
1.2	WPS,PQR & WPQ	Welding Parameters & Qualification	100%	WPS,PQR & WPQ	-	H	W- New R- Existing
2.0	Material Inspection						
2.1	Raw Material Identification (Billets, Rounds, Pipes, Coil, Plates, etc.) (*Alloy steels and Special services like NACE, H2, HIC, Wet H2S,LTCS, UOP, AXEN etc.)	Chemical and Mechanical Properties, Size & Steel making practice etc.	100%	Mill test certificate, Supplier's Inspection Report	-	H	W* / R

INSPECTION AND TEST PLAN
FOR
FORGED, SEAMLESS & WELDED FITTINGS

SL NO.	STAGE/ ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA
3.0	In Process Inspection						
3.1	Forming & Welding	Forming & Welding Parameters	100%	Supplier's records	-	H	-
3.2	Ferrite Check Of SS Welds (If Applicable)	% Ferrite Check	100%	Inspection Report	-	H	R
3.3	Heat Treatment	Stress Reliving, Normalizing, Tempering, Solution Annealing, Stabilization Heat Treatment etc. as applicable	100%	HT chart / Report	-	H	R
3.4	NDT-RT As Applicable	Surface & Internal Imperfections	As per PR/Purchase Specification	RT Films & Reports	-	H	R (Films Review)
3.5	NDT – UT (as applicable)	Surface & Internal Imperfections	As per PR/Purchase Specification	UT Report	-	H	R
3.6	NDT – DPT/MPT on Bevel Ends (as applicable)	Surface & Internal Imperfections	100%	Test Report	-	H	RW
3.7	Identification of Test Samples	Product Chemical, Mechanical, Impact, IGC and Other test as applicable	Per heat, per heat treatment lot (Note-4)	Test Reports	-	H	H

**INSPECTION AND TEST PLAN
FOR
FORGED, SEAMLESS & WELDED FITTINGS**

SL NO.	STAGE/ ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA
3.8	Product Analysis	Chemical Composition	As per PR/Purchase Specification	Test Reports	-	H	R
3.9	Destructive Testing	Mechanical, Impact, IGC, Hardness and Other test as applicable	100%	Test Reports	-	H	H
3.10	Galvanizing (If Applicable)	Integrity Of Galvanized Coating	100%	Inspection Report	-	H	R
4.0	Final Inspection						
4.1	Visual and Dimension	Size, Thickness / Schedule, Dimensions, Surface quality, Marking, etc.	100%	Inspection Report	-	H	RW
4.2	Hardness testing on finished fittings of Alloy steels and Special services (like NACE, H2, HIC, Wet H2S, UOP, AXEN etc.) & any other services as applicable.	Hardness value of Base metal & Welds/HAZ.	Random 10%	Test Report	-	H	RW
4.3	PMI Check	Chemical Check	As Per EIL Spec. 6-81-0001	Inspection report	-	H	RW

INSPECTION AND TEST PLAN
FOR
FORGED, SEAMLESS & WELDED FITTINGS

SL NO.	STAGE/ ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA
4.4	Final Stamping	Stamping Of Accepted Fittings	Stamping of Fittings which are witnessed by EIL/TPIA.	Inspection Report	-	H	H
5.0	Painting						
5.1	Rust Preventive Coating & Color Coding	Visual & Color Coding as applicable	100%	Inspection Report	-	W	-
6.0	Documentation & IC						
6.1	Documentation & Inspection Certificate(IC)	Review of Stage Inspection Reports / Test Reports & Issue of IC	100%	Supplier TC & IC	-	H	H





Legend: H- Hold (Do not proceed without approval), P-Perform, RW - Random Witness (As specified or 10% (min.1 no. of each size and type of Bulk item)), R-Review, W-Witness (Give due notice, work may proceed after scheduled date).

NOTES (As applicable):

1. This document describes the generic test requirements. Any additional test or Inspection scope if specified in contract documents shall also be applicable (unless otherwise agreed upon).
2. Acceptance Norms for all the activities shall be as per PO/PR/STANDARDS referred there in /Job Specification /Approved Documents.
3. For orders placed on stockiest, items shall be accepted based on manufacturer's TC with EN10204 type 3.2 certification from EIL approved suppliers.
4. Test piece marking shall be carried out from the product for each heat of raw material and for each heat treatment batch at shop floor.

फलेंजो, स्पैक्टैकल ब्लांडों एवं ड्रिप रिंगों के लिये निरीक्षण व परीक्षण योजना

INSPECTION AND TEST PLAN FOR FLANGES, SPECTACLE BLINDS & DRIP RINGS

6	22.02.2024	REVISED AND RE-ISSUED	 BBK	 PW	 RK	 MN	
5	14.11.2018	REVISED AND RE-ISSUED	KC	NM	RKS	RKT	
4	17.06.2013	REVISED AND RE-ISSUED	TKK	RKS	SCG	DM	
3	15.07.2011	REVISED AND RE-ISSUED	TKK	SCG	AKC	DM	
Rev. No.	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman	Approved by

Abbreviations:

CEIL	:	Certification Engineers International Limited	MRT	:	Mechanical Run Test
CIMFR	:	Central Institute of Mining & Fuel Research	NDT	:	Non Destructive Testing
CE	:	Carbon Equivalent	NPSH	:	Net Positive Suction Head
DFT	:	Dry Film Thickness	PO	:	Purchase Order
DPT	:	Dye Penetrant Testing	PESO	:	Petroleum Explosive Safety Organization
DHT	:	De-hydrogen Heat Treatment	PQR	:	Procedure Qualification Record
ERTL	:	Electronics Regional Test Laboratory	PR	:	Purchase Requisition
FCRI	:	Fluid Control Research Institute	PMI	:	Positive Material Identification
HT	:	Heat Treatment	RT	:	Radiography Testing
HIC	:	Hydrogen Induced Cracking	SSCC	:	Sulphide Stress Corrosion Cracking
ITP	:	Inspection and Test Plan	TC	:	Test Certificate
IP	:	Ingress Protection	TPI or TPIA	:	Third Party Inspection Agency
IHT	:	Intermediate Heat Treatment	UT	:	Ultrasonic Testing
IC	:	Inspection Certificate	VDR	:	Vendor Data Requirement
IGC	:	Inter Granular Corrosion	WPS	:	Welding Procedure Specification
MPT/MT	:	Magnetic Particle Testing	WPQ	:	Welders Performance Qualification
MTC	:	Material Test Certificate			

Inspection Standards Committee

Convenor: Mr. Rajeev Kumar

Members:

Mr. Chandrashekar
Mr. Avdesh Agrawal

Mr. G Suresh
Mr. Mahendra Mittal

Mr. Himangshu Pal
Ms. Sulakshna Hundekari
(Engg.)

Mr. R Muthu Ramalingam (RPO Rep.)
Mr. Anil Kumar

1.0 SCOPE

This Inspection and Test Plan covers the minimum testing requirements of Flanges, Spectacle Blinds & Drip Rings.

2.0 REFERENCE DOCUMENTS

PO/PR/Standards referred therein/ Job specifications /Approved documents.

3.0 INSPECTION AND TEST REQUIREMENTS

SL NO.	STAGE / ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA
1.0	Procedure						
1.1	Heat Treatment, NDT, PMI , IGC, Mechanical, Chemical testing and Other Procedures	Documented Procedures	100%	Procedure Documents	-	H	R
1.2	WPS, PQR & WPQ	Welding Parameters & Qualification Record	100%	WPS, PQR & WPQ	-	H	W- New R- Existing
2.0	Material Inspection						
2.1	Raw Material Inspection	Chemical & Mechanical Properties	100%	Test Certificates	-	H	R

INSPECTION AND TEST PLAN
FOR
FLANGES, SPECTACLE BLINDS & DRIP RINGS

STANDARD SPECIFICATION No.

6-81-0006 Rev. 6

Page 4 of 7

SL NO.	STAGE / ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA
3.0	In Process Inspection						
3.1	Welding / Forging	Forging /Welding Parameters	100%	Inspection Reports	-	H	-
3.2	Heat Treatment	Stress Relieving, Normalising, Tempering, Solution Annealing, Stabilization Heat Treatment etc., as applicable	100%	HT chart	-	H	R
3.3	Identification of Test Samples	Product Chemical, Mechanical, Impact, IGC (Per heat/ Heat Treatment lot) and Other tests, as applicable	100%	Test Reports	-	H	H
3.4	Product Analysis (As applicable)	Chemical Composition	As per PR/Purchase Specification	Test Reports	-	H	R
3.5	Destructive Testing	Mechanical, Impact, IGC and Other tests, as applicable	100%	Test Reports	-	H	H
3.6	NDT as applicable	Surface & Internal Imperfections	As per PR/Purchase Specification	NDT Reports	-	H	R

INSPECTION AND TEST PLAN
FOR
FLANGES, SPECTACLE BLINDS & DRIP RINGS

STANDARD SPECIFICATION No.

6-81-0006 Rev. 6

Page 5 of 7

SL NO.	STAGE / ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA
3.7	Galvanizing (If Applicable)	Integrity of Galvanised Coating	100%	Inspection Report	-	H	R
4.0	Final Inspection						
4.1	Final Inspection	1. Visual 2. Dimensions 3. Hardness 4. Marking etc.,	100%	Inspection Report	-	H	H (Note-1,2)
4.2	PMI Check	Chemical Check	As Per EIL Spec. 6-81-0001	Inspection report	-	H	RW
4.3	Review of Calibration Records	Summary of Calibration Reports of all Equipments, tools and instruments used during inspection and testing	100%	Calibration Reports	-	H	R
4.4	NDE Operator Qualification records	ASNT / ISNT Level I/II/III certifications	100%	Summery	H	H	R
4.5	Final Stamping	Stamping of Accepted Items	Stamping of Items which are witnessed by EIL/TPIA.	Inspection Report	-	H	H (Note-1,2)

SL NO.	STAGE / ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA
5.0	Painting						
5.1	Rust Preventive Coating & Color Coding	Visual & Color Coding as applicable	100%	Inspection Report	-	H	-
6.0	Documentation & IC						
6.1	Documentation & Inspection Certificate (IC)	Review of Stage Inspection Reports / Test Reports & Issue of IC	100%	Supplier TC & IC	-	H	H

Legend: H- Hold (Do not proceed without approval), P-Perform, RW - Random Witness (As specified or 10% (min.1 no. of each size and type of Bulk item)), R-Review, W-Witness (Give due notice, work may proceed after scheduled date).

NOTES (As applicable):

1. Non-NACE/HIC, Non-Hydrogen service & Non-LTCS, Carbon Steel (CS) Flanges, Spectacle Blinds and drip Rings up to size 24"-300 ANSI Class will be accepted based on the review of the Manufacturer's Test Certificates. Manufacturer's Test Certificate shall be as per EN 10204 Type 3.1. MTC along with backup reports to be reviewed by EIL/TPIA.
2. For cases apart from Note-1, Manufacturer's Test Certificate shall be as per EN 10204 Type 3.2 Certification, unless otherwise specified.

**INSPECTION AND TEST PLAN
FOR
FLANGES, SPECTACLE BLINDS & DRIP RINGS**

STANDARD SPECIFICATION No.


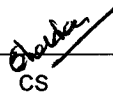


6-81-0006 Rev. 6

Page 7 of 7

3. This document describes the generic test requirements. Any additional test or Inspection scope if specified in contract documents shall also be applicable. (Unless otherwise agreed upon)
4. Acceptance Norms for all the activities shall be as per PO/PR/STANDARDS referred therein /Job Specification /Approved Documents.

बोल्टिंग मैटीरियल के लिए
निरीक्षण एवं परीक्षण योजना

INSPECTION AND TEST PLAN
FOR
BOLTING MATERIAL

5	23.12.2021	REVISED AND RE-ISSUED	 HKM	 CS	 RK	 S Mazumdar
4	19.09.2016	REVISED AND RE-ISSUED	TKK	HP	RKS	RN
3	17.06.2013	REVISED AND RE-ISSUED	TKK	RKS	SCG	DM
2	15.07.2011	REVISED AND RE-ISSUED	TKK	SCG	AKC	DM
1	28.09.2007	REVISED AND RE-ISSUED	PD	RB	MVKK	VC
Rev. No.	Date	Purpose	Prepared by	Checked by	Convenor Standards Committee	Chairman Standards Bureau
Approved by						

Abbreviations:

CEIL	:	Certification Engineers International Limited	MRT	:	Mechanical Run Test
CIMFR	:	Central Institute of Mining & Fuel Research	NDT	:	Non Destructive Testing
CE	:	Carbon Equivalent	NPSH	:	Net Positive Suction Head
DFT	:	Dry Film Thickness	PO	:	Purchase Order
DPT	:	Dye Penetrant Testing	PESO	:	Petroleum Explosive Safety Organization
DHT	:	De-hydrogen Heat Treatment	PQR	:	Procedure Qualification Record
ERTL	:	Electronics Regional Test Laboratory	PR	:	Purchase Requisition
FCRI	:	Fluid Control Research Institute	PMI	:	Positive Material Identification
HT	:	Heat Treatment	RT	:	Radiography Testing
HIC	:	Hydrogen Induced Cracking	SSCC	:	Sulphide Stress Corrosion Cracking
ITP	:	Inspection and Test Plan	TC	:	Test Certificate
IP	:	Ingress Protection	TPI or TPIA	:	Third Party Inspection Agency
IHT	:	Intermediate Heat Treatment	UT	:	Ultrasonic Testing
IC	:	Inspection Certificate	VDR	:	Vendor Data Requirement
IGC	:	Inter Granular Corrosion	WPS	:	Welding Procedure Specification
MPT/MT	:	Magnetic Particle Testing	WPQ	:	Welders Performance Qualification
MTC	:	Material Test Certificate			

Inspection Standards Committee

Convenor Mr. Rajeev Kumar

Members: Mr. Rajesh Sinha Mr. Himangshu Pal Mr. R. Muthuramalingam (RPO Representative)
 Mr. Chandrashekhar Mr. Avdhesh Agrawal Mr. P V Satyanarayana (Engg. Representative)
 Mr. Mahendra Mittal

1.0 SCOPE

This Inspection and Test Plan covers the minimum testing requirements of Bolting Material.

2.0 REFERENCE DOCUMENTS

PO/PR/ Standards referred therein/ Job specifications /Approved documents.

3.0 INSPECTION AND TEST REQUIREMENTS

SL NO.	STAGE/ ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA
1.0	Procedure						
1.1	Heat Treatment & NDT Procedures	Documented Procedures	100%	Procedure Documents	-	H	R
2.0	Material Inspection						
2.1	Raw Material Inspection	Chemical, Mechanical properties, Steel making process, Macro Etch, etc.	100% one no. per heat per size	Mill Test Certificates/ Lab Reports	H	H	R
3.0	In Process Inspection						

INSPECTION AND TEST PLAN
FOR
BOLTING MATERIAL

SL NO.	STAGE/ ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA
3.1	Thread Rolling, Hot forging of Nuts/Bolt Heads, Machining	Process Parameters	100%	Inspection Report	-	H	-
3.2	Heat Treatment	Normalising & Tempering, Quenching & Tempering Solution Annealing, Stabilization Heat Treatment, Strain Hardening, Nitriding etc. as applicable	100%	Heat treatment process records /charts	-	H	R
3.3	NDT (as applicable)	Defects detection	100%	Test Reports	-	H	R
3.4	TPM Identification of Test Samples	Product Analysis, Proof Load Test, Stress Rupture, Tensile, Hardness, Impact, and Other test as applicable	Lot as per specification.	Test Reports	-	H	H
3.5	Chemical Testing	Chemical analysis	Lot as per specification.	Test Reports		H	H

**INSPECTION AND TEST PLAN
 FOR
 BOLTING MATERIAL**

SL NO.	STAGE/ ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA
3.6	Mechanical Testing	Mechanical (0.2 Offset/0.5% extension under load), Hardness, Proof Load Test for Nuts (as applicable), Stress Rupture (As Applicable), Impact and Other test as applicable	Lot as per specification.	Test Reports	-	H	H
3.7	Galvanizing (If Applicable)	Integrity of Galvanised Coating	100%	Inspection Report	-	H	R
4.0	Final Inspection						
4.1	Visual & Dimension	Visual Marking & Dimensions	100% by supplier & Random by EIL/ TPIA	Inspection Report	-	H	RW (Note-3)
4.2	Final Stamping	Stamping of Accepted Bolting Material	Stamping of bolting material which are witnessed by EIL/TPIA. Others to have supplier's identification.	Inspection Report	-	H	RW (Note 3)

**INSPECTION AND TEST PLAN
 FOR
 BOLTING MATERIAL**

SL NO.	STAGE/ ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA
4.3	PMI Check	Chemical Check	As Per EIL Spec. 6-81-0001	Inspection report	-	H	RW (Note 3)
5.0	Painting						
5.1	Rust Preventive & Color Coding (as applicable)	Visual & Color Coding as applicable	100%	Inspection Report	-	H	-
6.0	Documentation & IC						
6.1	Documentation & Inspection Certificate (IC)	Review of Stage Inspection Reports / Test Reports & Issue of IC	100%	Supplier TC & IC	-	H	H

Legend: H- Hold (Do not proceed without approval), P-Perform, RW - Random Witness {As specified or NOTE 3), R-Review, W-Witness (Give due notice, work may proceed after scheduled date).

Notes (as applicable):

1. This document describes the generic test requirements. Any additional test or Inspection scope if specified in contract documents shall also be applicable (unless otherwise agreed upon).
2. Acceptance Norms for all the activities shall be as per PO/PR/STANDARDS referred therein /Job Specification /Approved Documents.
3. Final visual and dimension And PMI Check shall be checked as per below sampling plan:

**INSPECTION AND TEST PLAN
FOR
BOLTING MATERIAL**

Lot Size (Nos.)	Sample Size (Minimum) for EIL/TPIA	Sample size (Min) for Supplier
Upto 100	2% (Min. 2 Nos.)	10%
101 to 500	1% (Min. 3 Nos.)	10%
501 and above	0.5% (Min. 5Nos.)	10%

गास्केट्स के लिए
निरीक्षण व परीक्षण योजना

INSPECTION AND TEST PLAN
FOR
GASKETS

5	28.09.2022	REVISED AND RE-ISSUED	TKK	PTM	RK	SM
4	14.11.2018	REVISED AND RE-ISSUED	KC	NM	RKS	RKT
3	17.06.2013	REVISED AND RE-ISSUED	TKK	RKS	SCG	DM
2	15.07.2011	REVISED AND RE-ISSUED	TKK	SCG	AKC	DM
1	02.01.2008	REVISED AND RE-ISSUED	AM	SS	MVKK	VC
Rev. No.	Date	Purpose	Prepared By	Checked By	Standards Committee Convener	Standards Bureau Chairman
					Approved by	

Abbreviations:

CEIL	:	Certification Engineers International Limited	MRT	:	Mechanical Run Test
CIMFR	:	Central Institute of Mining & Fuel Research	NDT	:	Non Destructive Testing
CE	:	Carbon Equivalent	NPSH	:	Net Positive Suction Head
DFT	:	Dry Film Thickness	PO	:	Purchase Order
DPT	:	Dye Penetrant Testing	PESO	:	Petroleum Explosive Safety Organization
DHT	:	De-hydrogen Heat Treatment	PQR	:	Procedure Qualification Record
ERTL	:	Electronics Regional Test Laboratory	PR	:	Purchase Requisition
FCRI	:	Fluid Control Research Institute	PMI	:	Positive Material Identification
HT	:	Heat Treatment	RT	:	Radiography Testing
HIC	:	Hydrogen Induced Cracking	SSCC	:	Sulphide Stress Corrosion Cracking
ITP	:	Inspection and Test Plan	TC	:	Test Certificate
IP	:	Ingress Protection	TPI or TPIA	:	Third Party Inspection Agency
IHT	:	Intermediate Heat Treatment	UT	:	Ultrasonic Testing
IC	:	Inspection Certificate	VDR	:	Vendor Data Requirement
IGC	:	Inter Granular Corrosion	WPS	:	Welding Procedure Specification
MPT/MT	:	Magnetic Particle Testing	WPQ	:	Welders Performance Qualification
MTC	:	Material Test Certificate			

Inspection Standards Committee

Convenor : Mr. Rajeev Kumar

Members:

Mr. Rajesh Sinha
Mr. Avdhesh Agrawal

Mr. Chandrashekhar
Mr. Mahendra Mittal

Mr. Himangshu Pal
Miss Sulakshana Hundekari

Mr. R Muthu Ramalingam (RPO Rep.)

1.0 SCOPE

This Inspection and Test Plan covers the minimum testing requirements of Gaskets.

2.0 REFERENCE DOCUMENTS

PO/PR/ Standards referred there in/ Job specifications /Approved documents.

3.0 INSPECTION AND TEST REQUIREMENTS

SL NO.	STAGE / ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA
1.0	Procedure						
1.1	HT & Test Procedures, as applicable	Documented Procedures	100%	Procedure Documents	-	H	R
2.0	Material Inspection						
2.1	Raw Material Inspection	Chemical, Physical and other properties as per applicable material specification	100%	Test Certificates	H	H	-
3.0	In Process Inspection						
3.1	Punching & Finishing	Finish & Dimension	100%	Inspection Report	-	H	-

INSPECTION AND TEST PLAN
FOR
GASKETS

SL NO.	STAGE / ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA
3.2	Heat Treatment for RTJ Gaskets (As applicable)	Time & Temperature	100%	HT Chart		H	R
3.3	Marking	Size, Rating, Material, Color Coding etc., as applicable	100%	Test Record	-	H	-
4.0	Final Inspection						
	Final Visual, Dimension & Testing	<ul style="list-style-type: none"> Visual checks including marking check Dimension check 	100%	Inspection Report	-	H	R
4.1	Hardness test for RTJ Gaskets	Ring Hardness	10% (Per size/Rating/Heat /Heat treatment lot)	Test report	-	H	R
	Compressibility, Recovery, Sealability tests for Spiral Wound Gaskets	Compressibility, Recovery, Sealability	One per size/rating/lot	Test report	-	H	R

INSPECTION AND TEST PLAN
FOR
GASKETS


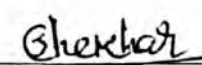


SL NO.	STAGE / ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA
4.2	PMI Check (as applicable)	Chemical Check	As per EIL Spec: 6-81-001	Inspection Report	-	H	R
4.3	Submission of Documents/ Certificate	Performance Qualification Test (applicable for Spiral wound Gaskets)	As per ASME B16.20	Type test report	-	H	R (Note-3)
5.0	Painting						
5.1	Rust Preventive & Color Coding as applicable	Visual & Color Coding as applicable	100%	Inspection Report	-	H	-
6.0	Documentation & IC						
6.1	Documentation & IC	Review of test reports, Inspection documents & Issue of IC	100%	Supplier Records / IC	-	H	H

Legend: H- Hold (Do not proceed without approval), P-Perform, RW - Random Witness (As specified or 10% (min.1 no. of each size and type of Bulk item)), R-Review, W-Witness (Give due notice, work may proceed after scheduled date).

Notes (as applicable):

1. This document describes the generic test requirements. Any additional test or Inspection scope if specified in contract documents shall also be applicable. (unless otherwise agreed upon)
2. Acceptance Norms for all the activities shall be as per PO/PR/STANDARDS referred therein /Job Specification /Approved Documents.
3. Performance qualification test of Spiral wound gaskets shall be carried out under reputed Third Party Inspection Agency(TPIA) arranged by the supplier

एयर कूल्ड हीट एक्सचेंजर के लिए
निरीक्षण व परीक्षण योजना
INSPECTION AND TEST PLAN
FOR
AIR COOLED HEAT EXCHANGER

4	14.05.2020	REVISED AND RE-ISSUED	 SK	 CS	 RKS	 SKS
3	20.11.2013	REVISED AND RE-ISSUED	TKK	RKS	SCG	SC
2	26.10.2012	REVISED AND RE-ISSUED	HP	RKS	SCG	DM
1	28.09.2007	REVISED AND RE-ISSUED	PD	RB	MVKK	VC
0	19.07.02	ISSUED FOR IMPLEMENTATION	NKN	SPS	AKB	SB
Rev. No.	Date	Purpose	Prepared by	Checked by	Convenor Standards Committee	Chairman Standards Bureau
Approved by						

Abbreviations:

AS/CS/SS	:	Alloy Steel / Carbon Steel / Stainless Steel	MRT	:	Mechanical Run Test
CEIL	:	Certification Engineers International Limited	NDT	:	Non Destructive Testing
CIMFR	:	Central Institute of Mining & Fuel Research	NPSH	:	Net Positive Suction Head
CE	:	Carbon Equivalent	PO	:	Purchase Order
DFT	:	Dry Film Thickness	PESO	:	Petroleum Explosive Safety Organization
DPT	:	Dye Penetrant Testing	PQR	:	Procedure Qualification Record
DHT	:	De-hydrogen Heat Treatment	PR	:	Purchase Requisition
ERTL	:	Electronics Regional Test Laboratory	PMI	:	Positive Material Identification
FCRI	:	Fluid Control Research Institute	PWHT	:	Post Weld Heat Treatment
HT	:	Heat Treatment	RT	:	Radiography Testing
HIC	:	Hydrogen Induced Cracking	SSCC	:	Sulphide Stress Corrosion Cracking
ITP	:	Inspection and Test Plan	TC	:	Test Certificate
IP	:	Ingress Protection	TPI or TPIA	:	Third Party Inspection Agency
IHT	:	Intermediate Heat Treatment	UT	:	Ultrasonic Testing
IC	:	Inspection Certificate	VDR	:	Vendor Data Requirement
IGC	:	Inter Granular Corrosion	WPS	:	Welding Procedure Specification
MPT/MT	:	Magnetic Particle Testing	WPQ	:	Welders Performance Qualification
MTC	:	Material Test Certificate			

Inspection Standards Committee

Convenor: Mr. R.K. Singh

Members:

Mr. Rajesh Sinha	Mr. Himangshu Pal	Mr. R. Muthuramalingam (RPO Representative)
Mr. Chandrashekhar	Mr. Avdhesh Agrawal	Mr. P V Satyanarayana (Engg. Representative)
Mr. Mahendra Mittal		

1.0 SCOPE

This Inspection and Test Plan covers the minimum testing requirements of AIR COOLED HEAT EXCHANGER.

2.0 REFERENCE DOCUMENTS

PO/PR/ Standards referred there in/ Job specifications /Approved documents.

3.0 INSPECTION AND TEST REQUIREMENTS

S.No.	Stage/Activity	Characteristics	Quantum of Check	Record	Scope of Inspection		
					Sub Supplier	Supplier	EIL/TPIA
1.0	Procedures						
1.1	Hydro test ,heat treatment, NDT, Header-box fabrication sequence, Run Test and other Procedures (as applicable)	Documented procedures.	100%	Procedure documents	-	H	R
1.2	Weld Plan & NDT Plan	As per PR/ Purchase Specification/ Applicable codes	100%	Procedure documents	-	H	R – CS A-AS/SS/ CLAD
1.3	WPS/ PQR /WPQ/Mock up	Documented procedures.	100%	Procedure documents	-	H	R-Existing W-New
2.0	Materials Procurement						

S.No.	Stage/Activity	Characteristics	Quantum of Check	Record	Scope of Inspection		
					Sub Supplier	Supplier	EIL/TPIA
2.1	Plates, pipes, forging, fittings, plug, Gaskets, tubes, Fan, V-Belts, Bearings, vibration transmitter, vibration switch etc. as applicable (Note-4)	Properties as per Purchase specification / Approved documents	100%	Mill test certificates	H	H	R
2.2	Motor / VFD (as applicable) *(supplier/sub supplier to arrange TPIA certification) (Note-3)	-As per applicable specification & ITP of motor & VFD	100%	MTC & Inspection Report	H	H*	W (Note-3)
3.0	In Process Inspection						
3.1	Materials identification for plates and pipes (pressure parts)	Review of test certificates, markings visual & dimensional inspection, identity correlation & transfer of identity	100%	Material clearance record	-	H	H
3.2	Material identification for forgings, fittings, tubes, fasteners, gaskets (pressure parts) and fin materials	Review of test certificates, markings identity correlation	100%	Material clearance record	-	H	R
3.3	Non Pressure Parts (C Frames, Tube Spacers, Plenum Chambers, Support Structurals, etc.)	Review of Manufacturer test certificates/ Check test reports as per material specification	100%	Inspection Report/ MTC/ Check test reports	W	W	R

INSPECTION AND TEST PLAN
FOR
AIR COOLED HEAT EXCHANGER

S.No.	Stage/Activity	Characteristics	Quantum of Check	Record	Scope of Inspection		
					Sub Supplier	Supplier	EIL/TPIA
3.4	Pulleys, belts, fans , vibration switch, vibration transmitter	Review of test certificates	100%	Inspection report	W	R	R
3.5	Tube finning	Visual & dimensional inspection (pitch, height, length of un finned portion, straightness, etc)	100%	Inspection report	W	H	RW
		Pull out test	Random	Test report	W	H	RW
3.6	Welding consumable	Chemical & mechanical properties/IGC (as applicable)	100%	Batch test certificates	W	R	R
3.7	Weld edge preparation & set up of side plates including tube sheet & pass partition plates.	Visual & dimensional inspection, weld edge, root gap. offset, cleanliness etc.	100%	Inspection check List	-	W	-
		NDT of weld edges (as applicable)	100%	NDT Reports	-	W	R
3.8	Intermediate Inspection of Welding	Welding parameters as per approved WPS/PQR	100%	Inspection report	-	W	-
3.9	Inspection of completed welds	Visual inspection for reinforcement, undercuts, surface defects etc.	100%	Inspection Check List	-	W	R
		Non destructive test RT/UT/PAUT Including NDT of partition plate weld & stiffener plate weld (as applicable)	100%	NDT reports/RT films/UT reports/PAUT records	-	W	R-RT (for film) W/R-UT/PAUT

INSPECTION AND TEST PLAN
FOR
AIR COOLED HEAT EXCHANGER

S.No.	Stage/Activity	Characteristics	Quantum of Check	Record	Scope of Inspection		
					Sub Supplier	Supplier	EIL/TPIA
		NDT of stiffener plate					
		Pneumatic Test of RF Pads, if any	100%	Leak Test report	-	H	R
		PWHT (as applicable)	100%	HT chart	-	W	R
		Hardness test (as applicable)	As applicable	Inspection report	-	W	RW
		PMI (AS/SS Components)	Each component and weld	Inspection report		W	RW
		Production test coupon testing	As applicable	Inspection report	-	H	H
3.10	Final inspection of Header boxes after PWHT	Visual/ dimensions	100%	Inspection report	-	H	R
3.11	Tube sheet	Hole dia, drift, surface finish, grove depth, ligament check and positional accuracy.	100%	Inspection report	-	H	W

S.No.	Stage/Activity	Characteristics	Quantum of Check	Record	Scope of Inspection		
					Sub Supplier	Supplier	EIL/TPIA
3.12	Plug sheet	Threading, finish, ligament check and positional accuracy	100%	Inspection report	-	W	W
3.13	Tube bundle -C frame assly, before tube insertion	Completeness of assembly	Drawing	Inspection report	-	W	R
3.14	Final assembly after tubes insertion	Alignment, completeness of assembly	Drawing	Inspection report	-	W	R
3.15	Tube to tube sheet expansion/ welding	% Thinning, length of expansion, finish & visual, distortion & DPT of welds.	Random	Inspection report	-	W	RW
4.0	Final Inspection						
4.1	Visual and dimensional inspection of tube bundles	Dimensions, completeness of assembly, nozzle elevation, orientation and projection	100%	Inspection report	-	H	H
4.2	Air test of tube to tube sheet joints (after root welding)	Leak check	100%	Inspection Report	-	W	R
4.3	Hydrostatic test	Leak check	100%	Inspection report	-	H	H
4.4	Surface preparation/ cleaning	Visual inspection for workmanship	100%	Inspection report	-	W	-
4.5	Final stamping of equipment and marking etc	Verifying stamping details	Name plate & rub off stamping	Name Plate/ rub-off	-	H	H

INSPECTION AND TEST PLAN
FOR
AIR COOLED HEAT EXCHANGER

S.No.	Stage/Activity	Characteristics	Quantum of Check	Record	Scope of Inspection		
					Sub Supplier	Supplier	EIL/TPIA
4.6	Drying of equipment	Cleanliness/ dry ness	Full equipment	Inspection report	-	W	-
4.7	Nitrogen Purging	N2 pressure & non return valve	Full equipment	Inspection report	-	W	-
4.8	Complete Modular assembly (Plenum chambers, motor suspension system, fan screen and guard, structural support assembly etc.)	Trial assembly (as applicable) Dimensions, match marking and completeness of assembly	drawing	Inspection report	-	W	W/R (NOTE-5)
4.9	Trial run test at shop (if specified)	Dimensional accuracy, clearances etc.	1 of each type	Inspection report	-	H	H
5.0	Painting						
5.1	Pickling & passivation (for SS items)/ painting/ hot dip galvanizing (Headers & frames) etc. (as applicable)	Visual inspection for workmanship / DFT check	100%	Inspection report	-	W	-
6.0	Site Assembly						
6.1	Assembly at Site	Structural / Mechanical / Electrical/ Instrumentation	100%	Inspection Report	-	W	R
6.2	Trial Run test (if specified)	Checks Electrical / Instrumentation Checks / Vibration	100%	Inspection Report	-	H	W
7.0	Documentation						
7.1	Final stamping, review of inspection documents and issue of IC	Verifying stamping details and review of inspection documents	100%	IC	-	H	H

S.No.	Stage/Activity	Characteristics	Quantum of Check	Record	Scope of Inspection		
					Sub Supplier	Supplier	EIL/TPIA
7.2	Final documents as per PR	Verification & compilation of inspection & test records for submission to customer	100%	Final Dossier / Completeness Certificate	-	H	H

Legend: A-Approval, H- Hold (Do not proceed without approval), P-Perform, RW - Random Witness (As specified or 10% (min.1 no. of each size and type of Bulk item)), R-Review, W-Witness (Give due notice, work may proceed after scheduled date).

NOTES (As applicable):

1. This document describes the generic test requirements. Any additional test or Inspection scope if specified in contract documents shall also be applicable. (Unless otherwise agreed upon)
2. Acceptance Norms for all the activities shall be as per PO/PR/STANDARDS referred there in /Job Specification /Approved Documents.
3. Inspection Test Requirements of Motors/VFD shall be as per EIL ITP 6-81-1031 (HV Motors), 6-81-1032 (MV Motors), 6-81-1038 (VFD's).
4. Third Party Certifications shall be as per EN 10204 Type 3.2 for Forgings, Fittings, Plugs, Tubes and all AS & SS materials. TPIA shall be arranged by supplier. Certifications shall be as per EN 10204 Type 3.1 for Fans, CS Pipes, CS Plates, Gaskets and Fasteners.
5. In case, structures are dispatched to site in dismantled condition, inspection shall be review stage. In case, modular assembly is completed at supplier/sub-supplier's works, it shall be witnessed by EIL/TPIA. TPIA at sub-supplier's works shall be arranged TPIA by supplier.
6. For EPC jobs, all inspection shall be carried out by TPIA, unless notified otherwise.

अग्निरोधक नियंत्रण स्टेशनों के लिए निरीक्षण एवं परीक्षण योजना

INSPECTION AND TEST PLAN FOR FLAMEPROOF CONTROL STATIONS

5.	28.08.2024	Revised and Reissued	RP	GS	RK	MN
4.	14.01.2020	Revised and Reissued	MM	RS	RKS	RKT
3.	21.11.2013	Revised and Reissued	MJ	RS	SCG	SC
2	29.06.2012	Revised and Reissued	AB	HVJ	AKC	DM
1	28.09.2007	Revised and Re-issued	AKG	PPM	MVKK	VC
0	30.04.2002	Issued for implementation	RG	AKC	AKB	GRR
Rev. No.	Date	Purpose	Prepared by	Checked by	Standards Committee Convener	Standards Bureau Chairman
					Approved by	

Abbreviations

BIS	:	Bureau of Indian Standard	NEMA	:	National Electrical Manufacturers Association
CIMFR	:	Central Institute of Mining & Fuel Research	PB	:	Push Button
DFT	:	Dry Film Thickness	PO	:	Purchase Order
ERTL	:	Electronics Regional Test Laboratory	PESO	:	Petroleum Explosive Safety Organization
FM	:	Factory Mutual	PR	:	Purchase Requisition
FLP	:	Flame Proof	PVC	:	Poly Vinyl Chloride
IL	:	Indicating Lamps	QC	:	Quality Control
ITP	:	Inspection and Test Plan	TC	:	Test Certificate
IP	:	Ingress Protection	TPI or TPIA	:	Third Party Inspection Agency
IC	:	Inspection Certification	VDR	:	Vendor Data Requirement
IS	:	Indian Standard	XLPE	:	Cross Linked Poly Ethylene
IEC	:	International Electro technical Commission			
JEC	:	Japanese Electro technical Committee			
MTC	:	Material Test Certificate			

Inspection Standards Committee

Convenor : Mr. R K Singh

Members: Mr. G Suresh
Mr. Mahendra Mittal

Mr. Himangshu Pal
Mr. Avdesh Agrawal

Mr. Chandrashekhar
Mr. Anil Kumar

Mr. R Muthu Ramalingam
Mr. Arvind NP Singh (Engg)

1.0 SCOPE

This Inspection and Test Plan covers the minimum testing requirements of Flameproof Control Stations.

2.0 REFERENCE DOCUMENTS

PO/PR/ Standards referred there in/Job specifications/Approved documents/Relevant IS/IEC Standards.

3.0 INSPECTION AND TEST REQUIREMENTS

SL NO.	STAGE/ ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA
1.0	Procedures	--	--	--	--	--	--
2.0	Material Inspection						
2.1	Incoming material like castings, glass, meters, PBs, ILs, Fasteners etc	Visual, Dimensional, Chemical, Physical and Operational checks, (as applicable)	100%	MTC / Lab test records	H	H	R
3.0	In process Inspection						
3.1	Machining, Joints, Sealing methods	As per Test Lab Certified Drawings for Hazardous Area Applications	100%	Test Certificates	-	H	-
3.2	Assembly and Wiring Checks	Visual, Dimensional, Bill of Material, Rating of Components, Tightness of wiring terminations, Size, Type (FR/FRLS), continuity, color coding.	100%	Test Certificates	-	H	-

INSPECTION AND TEST PLAN
FOR
FLAMEPROOF CONTROL STATIONS

STANDARD SPECIFICATION No.

6-81-1006 Rev. 5

Page 4 of 5

SL NO.	STAGE/ ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA
3.3	Flameproof enclosure without components	Routine Over-Pressure test	100%	Test Certificates	-	H	R
4.0	Final Inspection						
4.1	Flameproof Control Station (Routine tests)	<ul style="list-style-type: none"> • Visual/Dimensional/BOM Checks • Nameplate and Tag Number checks • Adherence of panels to Hazardous Area Certification conditions including Flame Path, Flame Gap, Thread Check, Thickness of Enclosure, No. of Cable Entries, Rating of mounted components, Maximum number of door/ cover mounted components, Joints, Sealing etc. • Wiring Checks/Electrical/ Functional Checks • High voltage test • IR test before and after High voltage Test • Paint Shade, Thickness and Adhesion check. 	100% by Supplier 10% by EIL/TPIA	Test Records / Inspection Witness Record	-	H	H
4.2	Submission of Certificates & Documents	<ul style="list-style-type: none"> • Test Certificate of testing agency (CIMFR/ KLPL etc) for suitability of model to intended Hazardous area classification as per latest IS/IEC standards. • Certificate of Statutory authority (PESO). • Valid BIS License. 	For each Type/Model	Certificates from test agencies	-	H	R

SL NO.	STAGE/ ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA
5.0	Painting						
5.1	Painting and Packing	<ul style="list-style-type: none"> Visual checks for compliance to Painting requirements as per contract. Suitable protection to prevent entry of foreign material. Proper packing to prevent any damage during transportation and storage, as per contract. 	100%	Packing list / Supplier's Records	-	H	-
6.0	Documentation and IC						
6.1	Documentation and IC	<ul style="list-style-type: none"> Review of Internal Test Reports & MTC IC Issuance 	100%	Supplier's Test Records / Inspection Certificate	-	H	H

Legends: H- Hold (Do not proceed without approval), Random 10% , R-Review, RW-Random witness, W- Witness (Give due notice, work may proceed after scheduled date).

NOTES :-

1. This document describes the generic test requirements. Any additional test or inspection scope if specified in contract documents shall also be applicable. (Unless otherwise agreed upon).
2. Acceptance Norms shall be as per PO/PR/ Standards referred there in/ Job specifications /Approved documents/ Hazardous Area certifications.
3. Supplier has to furnish internal test reports before scheduled inspection date.

औद्योगिक नियंत्रण स्टेशनों के लिए निरीक्षण व परीक्षण योजना

INSPECTION AND TEST PLAN FOR INDUSTRIAL TYPE CONTROL STATIONS

Rev. No.	Date	Purpose	Prepared by	Checked by	Standards Committee Convener	Standards Bureau Chairman
4	18.05.2020	Revised and Re-issued	NP	RS	RKS	SKS
3	30.01.2014	Revised and Re-issued	MJ	RS	SCG	SC
2	03.10.2012	Revised and Re-issued	RKP	HVJ	AKC	DM
1	28.09.2007	Revised and Re-issued	AKG	PPM	MVKK	VC
0	30.04.2002	Issued for implementation	RG	AKC	AKB	GRR

NP *TS* *SCG* *DM*

Abbreviations

BIS	: Bureau of Indian Standards	MTC	: Material Test Certificates
BOM	: Bill of Material	MFR	: Manufacturer
CEIL	: Certification Engineers International Limited	NO.	: Number
CT	: Current Transformer	NEMA	: National Electrical Manufacturers Association
EPC	: Engineering Procurement Construction	PO	: Purchase Order
HV	: High Voltage	PR	: Purchase Requisition
IC	: Inspection Certification	PT	: Potential Transformer/Voltage Transformer
IEC	: International Electro technical Commission	PVC	: Poly Vinyl Chloride
IP	: Ingress Protection	QC	: Quality Control
IRN	: Inspection Release Note	TC	: Test Certificate
ITP	: Inspection and Test Plan	TPI or TPIA	: Third Party Inspection Agency
Lab.	: Third Party Laboratory	UL	: Under writer Laboratories
MOC	: Material of Construction	VDR	: Vendor Data Requirement

Inspection Standards Committee

Convenor : Mr. R.K. Singh

Members : Mr. Rajesh Sinha

Mr. R. Muthuramalingam

Ms. Arvind NP Singh (Engg.)

Mr. Himangshu Pal

Mr. Avdhesh Agrawal

Mr. Chandrashekhar

Mr. Mahendra Mittal

1.0 SCOPE:

This Inspection and Test Plan covers the minimum testing requirements of Industrial type control stations.

2.0 REFERENCE DOCUMENTS:

PO/PR & Standards referred there in /Job specifications / Approved documents

3.0 INSPECTION AND TEST REQUIREMENTS:

SL. NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA
1.0	Procedure	-	-	-	-	-	-
2.0	Material Inspection						
2.1	Incoming material : Sheet steel, Circuit Breaker, CT/PT, Ammeter, Voltmeter as applicable	Physical & Chemical Properties for Sheet Steel. Make, Model, Rating, Serial, Accuracy etc. as applicable	100%/	MTC / Mfr's TC / Lab. TC	H	H	R
3.0	Inprocess Inspection						
3.1	Fabrication of Enclosure and painting /Powder Coating (as applicable)	Visual, Dimension and Routine tests	100%	Supplier's Test Records	H	H	-
3.2	Assembly/Wiring work	Wiring Check & Routine electrical Tests	100%	Supplier's Test Records	H	H	-

SL. NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA
4.0	Final Inspection						
4.1	Acceptance Tests	<ul style="list-style-type: none"> Visual Check BOM Verification. Dimensional Verification. Electrical Check/Test : <ol style="list-style-type: none"> Wire Continuity, Functional Check of Components and Control Schemes, HV Test IR Test (before & after HV) Paint Thickness & Paint Shade 	100%	Inspection witness Test Records	-	H	RW
4.2	Submission of Certificates	<ul style="list-style-type: none"> Certificate of testing agency for suitability of degree of protection (as specified) 	Samples / Prototype	Type Test Certificates	-	H	R
5.0	Painting and Packing						
5.1	Painting and Packing	<ul style="list-style-type: none"> Visual Suitable protection to prevent entry of foreign material. Proper packing to prevent any damage during transportation. 	100%	Test records	-	H	-

SL. NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA
6.0	Documentation						
6.1	Documentation and IC/IRN	<ul style="list-style-type: none"> Review of Internal Test Report Issuance of IC/IRN 	100%	Supplier's Test Records / IC/IRN	-	H	H
6.2	Final Document submission (if applicable)	Compilation of Inspection reports ,drawings, etc as per VDR / PR	100%	Final data folder /Completeness certificate	-	H	H

Legends: H- Hold (Do not proceed without approval,R-Review, RW-Random witness (As specified or 10 %-Samples must include minimum 1 No. of each type), W-Witness (Give due notice, work may proceed after scheduled date).

NOTES :

1. This document describes the generic test requirements. Any additional test or inspection scope if specified in contract documents shall also be applicable. (Unless otherwise agreed upon).
2. Acceptance Norms for all the activities shall be as per PO/PR/ Standards referred there in/ Job specifications /Approved documents
3. For EPC Jobs, Scope of Inspection shall be under TPIA only, unless specified otherwise.

ऊर्जा दक्ष मध्यम वोल्टेज मोटरों
के लिए निरीक्षण व परीक्षण योजना
INSPECTION AND TEST PLAN FOR
ENERGY EFFICIENT
MEDIUM VOLTAGE MOTORS

Rev. No.	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
1	15.03.2024	Revised	MM	GS	RK	MN
0	12.11.2018	ISSUED FOR IMPLEMENTATION	MM	RS	RKS	RKT

Abbreviations

BIS	:	Bureau of Indian Standard	MTC	:	Material Test Certificate
CIMFR	:	Central Institute of Mining & Fuel Research	NEMA	:	National Electrical Manufacturers Association
EIL	:	Engineers India Limited	PO	:	Purchase Order
FM	:	Factory Mutual	PESO	:	Petroleum Explosive Safety Organization
FLP	:	Flame Proof	PR	:	Purchase Requisition
ITP	:	Inspection and Test Plan	QC	:	Quality Control
IP	:	Ingress Protection	TC	:	Test Certificate
IC	:	Inspection Certification	TPI or TPIA	:	Third Party Inspection Agency
IEC	:	International Electro technical Commission	VDR	:	Vendor Data Requirement
JEC	:	Japanese Electro technical Committee	VFD	:	Variable Frequency Drive

Inspection Standards Committee

Convenor : Mr. Rajeev Kumar

Members:

Mr. G Suresh
Mr. Mahendra Mittal

Mr. Himangshu Pal
Mr. R Muthuramalingam
(RPO Representative)

Mr. Chandrashekhar
Mrs Arvind NP Singh (Electrical)

Mr. Avdhesh Agrawal
Mr Anil Kumar

1.0 SCOPE

This Inspection and Test Plan covers the minimum testing & inspection requirements of three phase medium voltage energy efficient squirrel cage induction motors.

2.0 REFERENCE DOCUMENTS

PO/PR & Standards referred therein /Job specifications / Approved documents/ Relevant IEC/IS.

3.0 INSPECTION AND TEST REQUIREMENTS

SL NO.	STAGE/ ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA
1.0	Procedures	--	--	--	--	--	--
2.0	Material Inspection						
2.1	Raw Material: Body (casting or fabrication), Rotor Shaft, Core Laminations, Copper, Insulation Material, Bearings, Cable Boxes, Cable Glands, etc.	Chemical, Physical Properties, Finish as per Relevant Standard	100%	Material Test Certificates / Test records	H	H	-

SL NO.	STAGE/ ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA
3.0	In-process Inspection						
3.1	Motor Assembly	Vacuum Impregnation and Bracing of Winding, Core Assembly, Rotor Bars and End Rings Assembly, Rotor Balancing, Terminal Box Mounting and Clearances in between, Bearing Setting, etc. as per Supplier's Internal Standards	100%	Test Records	-	H	R
4.0	Final Inspection						
4.1	Motor (Routine Tests)	<ul style="list-style-type: none"> • Visual Check (Nameplate, Terminal Box Location, Terminal Type, Clearances, Size, Entries, Space Adequacy & Gland Size, Direction of Rotation etc.) • Dimensions Check (Including Shaft Height etc., Foundation Hole Dia and Distance, Shaft Dia.) • Cable Glands, Cable Lugs Size and No. of Entries in Terminal Box • Winding Resistance • Space heater resistance & IR check • Accessories (RTD, BTD and Thermistor) Resistance measurement check (as applicable) • No Load Test and Measurement of Voltage, Speed, Current, Power Input • Reduced Voltage Starting and Running • Insulation Resistance before & after High Voltage Test • High Voltage (Per Phase) 	100%	Inspection test records	-	H	H See Note 4 & 5

INSPECTION AND TEST PLAN
 FOR ENERGY EFFICIENT
 MEDIUM VOLTAGE MOTORS

SL NO.	STAGE/ ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA
		<ul style="list-style-type: none"> Vibration at No Load Noise Level at No load 					
4.2	Motor (Type Tests)	<ul style="list-style-type: none"> Full Load Test and Measurement of Voltage, Current, Power, Slip, Power Factor, Bearing Noise. Efficiency and Pf at 100%, 75% and 50% Load Temp Rise Test Momentary Overload Test Vibration before and after over speed test Over Speed Measurement of Starting Torque, Starting Current, Full Load Torque, Pull Out Torque by JEC/IEC (By Logarithmic Proportion Current Method II 	One Motor from each type/rating	Inspection test records	-	H	H See Note 4 & 5
5.0	Painting						
5.1	Painting and Packing	<ul style="list-style-type: none"> Visual Suitable protection to prevent entry of foreign material. Proper packing with suitable plugs to prevent Ingress of Moisture and any damage during Transportation and Storage. 	100%	Packing list / Supplier's Records	-	H	-
6.0	Documentation and IC						
6.1	Documentation and IC	<ul style="list-style-type: none"> Review of Internal Test Reports Test Certificate from Recognized Testing 	100%	Supplier's Test Records /	-	H	H

SL NO.	STAGE/ ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA
		Laboratory for Area Classification. • BIS Certificate for FLP Motors and Accessories as applicable. • PESO approved Certificates for Motors and Accessories as applicable. • Degree of Protection of Terminal Box and Body • IC Issuance		Certificates from statutory bodies / Inspection Certificate (IC)			
6.2	Final Document submission	Compilation of Inspection Reports, Drawings, etc. as per VDR / PR	100%	Final data folder /Completeness certificate	-	H	H

Legends: H- Hold (Do not proceed without approval, R-Review, RW-Random witness (As specified or 10 % - Samples must include min 1 No of each type), W- Witness (Give due notice, work may proceed after scheduled date).

NOTES :-

1. For VFD application motors, separate FAT procedure to be submitted for EIL/ TPIA approval.
2. This document describes the generic test requirements. Any additional test or inspection scope if specified in contract documents shall also be applicable.
3. Acceptance Norms for all the activities shall be as per PO/PR/ Standards referred therein/ Job specifications /Approved documents.
4. Motors up to 55 KW would be accepted based on Manufacturer's test certificates. Higher rating will have witness by TPIA appointed by Main Supplier.
5. Motors ordered with integration test (VFD fed motors) requirement as per PR shall be witnessed by EIL/ TPIA (as applicable) and main supplier for integration test (irrespective of rating) at motor manufacturer's works.

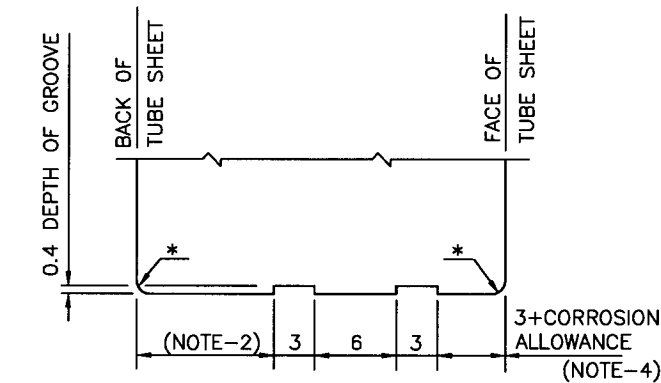


FIG.-1

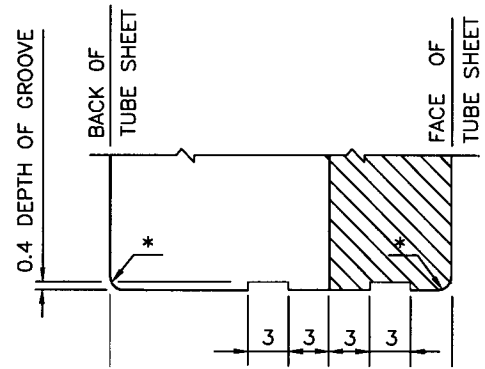
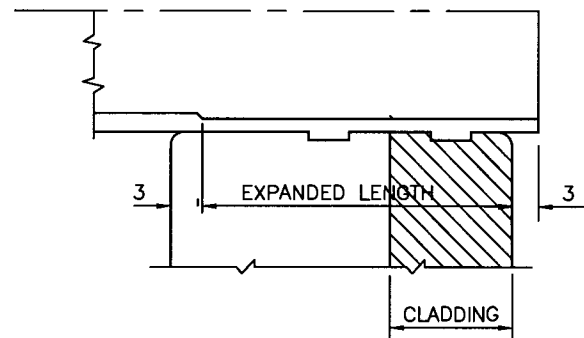
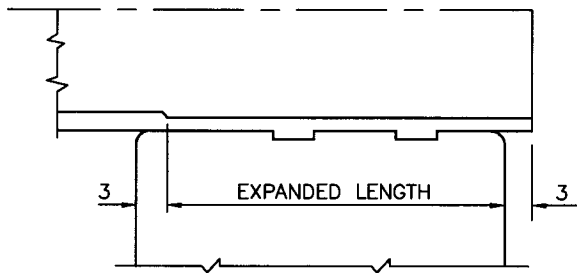


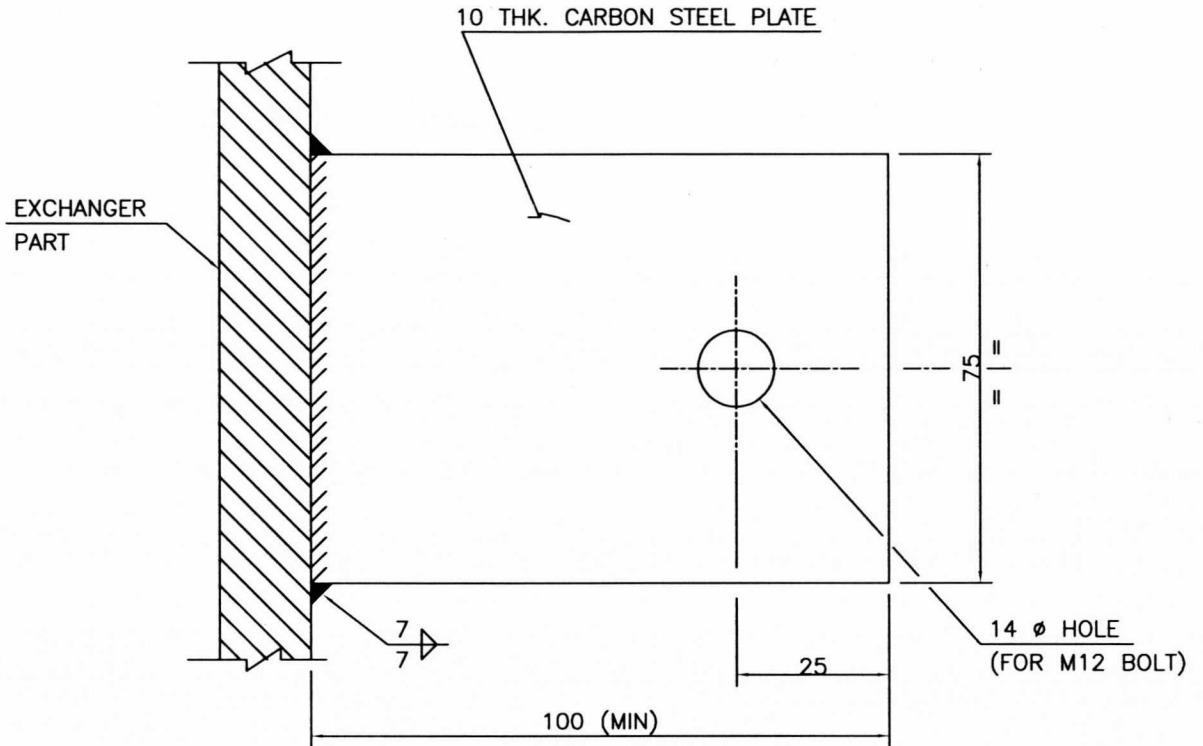
FIG.-2



NOTES :-

1. ALL DIMENSIONS ARE IN mm UNLESS STATED OTHERWISE.
2. FOR TUBESHEET THICKNESS WHERE THE GAP BETWEEN 2ND GROOVE & BACK OF TUBE SHEET IS LOWER THAN 6 mm DELETE 2ND GROOVE.
3. FOLLOW SPECIAL CLOSE FIT AS PER TEMA / API 661 UNLESS SPECIFIED OTHERWISE
4. FOR CORROSION ALLOWANCE LESS THAN 4 mm., INCREASE THIS DIMENSION TO TUBE SHEET THICKNESS MINUS 18 mm. BUT NOT TO EXCEED 7 mm.
- * 5. CHAMFER (1X45°) OR RADIUS (R=1).

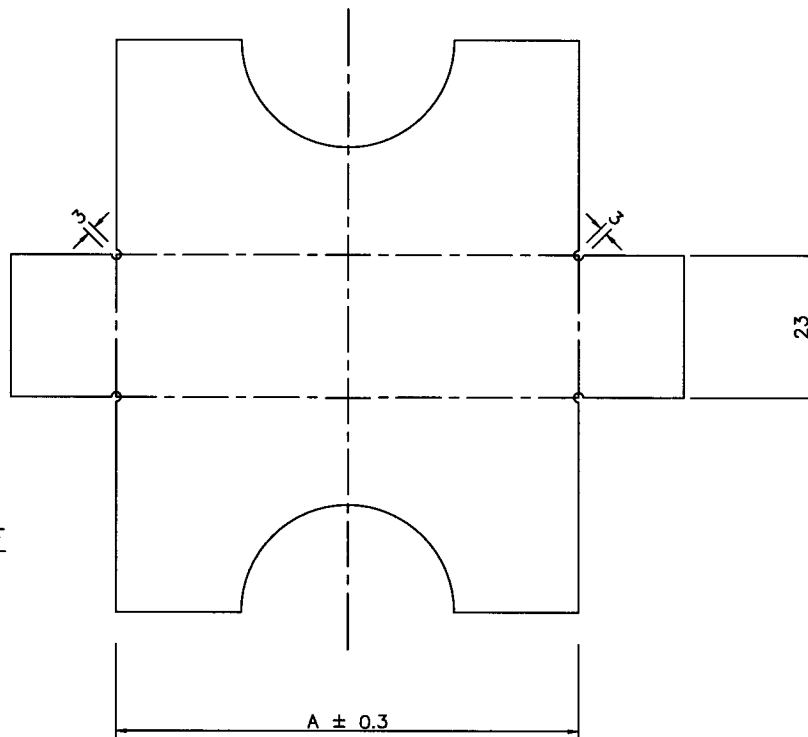
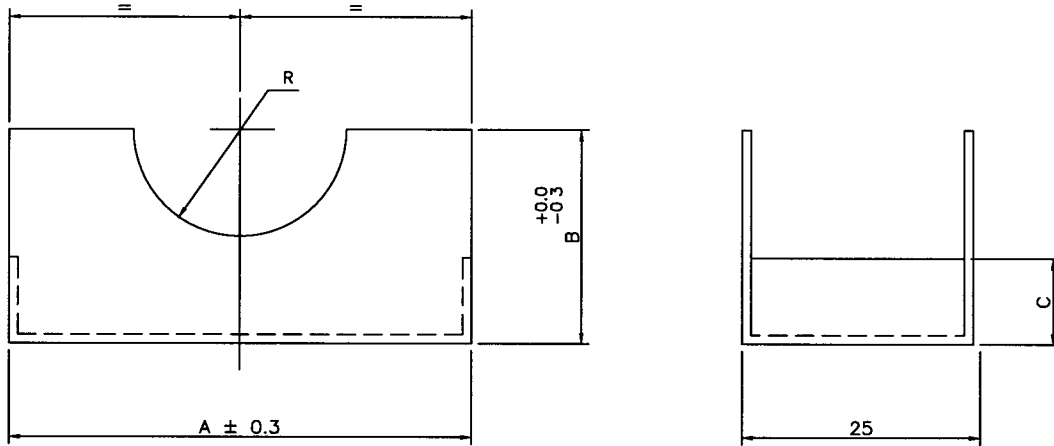
5	31.10.19	REAFFIRMED AND REISSUED AS STANDARD	DP	MSK	KJH	RKT
4	06.05.14	REVISED AND REISSUED AS STANDARD	GCP	KA	RKT	SC
Rev No	Date	Purpose	Prepared by	Checked by	Stds Committee Convener	Stds Bureau Chairman



NOTES: -

1. ALL DIMENSIONS ARE IN mm UNLESS STATED OTHERWISE.
2. DO NOT WELD EARTHING LUGS TO PRESSURE PARTS. IF REQUIRED, TAKE PRIOR APPROVAL OF COMPANY.
3. EARTHING LUG TO PROTRUDE OUT OF INSULATION, WHEREVER REQUIRED.
4. ALL EXCHANGERS TO BE FITTED WITH 2 EARTHING LUGS.
5. LOCATION OF EARTHING LUGS :-
 - (i) FOR VERTICAL EXCHANGER WITH 2 LUG SUPPORTS :- ON BOTH LUG SUPPORTS AT VERTICAL WEB.
 - (ii) FOR VERTICAL EXCHANGER WITH 3 LUG SUPPORTS :- ON ANY TWO AT VERTICAL WEB.
FOR VERTICAL EXCHANGER WITH 4 LUG SUPPORTS :- ON ANY TWO DIAMETRICALLY OPPOSITE AT VERTICAL WEB.
 - (iii) FOR HORIZONTAL EXCHANGER :- ONE ON CENTRAL WEB OF EACH SADDLE SUPPORT.
 - (iv) EARTHING LUG SHOULD BE LOCATED SUCH THAT IT WILL NOT FOUL WITH ANCHOR BOLT DURING ERECTION.
6. EARTHING LUG SHOULD BE PAINTED / GALVANISED.

6	16.11.2022	REVISED AND REISSUED AS STANDARD	NS	TK	NK	SM
5	20.03.2018	REVISED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN
4	30.09.2011	REVISED AND REISSUED AS STANDARD	JS	RKT	AKM/SC	DM
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convener	Stds. Bureau Chairman
						Approved by

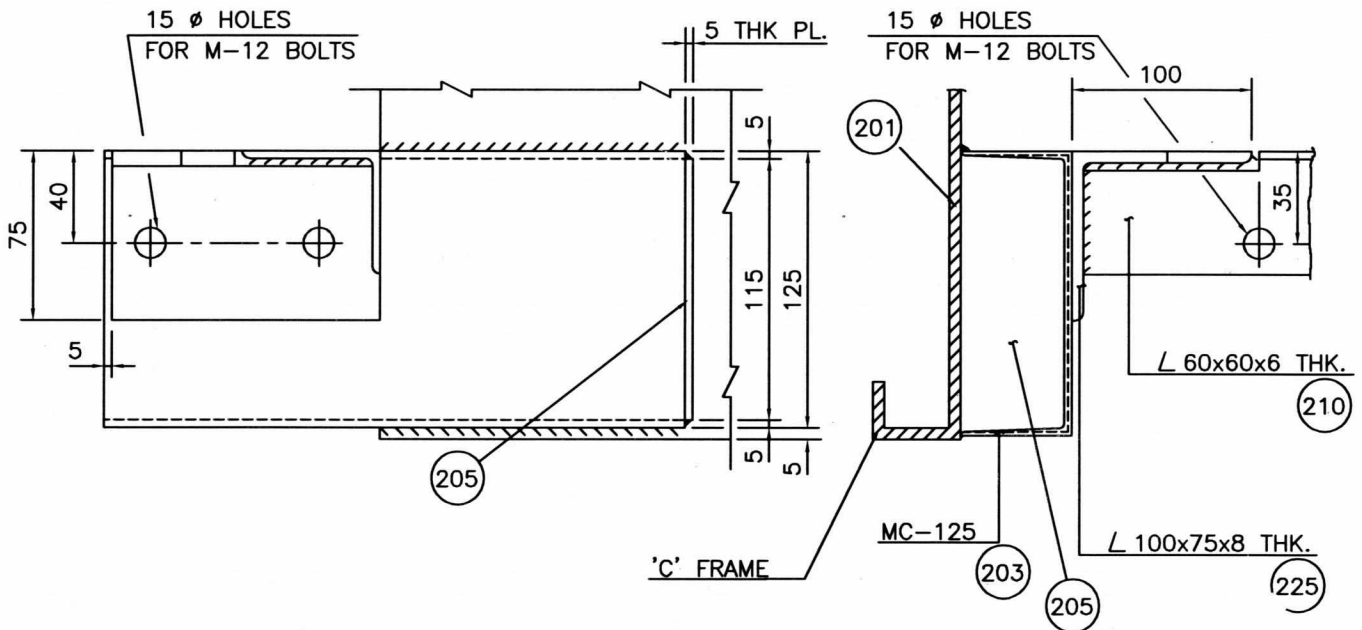


DEVELOPED FORM OF
PLATE 1 mm THK.

MATERIAL : ALUMINIUM

- A = HORIZONTAL TUBE PITCH - 0.2 mm
- B = VERTICAL TUBE PITCH / 2
- C = B - TUBE OUTSIDE RADIUS - 1 mm
- R = TUBE OUTSIDE RADIUS + 0.6 mm

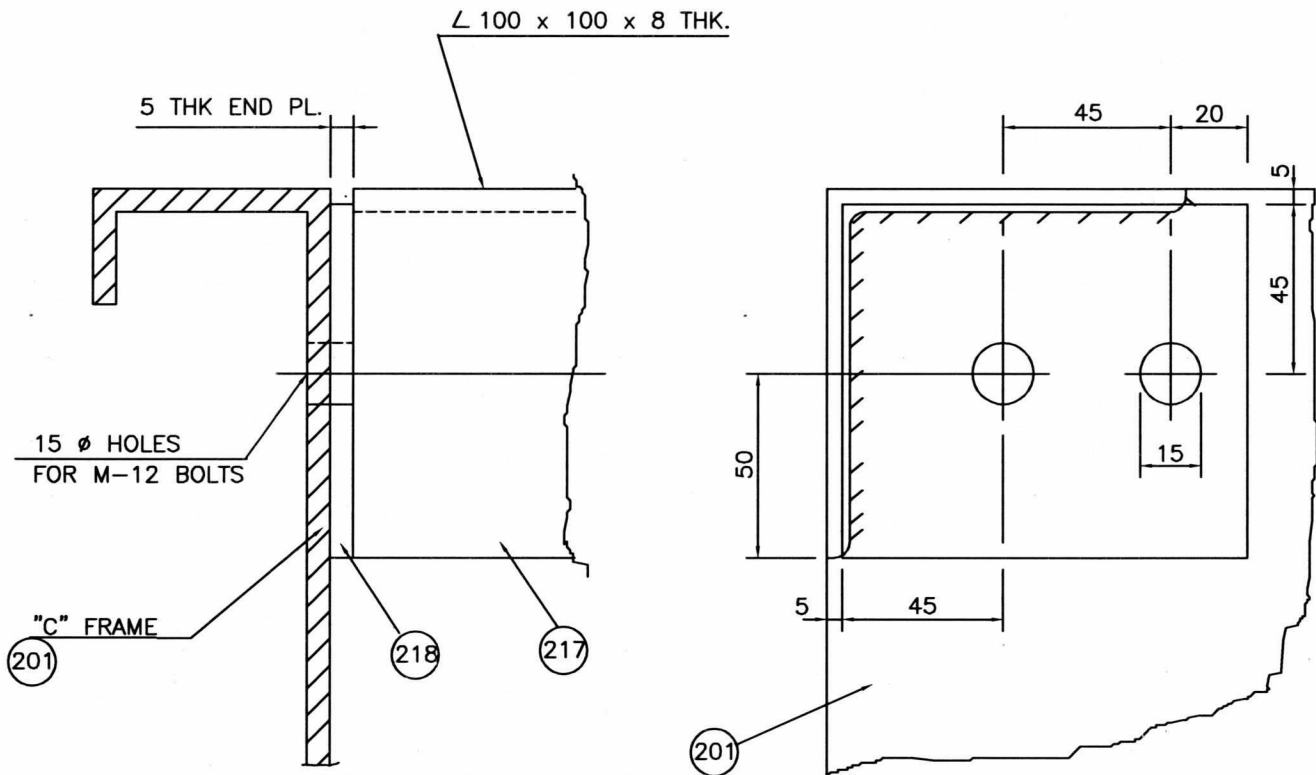
5	31.10.19	REAFFIRMED AND REISSUED AS STANDARD	DP	NSK	KJHC	RKT
4	06.05.14	REAFFIRMED AND REISSUED AS STANDARD	GCP	KA	RKT	SC
Rev No	Date	Purpose	Prepared by	Checked by	Stds Committee Convener	Stds Bureau Chairman
						Approved by



NOTE:-

1. ALL DIMENSIONS ARE IN mm UNLESS STATED OTHERWISE.
2. THE PART NOS RELATE TO THOSE SHOWN IN TUBE BUNDLE FRAME DRAWING.

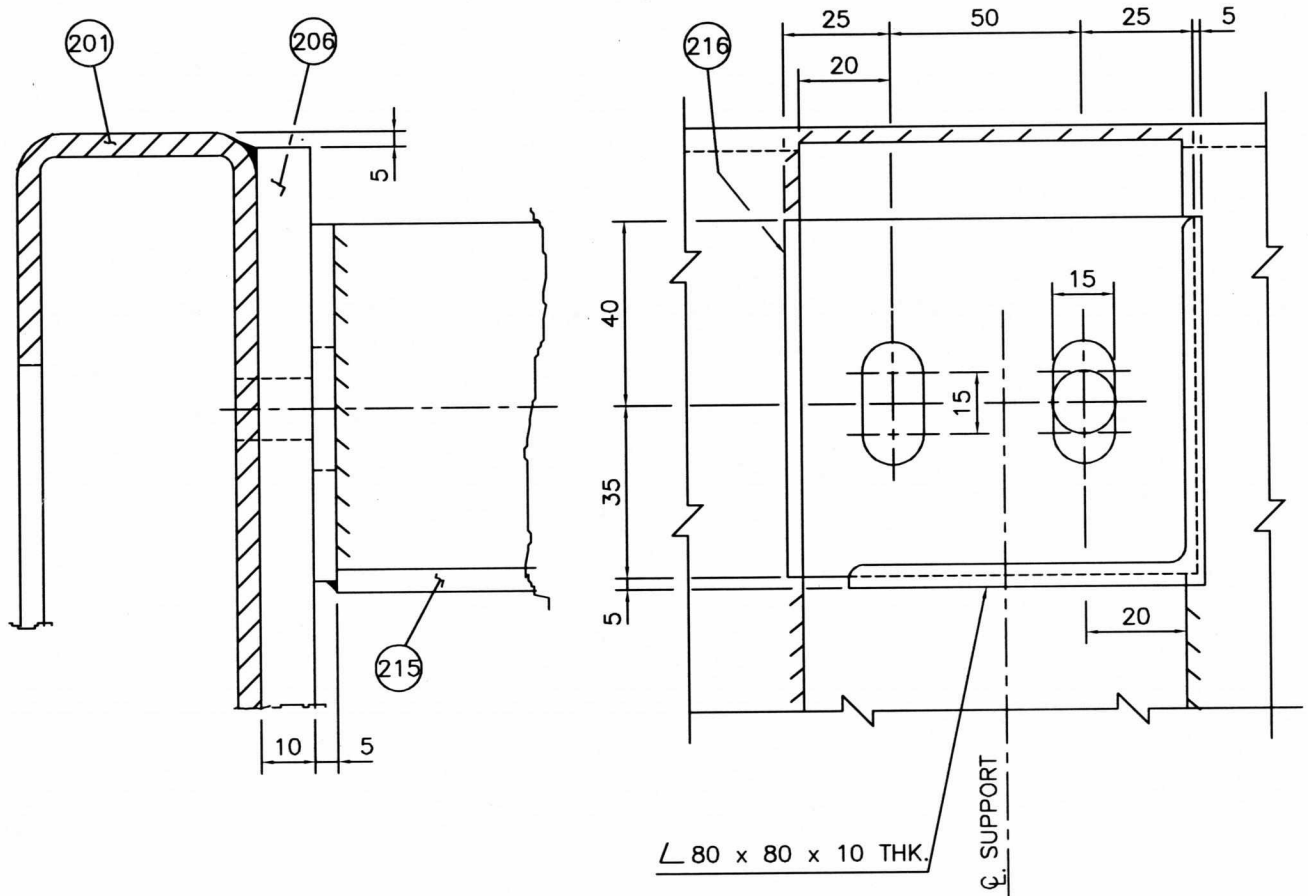
5	18.07.2023	REVISED AND REISSUED AS STANDARD	JIT SINGH	TK	NK	SM
4	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convener	Stds. Bureau Chairman
						Approved by



NOTE:-

1. ALL DIMENSIONS ARE IN mm UNLESS STATED OTHERWISE.
2. THE PART NOS RELATE TO THOSE SHOWN IN TUBE BUNDLE FRAME DRAWING.

5	18.07.2023	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	TK	NK	SM
4	20.03.2018	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convener	Stds. Bureau Chairman
						Approved by



NOTE:-

1. ALL DIMENSIONS ARE IN mm UNLESS STATED OTHERWISE.
2. THE PART NOS RELATE TO THOSE SHOWN IN TUBE BUNDLE FRAME DRAWING.

5	24.02.2023	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	TK	Nalin NK	SM
4	20.03.2018	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	