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ANNEX A: SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS FOR OFFERED BUSBAR CONNECTORS

(to be filled and signed by the Manufacturer and submitted together with relevant copies of the Manufacturer's catalogues, brochures, drawings, technical data, sales records for past five years, four customer reference letters, details of manufacturing capacity, the manufacturer's experience, copies of complete type test reports and accreditation certificate to ISO/IEC 17025 for the testing laboratory for tender evaluation, all in English Language)

0.1 Circulation List

COPY NO.	COPY HOLDER
1	Research & Development Manager
2	Supply Chain Manager – Procurement
Electronic copy (pdf) on The Kenya Power & Lighting Company Server; currently: http://172.16.1.40/dms/browse.php?fFolderId=23	

0.2 Amendment Record

Rev No.	Date (YYYY-MM-DD)	Description of Change	Prepared by (Name & Signature)	Approved by (Name & Signature)
Issue 1 Rev 0	2014-05-09	Cancels and replaces Issue 1 Rev 0 dated 2010-08-26	S. Kimitei	G. Owuor

FOREWORD

This specification has been prepared by the Research and Development Department in collaboration with Distribution Division both of The Kenya Power and Lighting Company Limited (abbreviated as KPLC) and it lays down requirements for Busbar Connectors designed to withstand service voltages of upto 245kV. It is intended for use by KPLC in purchasing the connectors.

The bidder shall submit information which demonstrates satisfactory service experience of the manufacturer with products which fall within the scope of this specification.

1. SCOPE

This specification is for busbar connectors for use with copper busbar tubes for connection of switchgear and other substation equipment. The busbar connectors shall be suitable for service voltages of upto 245kV, 50Hz system.

The specification also covers inspection and test of the connectors as well as schedule of Guaranteed Technical Particulars to be filled, signed by the manufacturer and submitted together with other required details for tender evaluation.

The specification stipulates the minimum requirements for busbar connectors acceptable for use in the company and it shall be the responsibility of the supplier to ensure adequacy of the design, good workmanship, good engineering practice and adherence to standards, specifications and applicable regulations in the manufacture of the connectors for The Kenya Power & Lighting Company Ltd.

The specification does not purport to include all the necessary provisions of a contract.

2. REFERENCES

The following standards contain provisions which, through reference in this text constitute provisions of this specification. Unless otherwise stated, the latest editions (including amendments) apply.

ISO 1461: Hot dip galvanized coatings on fabricated iron and steel articles – Specifications and test methods

BS 159: Busbars and Busbar Connections.

BS 1977: Specification for Copper for Electrical Purposes

3. TERMS AND DEFINITIONS

The definitions given in the reference standards apply.

4. REQUIREMENTS

4.1 SERVICE CONDITIONS

The busbar connectors shall be suitable for continuous operation outdoors in tropical areas at altitudes of up to 2200m above sea level, humidity of up to 90%, average ambient temperature of +30°C with a minimum of -1°C and a maximum of +40°C.

4.2 MATERIALS AND CONSTRUCTION

4.2.1 The busbar connectors shall be made from bronze by casting. The copper alloy (bronze) shall have high copper content (of at least 84%) with resistivity of 12-14μΩcm.

4.2.2 Each connector shall be electro-tinned and shall be designed to ensure full mechanical strength and adequate cross-sectional area for rated current carrying capacity.

4.2.3 Each clamp (all types) shall be supplied complete with bolts, nuts and split spring washers all in stainless steel.

4.2.4 Expansion Type Connectors

Expansion type connectors shall be fitted with tinned copper laminations, with ends resistant welded without filler to form a compact connector element. Each connector shall consist of clamps, busbar tube guide/support and the flexible copper strips as indicated on the general arrangement drawings attached.

4.2.5 Rigid (Fixed) Type Connectors

(a) Rigid type connector shall consist of clamps fitted on a palm.

(b) Each connector shall be supplied complete with holes drilled as per the drawings.

(c) Split clamps indicated on the drawings shall be made of copper zinc alloy of high conductivity and mechanical strength.

4.2.6 Resistance to Corrosion

(a) All parts of each connector shall be resistant to atmospheric corrosion both in storage and service.

(b) Tinning shall be adequate for specified service conditions and proof shall be provided in the bid. The level of tinning shall also be suitable for connection of aluminium conductor where specified.

(c) Bolts, nuts and washers shall all be in stainless steel.

4.3 GENERAL ARRANGEMENT DRAWINGS

Dimensions, palm hole drilling and general arrangement for each type of connector shall be as per the attached drawings.

Table 2: General Arrangement Drawings for Bus Bar Connectors

CODE	DESCRIPTION	DRAWING No.
114836	Fixed (Rigid) Clamp for 1" (25.4mm) OD Copper Tubes (Electro-tinned)	SK No. 08605 Sheet 1
114844	Fixed (Rigid) Clamp for 2" (50.8mm) OD Copper Tubes (Electro-tinned)	SK No. 08605 Sheet 1
114834	Expansion Clamp for 1" (25.4mm) OD Copper Tubes (Copper Silver Coated)	SK No. 08605 Sheet 2
114843	Fixed (Rigid) Interspan Clamp for 2" (50.8mm) Copper Tubes (Electro-tinned)	SK No. 08605 Sheet 2
114837	Fixed (Rigid) Clamp for 1" (25.4mm) Copper Tubes (palm: silver coated, clamp: electro-tinned)	SK No. 08605 Sheet 3
114849	Expansion Clamp for 2" (50.8mm) OD Copper Tubes (Electro-tinned)	SK No. 08605 Sheet 4
114838	Fixed (Rigid) Clamp for 1" (25.4mm) OD Copper Tubes (Electro-tinned)	SK No. 08605 Sheet 5
114853	Expansion Clamp for 3" (76.2mm) OD Copper Tubes (palm: silver coated, clamp: electro-tinned)	SK No. 08605 Sheet 6
114852	Expansion Clamp for 76mmOD Cu Tubes	SK No. 08605 Sheet 7

CODE	DESCRIPTION	DRAWING No.
114832	Fixed (Rigid) Clamp for 76mm OD Copper Tubes (Electro-tinned)	SK No. 08605 Sheet 8
114824	Expansion Clamp for 76mm OD Copper Tubes (Electro-tinned)	SK No. 08605 Sheet 8
114846	Bus Bar Fittings, straight clamp support	SK No. 08605 Sheet 9
114847	Bus Bar Fittings, connector clamp	SK No. 08605 Sheet 9
114850	Bus Bar Fittings, straight expansion support	SK No. 08605 Sheet 9
	Details for 2" OD Cu Tube Clamp	SK No. 08605 Sheet 10
114830	Tee Clamp for 1½" (38.1mm) copper tube and 150mm² stranded conductor (Electro-tinned)	SK No. 08605 Sheet 11A
114829	Tee Clamp for 2" (50.8mm) copper tube and 150mm² stranded conductor (Electro-tinned)	SK No. 08605 Sheet 11
114828	Tee Clamp for 3" (76.2mm) copper tube and 150mm² stranded conductor (Electro-tinned)	SK No. 08605 Sheet 11
114827	Tee Clamp for stranded conductors (U Bolt type) (Electro-tinned)	SK No. 08605 Sheet 12
180734, 180735, 180738, 180732	Stainless steel bolts and nuts *(this description supersedes the drawing)*	SK No. 08605 Sheet 13
181810	Fixed (Rigid) Bus Bar Clamp for 1½" (38.1mm) Copper Tubes (Electro-tinned)	SK No. 08605 Sheet 14
114842	Fixed (Rigid) Bus Bar Clamp for 2" (50.8mm) Copper Tubes (Electro-tinned)	SK No. 08605 Sheet 15
124149	Compression lug, 30mm², Copper	SK No. 08605 Sheet 16
114851	2" Dia Expansion clamp	SK No. 08605 Sheet 17
114823	Bus Bar Angle Expansion Clamp for 2" (50.8mm) Copper Tubes	SK No. 08605 Sheet 18
114889	1" OD – 3"OD Tee Clamp (Electro-tinned)	SK No. 08605 Sheet 19
199160	Rigid Clamp for 25.4mm Copper Tubes (palm: silver coated, clamp: electro-tinned)	SK No. 08605 Sheet 20
114848	Electro-tinned Connector S/Clamp 2"	Fig 1.

4.4 RATINGS AND CHARACTERISTICS

4.4.1 Ratings

Table 3: Ratings

Description		Requirement
Rated Voltage and Frequency		245kV 50Hz
Rated Current (Continuous Normal Current)	Connector for 25.4mm (1") Copper Tube	800A
	Connector for 38.1mm (1½") Copper Tube	1400A
	Connector for 50.8mm (2") Copper Tube	1600A
	Connector for 76.2mm (3") Copper Tube	2500A
Short time withstand current		31.5kA, 3sec.

4.4.2 Temperature Rise

The Temperature Rise of the busbar connector above the ambient temperature when carrying rated normal current at rated frequency shall not exceed 50°C as per BS 159.

4.5. QUALITY MANAGEMENT SYSTEM

4.5.1 The bidder shall submit a quality assurance plan (QAP) that will be used to ensure that the design, material, workmanship, tests, service capability, maintenance and documentation, will fulfil the requirements stated in the contract documents, standards, specifications and regulations. The QAP shall be based on and include relevant parts to fulfil the requirements of ISO 9001:2008.

4.5.2 The Manufacturer's Declaration of Conformity to reference standards and copies of quality management certifications including copy of valid and relevant ISO 9001: 2008 certificate shall be submitted with the tender for evaluation.

4.5.3 The bidder shall indicate the delivery time of the busbar connectors, manufacturer's monthly & annual production capacity and experience in the production of the type and size of connector being offered. A detailed list & contact addresses (including e-mail) of the manufacturer's previous customers for similar connectors sold in the last five years as well as reference letters from at least four of the customers shall be submitted with the tender for evaluation.

5. TESTS AND INSPECTION

5.1 The connectors shall be inspected and tested in accordance with the requirement of BS 159 and this specification. It shall be the responsibility of the supplier to perform or to have performed all the tests specified.

5.2 Copies of previous test certificates and test reports by a third party testing laboratory that is accredited to ISO/IEC 17025 shall be submitted with the offer for evaluation. A copy of the accreditation certificate to ISO/IEC 17025 for the testing laboratory shall also be submitted. Any translations of certificates and test reports into English language shall be signed and stamped by the third party testing laboratory that carried out the tests.

5.3 Routine and sample test reports (including dimensions and current carrying capacity) for the busbar connectors to be supplied shall be submitted to KPLC for approval before shipment/delivery of the goods. KPLC Engineers will witness these tests at the factory before shipment.

5.4 On receipt of the goods KPLC may perform any of the relevant tests in order to verify compliance with this specification. The supplier shall replace without charge to KPLC busbar connectors which upon examination, test or use fail to meet any of the requirements in the specification.

6. MARKING AND PACKING

6.1 Each busbar connector shall be engraved legibly and indelibly with the following information, all in English:

- The manufacturer's name or identity
- Voltage & Current Rating
- KPLC Order Number

6.2 The busbar connectors shall packed in wooden boxes so as to protect them from damage during transportation and storage. Each connector shall be supplied fully assembled and marked for ease of use.

7. DOCUMENTATION

7.1 The bidder shall submit its tender complete with technical documents required by Annex A (Guaranteed Technical Particulars) for tender evaluation. The information shall include the following:

a) Schedule of Guaranteed Technical Particulars fully filled and signed by the manufacturer;
b) Copies of the Manufacturer's catalogues, brochures, drawings and technical data;
c) Sales records for the last five years and at least four customer reference letters;
d) Details of manufacturing capacity and the manufacturer's experience;
e) Copies of required test reports by a third party testing laboratory accredited to ISO/IEC 17025;

f) Copy of accreditation certificate to ISO/IEC 17025 for the third party testing laboratory;
g) Manufacturer's warranty and guarantee;
h) Manufacturers letter of authorization, ISO 9001:2008 certificate and other technical documents required in the tender.

7.2 The successful bidder (supplier) shall submit the following documents/details to The Kenya Power & Lighting Company for approval before manufacture:

a) Schedule of Guaranteed Technical Particulars fully filled and signed by the manufacturer,
b) Design Drawings and construction details of the connectors,
c) Quality assurance plan (QAP) that will be used to ensure that the design, material, workmanship, tests, service capability, maintenance and documentation will fulfil the requirements stated in the contract documents, standards, specifications and regulations. The QAP shall be based on and include relevant parts to fulfil the requirements of ISO 9001:2008
d) Test Program to be used after manufacture,
e) Marking details and method to be used in marking the connectors,
f) Manufacturer's undertaking to ensure adequacy of the design, good workmanship, good engineering practice and adherence to standards, specifications and applicable regulations in the manufacture of the busbar connectors for The Kenya Power & Lighting Company Ltd;
g) Packaging details (including packaging materials and length on drum).

The drawings to be submitted by the supplier to KPLC for approval before manufacture shall be in standard format clearly indication drawing number, parts list with material details & quantities, standard of manufacture, ratings, approval details and identify of the manufacturer (as per manufacturer's authorization submitted during tendering)

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ANNEX A: SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS FOR OFFERED BUSBAR CONNECTORS

(to be filled and signed by the Manufacturer and submitted together with relevant copies of the Manufacturer's catalogues, brochures, drawings, technical data, sales records for previous five years, four customer reference letters, details of manufacturing capacity, the manufacturer's experience, copies of complete type test reports and accreditation certificate to ISO/IEC 17025 for the testing laboratory for tender evaluation, all in English Language)

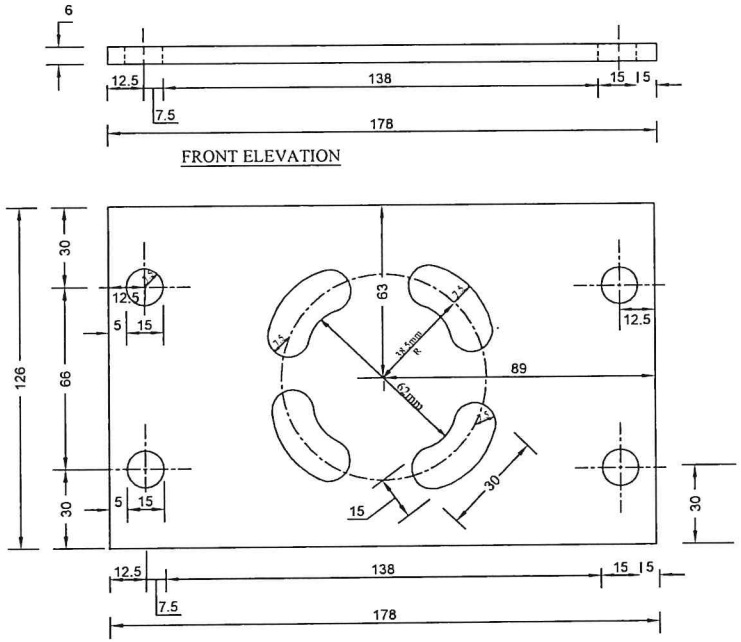
Tender No..... Bidder's Name & Address .....

Clause /Requirement		**Bidder's offer** (indicate full details of the offered item for each requirement of the specification)
Name and address of the Manufacturer		
Country of manufacture		
Manufacturer's Letter of Authorization		
Model/Type Reference No. of the offered busbar connectors		
Manufacturer's warranty and guarantee for the offered busbar connectors		
1 Scope: a) Design, manufacture, test, ship and deliver Busbar Connectors to KPLC store/site as per terms of contract		a)
b) Ensure adequacy of the design, good workmanship, good engineering practice and adherence to standards, specifications and applicable regulations in the manufacture of the connectors for KPLC		b)
2 Applicable Standards		
3 Terms & definitions		
4.1 Service Conditions		
4.2 Materials & Construction		
4.2.1 Material details of the Bronze used in the connector	Chemical composition	
	Tensile strength, N/mm^2	
	Elastic yield point, N/mm^2	
	Elongation, %	
	Hardness, Brinell	
	Resistivity, μΩcm	
4.2.2 Construction & finish	Thickness of tin coating	
	Chemical composition of tin coating	

Clause /Requirement		Bidder's offer (indicate full details of the offered item for each requirement of the specification)
4.2.3 Material details of the stainless steel bolts, nuts & washers	Chemical composition	
	Tensile strength, N/mm^2	
	Elastic yield point, N/mm^2	
	Elongation, %	
	Hardness, Brinell	
4.2.4 Expansion type connectors		
4.2.5 Rigid (fixed) type connectors		
4.2.6 Resistance to corrosion		
4.3 Drawings		
4.4.1	Rated voltage & frequency	
	Rated current (continuous current)	
	Rated short time withstand current	
4.4.2 Temperature rise		
4.5 Quality Management System		
4.5.1 Quality assurance plan		
4.5.2 Manufacturer's declaration of conformity & copy of ISO 9001:2008 certificate		
4.5.3	Manufacturer's production capacity	
	Manufacture's experience	
	List of previous customers in last five years	
	Reference letters from four previous customers	
5.1 Tests & Inspection		
5.2 Copies of test reports submitted with tender		
5.3 Test reports to be submitted by the supplier to KPLC before delivery		
5.3 Tests to be witnessed by KPLC at the factory before shipment		
5.4 Inspection & test before acceptance to stores		
6.1 Marking		
6.2 Packaging		
7.1 Documents submitted with tender for evaluation		
7.2 Documents to be submitted by supplier to KPLC for approval before manufacture		
Statement of compliance to Tender Specifications		

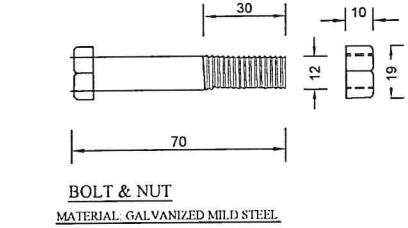
.....

Manufacturer's Name, Signature, Stamp and Date

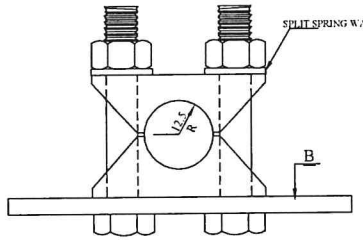


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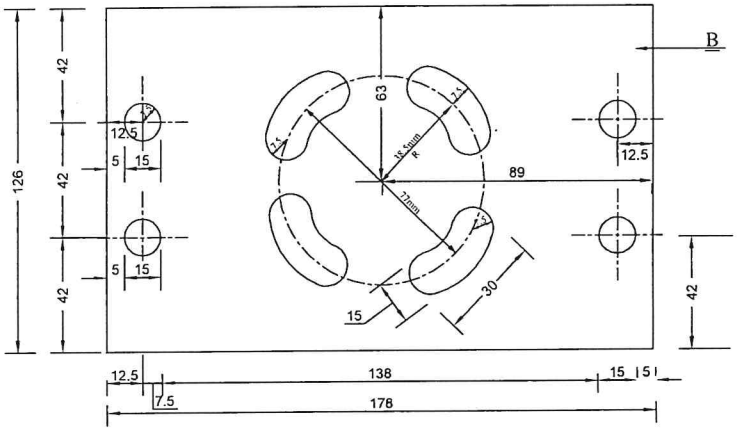
PLAN FOR 2" OD. Cu TUBES
MATERIAL: COPPER ELECTRO TINNED
CODE No. 114844



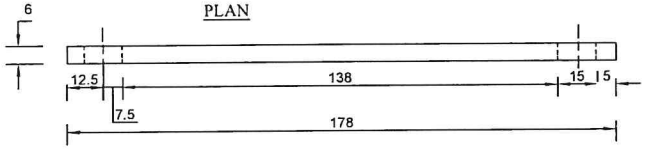
BOLT & NUT
MATERIAL: GALVANIZED MILD STEEL



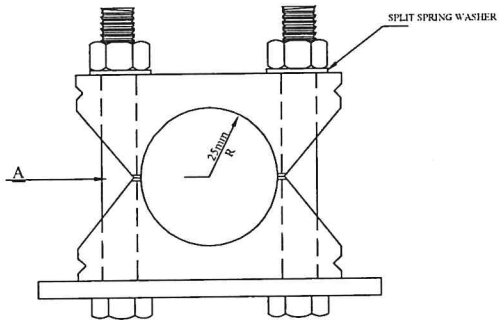
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MATERIAL: HIGH COPPER CONTENT ALLOY TINNED



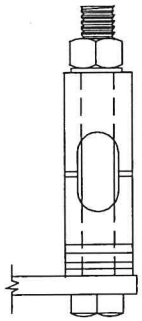
PLAN



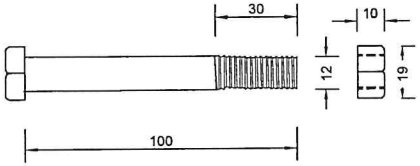
PLAN FOR 1" OD. Cu TUBES
MATERIAL: COPPER ELECTRO TINNED
CODE No. 114836



CLAMP END VIW (x2)
MATERIAL: HIGH COPPER CONTENT ALLOY TINNED



VIEW AT 'A'



BOLT & NUT
MATERIAL: GALVANIZED MILD STEEL

FRONT ELEVATION

	NAME	DATE	SIGN
APPROVED			
CHECKED ENGINEER I/C			
CHECKED PRINCIPAL D'MAN	B. GAITHO		
DRAWN	J.M.Kahare	16/04/2011	Kahare
TRACED			

NOTE
-DIMENSIONS SHOWN IN MM U.O.S

REF	REVISION	DATE	SIGN	CHECKED	DATE
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2					
3					
4					
5					
6					

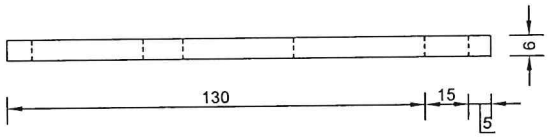
DETAILS OF RIGID CLAMPS FOR 1" & 2"O.D Cu. TUBES
(Code Nos. 114836 & 114844)

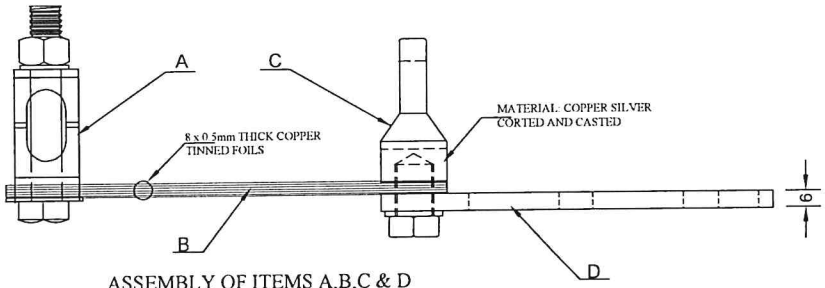
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SHEET 1

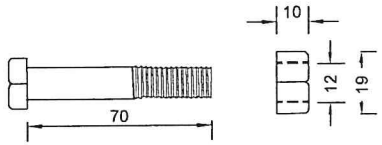
K.P.&L.Co.Ltd

SK. No. 08605

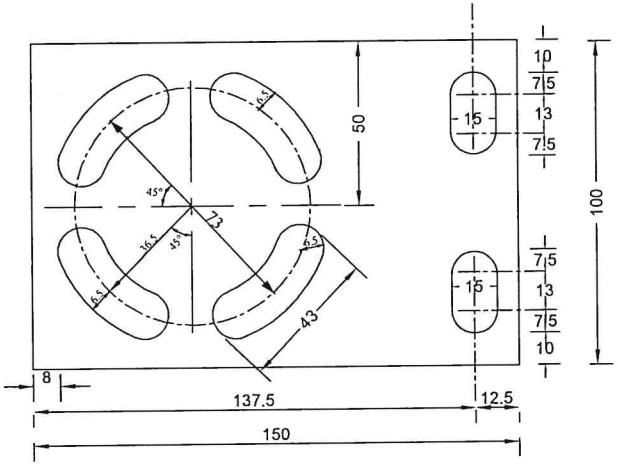




ASSEMBLY OF ITEMS A,B,C & D
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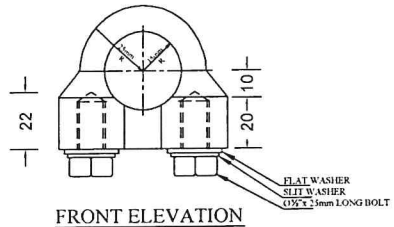


BOLT NUT OF ITEM 'A'

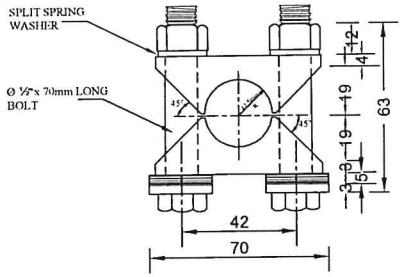


MATERIAL: COPPER SILVER COATED
PLAN OF ITEM 'D'.

PLAN - CLAMP FOR 1" O.D CU TUBES
CODE No. 114834

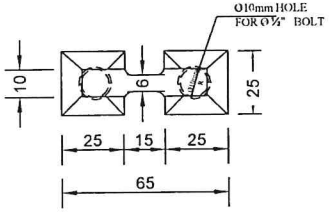


FRONT ELEVATION
ITEM 'C'

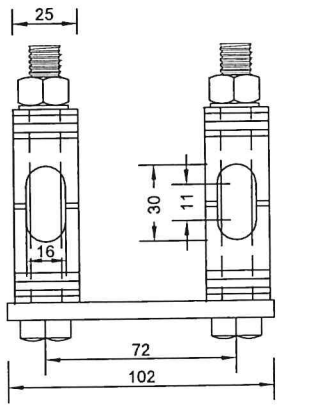


MATERIAL: HIGH COPPER CONTENT ALLOY TINNED.

END ELEVATION OF ITEM 'A'

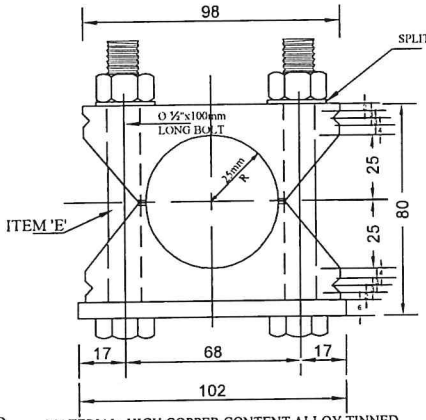


PLAN
ITEM 'C'



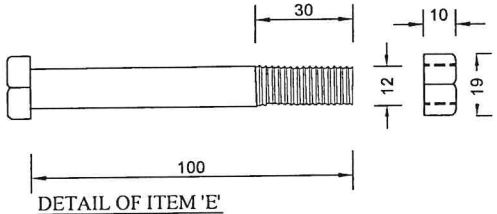
MATERIAL: HIGH COPPER CONTENT ALLOY TINNED.

FRONT ELEVATION



MATERIAL: HIGH COPPER CONTENT ALLOY TINNED.

END ELEVATION



DETAIL OF ITEM 'E'
BOLT & NUT

MATERIAL: GALVANIZED MILD STEEL

CODE No. 114843

	NAME	DATE	SIGN
APPROVED			
CHECKED ENGINEER I/C			
CHECKED PRINCIPAL D'MAN	B. GAITHO		
DRAWN	J.M.Kahare	16/04/2011	Kahare
TRACED			

NOTE
-DIMENSIONS SHOWN IN MM U.O.S.

REF	REVISION	DATE	SIGN	CHECKED	DATE
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2					
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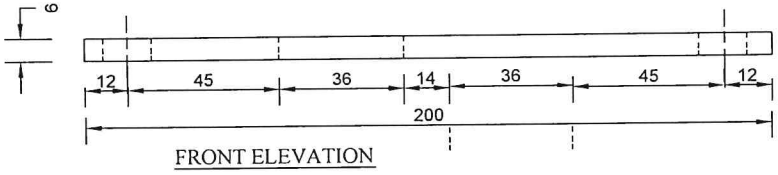
SHEET 2

DETAILS OF EXPANSION CLAMPS FOR 1" O.D Cu. TUBES
(Code Nos. 114834) & DEATILS OF RIGID INTER SPAN CLAMP FOR 2" O.D Cu TUB CODE 114843)

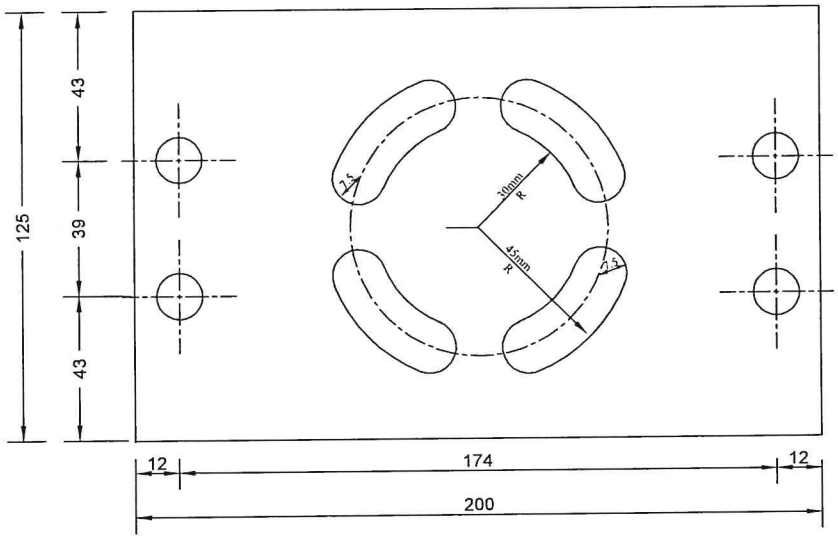
SCALE FULL SCALE

K.P.&.L.Co.Ltd

SK. No. 08605



FRONT ELEVATION

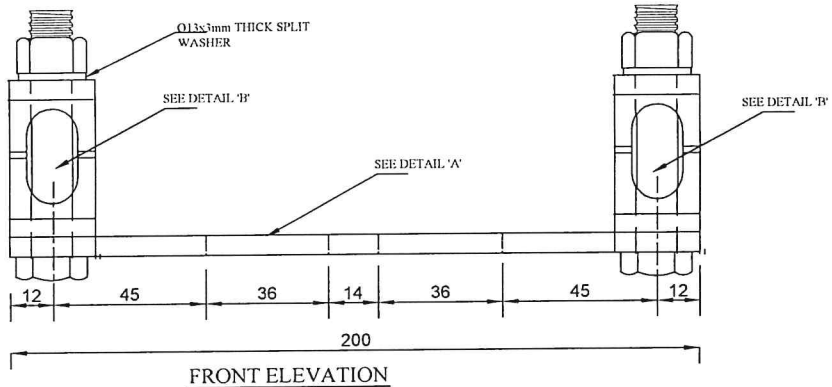


PLAN

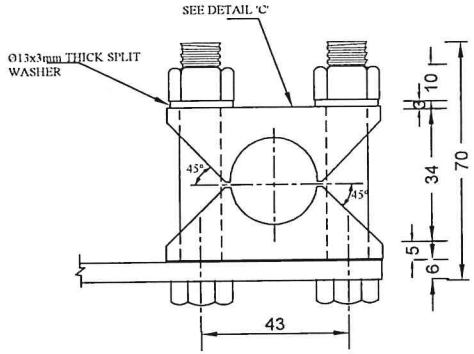
MATERIAL: COPPER SILVER COATED

DETAIL 'A'

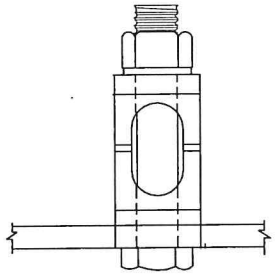
ASSEMBLY



FRONT ELEVATION

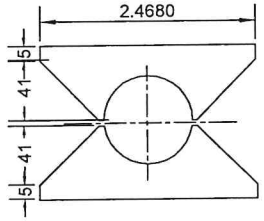


END ELEVATION



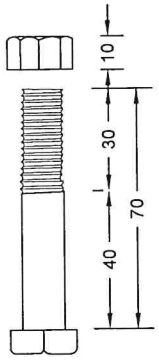
FRONT ELEVATION

CODE: 114837 MATERIAL: HIGH COPPER CONTENT ALLOY TINNED

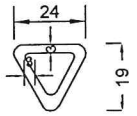


DETAIL 'C'

CODE: 114837 MATERIAL: HIGH COPPER CONTENT ALLOY TINNED



BOLT & NUT DETAIL 'B'

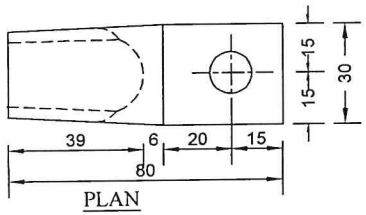


FRONT ELEVATION

CODE: 146267 MATERIAL: ALUMINIUM



END ELEVATION



PLAN

	NAME	DATE	SIGN
APPROVED			
CHECKED ENGINEER I/C			
CHECKED PRINCIPAL D'MAN	B. GAITHO		
DRAWN	J.M.Kahuro	16/08/2011	Kahuro
TRACED			

NOTE
-DIMENSIONS SHOWN IN MM U.O.S

REF	REVISION	DATE	SIGN	CHECKED	DATE
1					
2					
3					
4					
5					
6					

DETAILS FOR RIGID CLAMPS FOR 1" Cu. TUBES

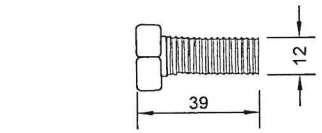
(Code Nos. 114837)

SCALE FULL SC

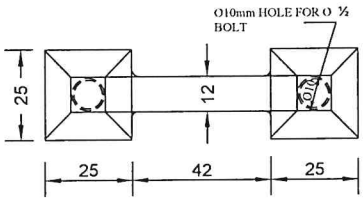
SHEET 3

K.P.&.L.Co.Ltd

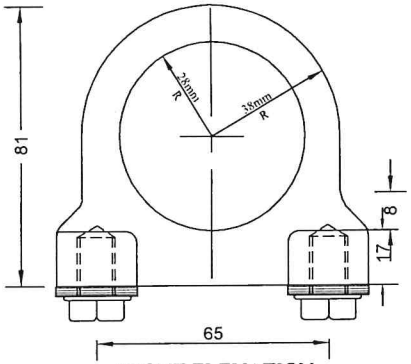
SK. No. 08605



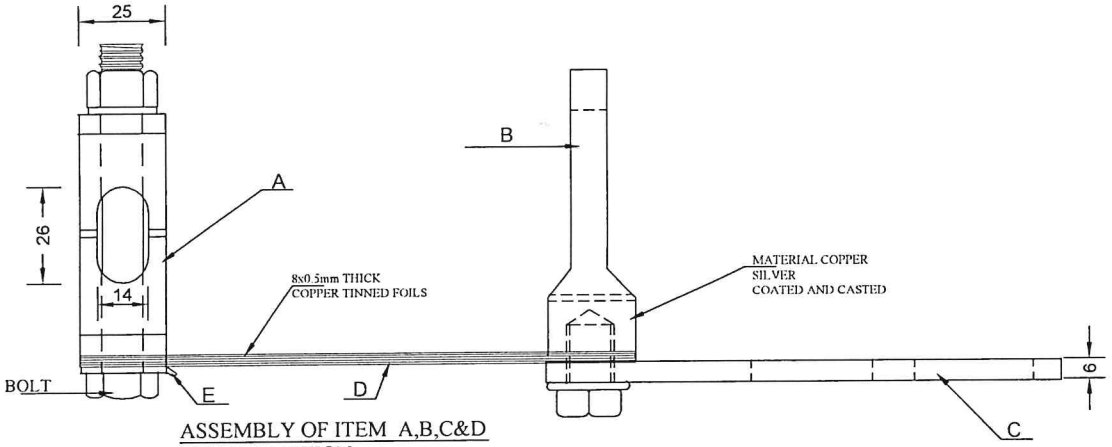
BOLT OF ITEM 'B'



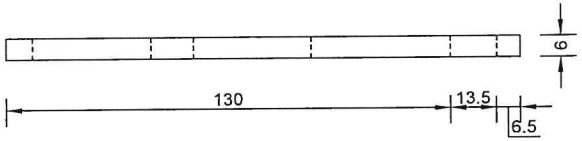
PLAN
ITEM 'B'

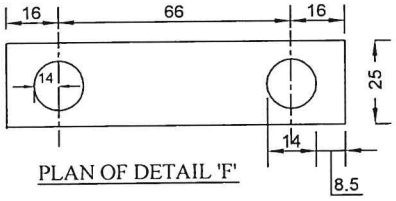


FRONT ELEVATION
ITEM 'B'

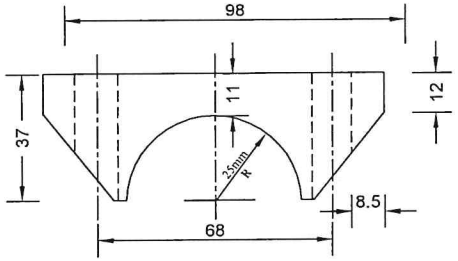


ASSEMBLY OF ITEM A,B,C&D
END ELEVATION

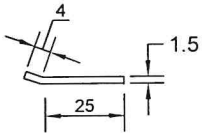


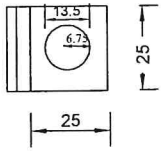


PLAN OF DETAIL 'F'

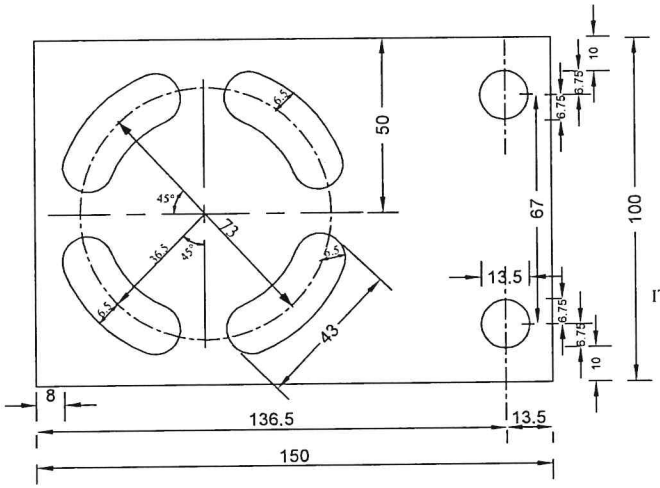


DETAIL 'F' (PART OF ITEM 'A'
END ELEVATION

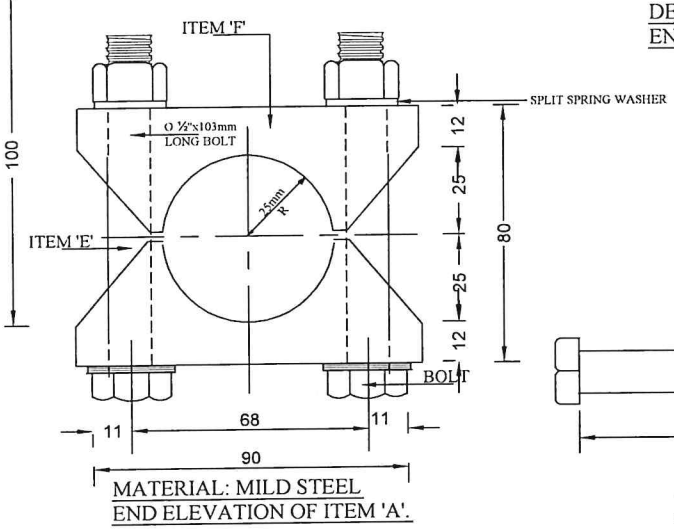




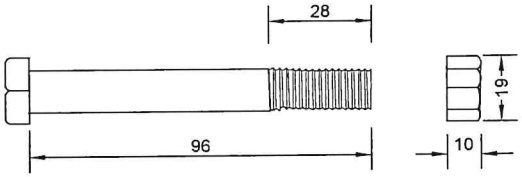
PLAN (2No. washers)
ITEM 'E'



MATERIAL: COPPER SILVER COATED
PLAN OF ITEM 'C'.



MATERIAL: MILD STEEL
END ELEVATION OF ITEM 'A'.



DETAIL OF ITEM ' E'
BOLT & NUT

	NAME	DATE	SIGN
APPROVED			
CHECKED ENGINEER I/C			
CHECKED PRINCIPAL D'MAN	B GAITHO		
DRAWN	J M Kahare	16/01/2011	Kahare
TRACED			

NOTE
-DIMENSIONS SHOWN IN MILLIMETERS

REF	REVISION	DATE	SIGN	CHECKED	DATE
1					
2					
3					
4					
5					
6					

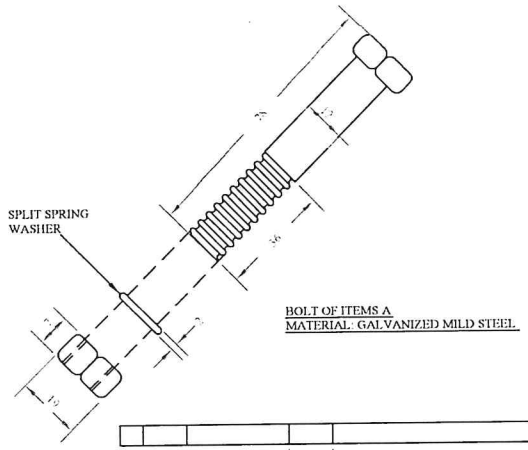
DETAILS FO EXPANSION CLAMPS FOR 2" O.D. Cu. TUBES (Code Nos. 114849)

SCALE FULL SCALE

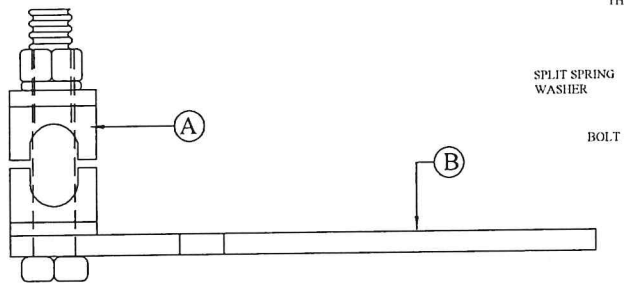
SHEET 4

K.P.&.L.Co.Ltd

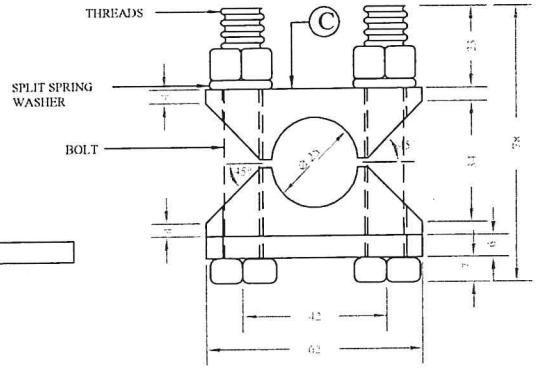
SK. No. 08605



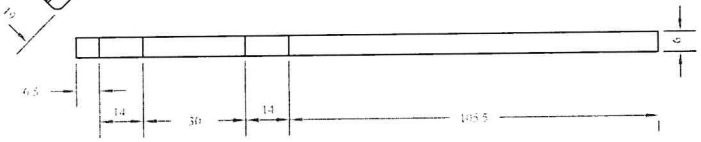
BOLT OF ITEMS A
MATERIAL: GALVANIZED MILD STEEL

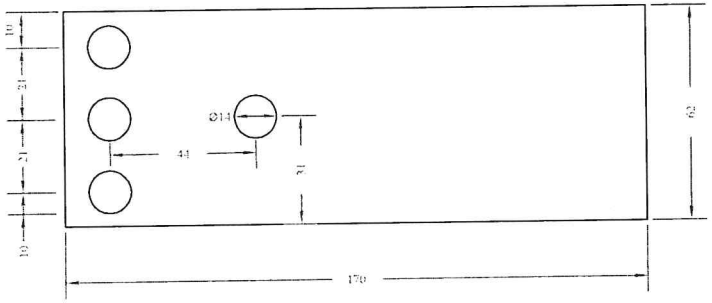


ASSEMBLY OF ITEMS A & B
END ELEVATION

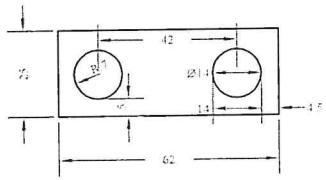


MATERIAL: COPPER ALLOY
END ELEVATION OF ITEM A

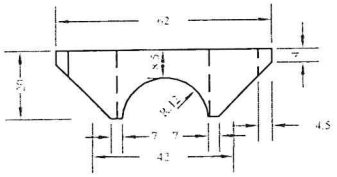




MATERIAL: COPPER ALLOY TINNED
PLAN OF ITEM 'B'
CODE NO. 114838



PLAN OF DETAIL 'C'
PART OF ITEM 'A'



END ELEVATION
PART OF ITEM 'A'

NOTE:
-MATERIAL: HIGH COPPER CONTENT ALLOY CASTING.
-DIMENSIONS SHOWN IN MM U.O.S.

SHEET 5

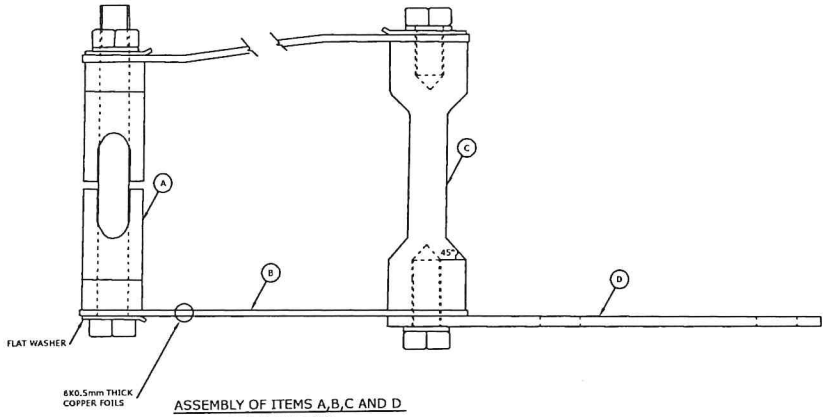
	DATE	NAME	SIGN
APPROVED			
CHECKED ENGINEER I/C			
CHECKED PRINCIPAL D'MAN			
DRAWN	APRIL 2011	A M MUIRU	
TRACED			

REF	REVISION	DATE	SIGN	CHECKED	DATE
1					
2					
3					
4					
5					
6					

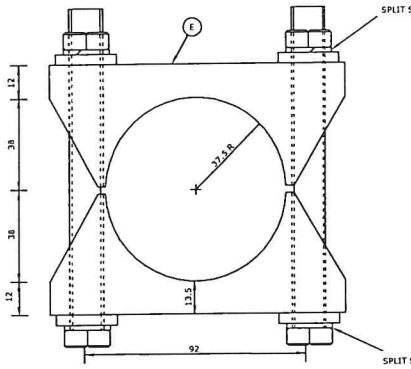
DETAIL OF RIGID CLAMP FOR 1" CU. TUBES (CODE NO 114038)

K.P.&L.Co. Ltd.

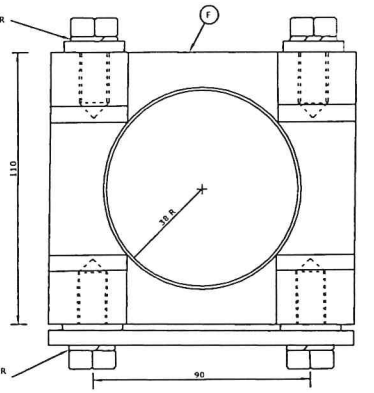
SK. No. 08605



ASSEMBLY OF ITEMS A,B,C AND D
END ELEVATION



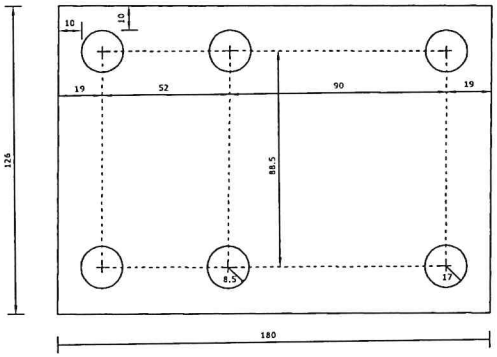
END ELEVATION
MATERIAL : HIGH COPPER CONTENT ALLOY TINNED



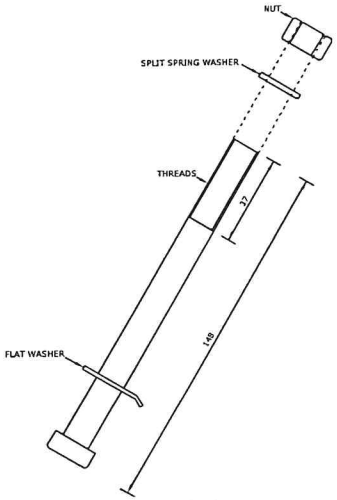
END ELEVATION
MATERIAL : HIGH COPPER CONTENT ALLOY TINNED



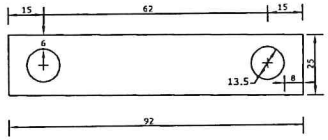
END ELEVATION



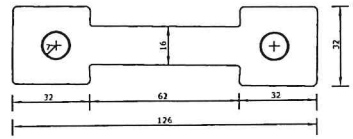
MATERIAL : COPPER SILVER COATED
PLAN OF ITEM D
CODE 114853



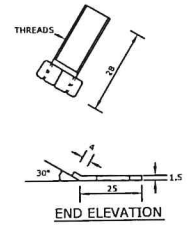
BOLT AND NUT OF ITEM A
MATERIAL : GALVANIZED MILD STEEL



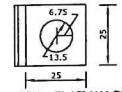
PLAN OF DETAIL E



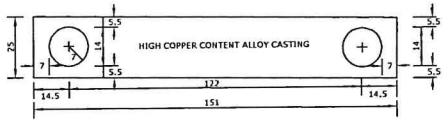
PLAN OF DETAIL F



END ELEVATION



PLAN (6No FLAT WASHERS)
MATERIAL : GALVANIZED MILD STEEL



ITEM B
MATERIAL : COPPER TINNED FOIL 0.5mm THICK
No REQUIRED 32 TOTAL

NOTE
-MATERIAL : HIGH COPPER CONTENT ALLOY CASTING
-DIMENSIONS IN MM U.O.S

	DATE	SIGN
APPROVED		
CHECKED ENGINEER I/C		
CHECKED HEAD D'MAN		
CHECKED H/SURVEYOR		
DRAWN	MARCH 2011	DENNIS .W
SURVEYED		
TRACED		

REF	REVISION	DATE	SIGN	CHECKED	SIGN
1					
2					
3					
4					
5					
6					

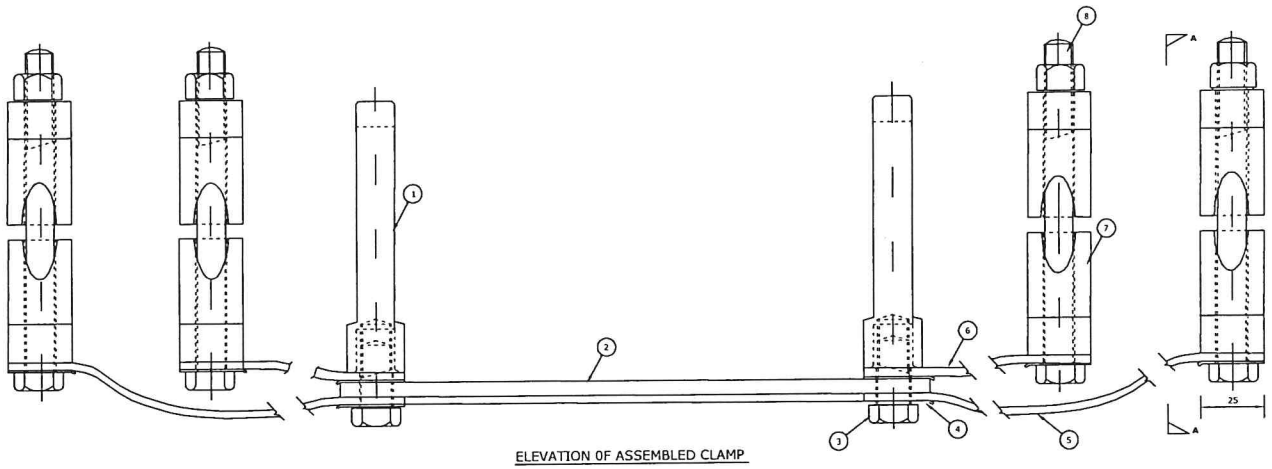
DETAILS OF EXPANSION CLAMPS FOR 3" O.D. Cu TUBES (CODE 114853)

SCALE : FULL SIZE

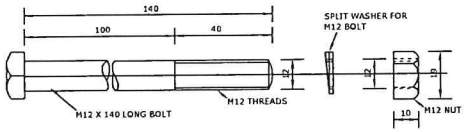
SHEET 6

K.P.&L CO. LTD.

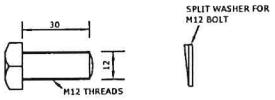
SK.NO.08605



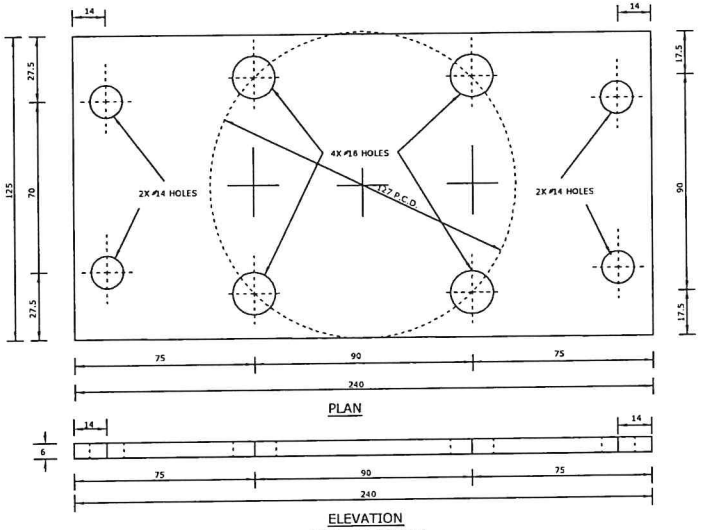
ELEVATION OF ASSEMBLED CLAMP



ELEVATION
(BOLT,WASHER AND NUT)
(ITEM 8-8 REQD.)

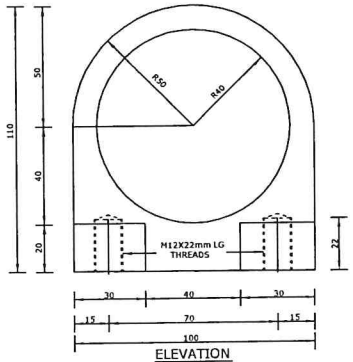


ELEVATION
(ITEM 3-4 REQD.)

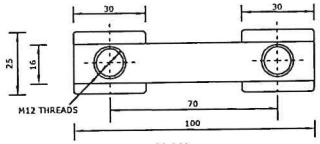


PLAN

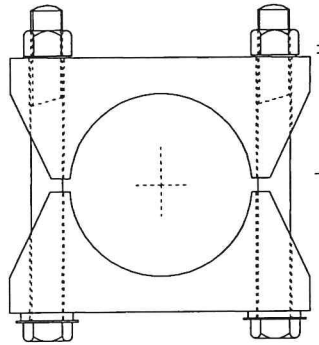
ELEVATION
(ITEM 2-1 REQD.)



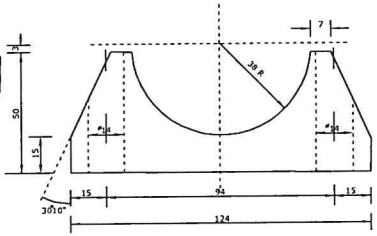
ELEVATION
(ITEM 1-2 REQD.)



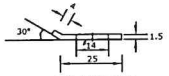
PLAN



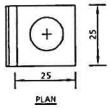
SECTION A-A



ELEVATION
(ITEM 7-8 REQD.)

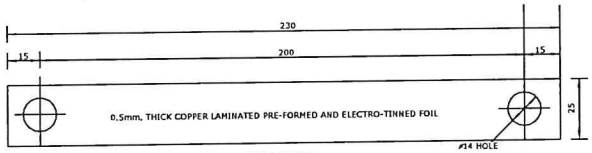


ELEVATION
(ITEM 4-16 REQD.)

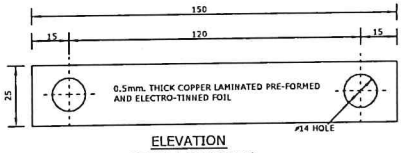


PLAN

NOTE
-MATERIAL : HIGH COPPER CONTENT ALLOY CASTING
-DIMENSIONS IN MM U.O.S



ELEVATION
(ITEM 5-32 REQD.)



ELEVATION
(ITEM 6-32 REQD.)

	DATE	SIGN
APPROVED		
CHECKED ENGINEER I/C		
CHECKED HEAD D/MAN		
CHECKED H/SURVEYOR		
DRAWN	MARCH 2011	DENNIS .W
SURVEYED		
TRACED		

REF	REVISION	DATE	SIGN	CHECKED	SIGN
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2					
3					
4					
5					
6					

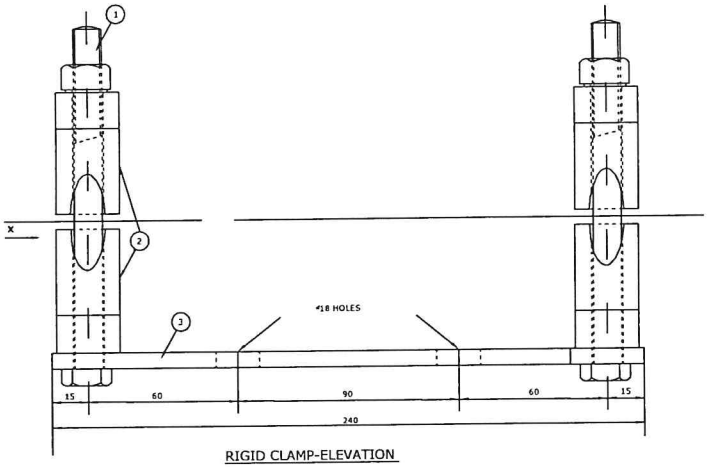
DETAILS OF EXPANSION CLAMPS FOR 76mm. O.D. Cu TUBES (CODE 114852)

SCALE : FULL SIZE

SHEET 7

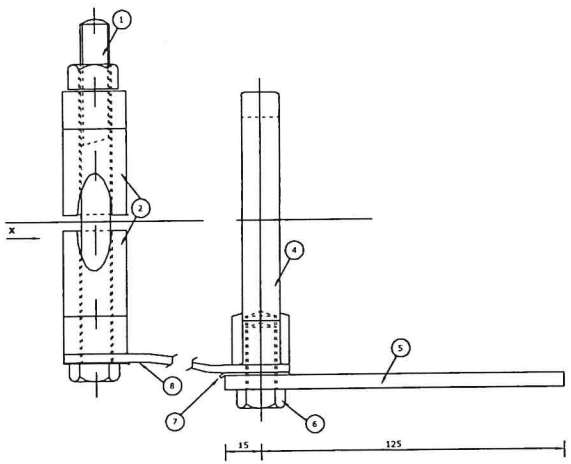
K.P.&L CO. LTD.

SK.NO.08605



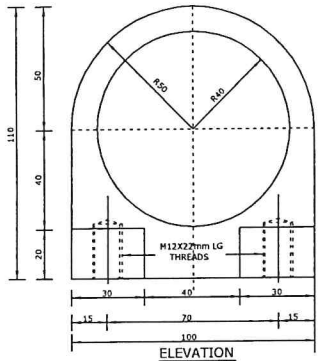
RIGID CLAMP-ELEVATION

CODE 114832



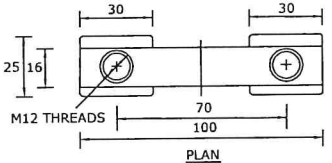
EXPANSION CLAMP-ELEVATION

CODE 114824

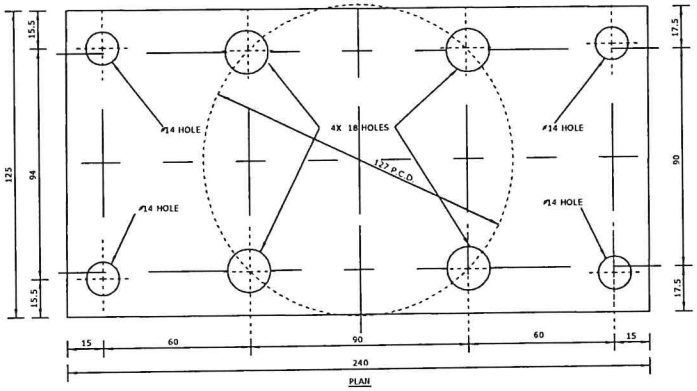


ELEVATION

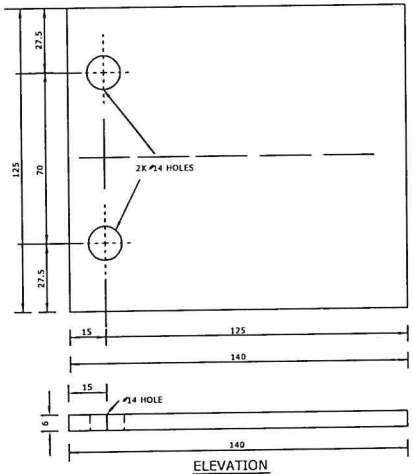
(ITEM 4-B)(1 REQD.)



PLAN

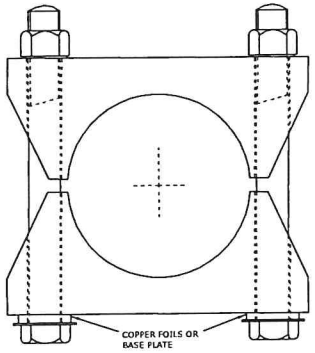


PLAN

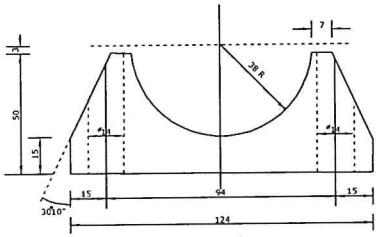


ELEVATION

(ITEM 5-1 REQD.)



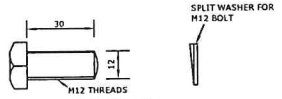
ELEVATION X



ELEVATION

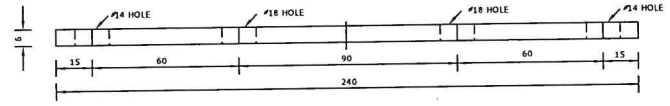
(ITEM 2- A (4 REQD.)

B (2 REQD.)



ELEVATION

(ITEM 6-B)2 REQD.)

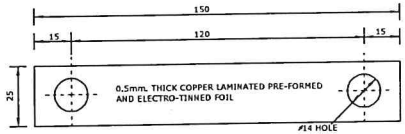


Cu PLATE FOR RIGID CLAMP

CODE 114832

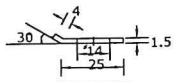
ELEVATION

(ITEM 3-1 REQD.)



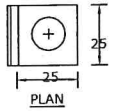
ELEVATION

(ITEM 8-B(16 REQD.)

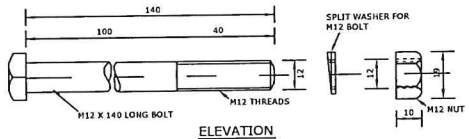


ELEVATION

(ITEM 7-B(2 REQD.)



PLAN



ELEVATION

(BOLT,WASHER AND NUT)

(ITEM 1- A (4 REQD.)

B (2 REQD.)

MATERIAL : GALVANIZED MILD STEEL

	DATE	SIGN
APPROVED		
CHECKED ENGINEER I/C		
CHECKED HEAD DRAUGHTSMAN		
CHECKED H/SURVEYOR		
DRAWN	MARCH 2011	DENNIS .W
SURVEYED		
TRACED		

NOTE

-MATERIAL : HIGH COPPER CONTENT ALLOY TINNED U.O.S.

-DIMENSIONS IN MM U.O.S

REF		DATE	SIGN	CHECKED	SIGN
1					
2					
3					
4					
5					
6					

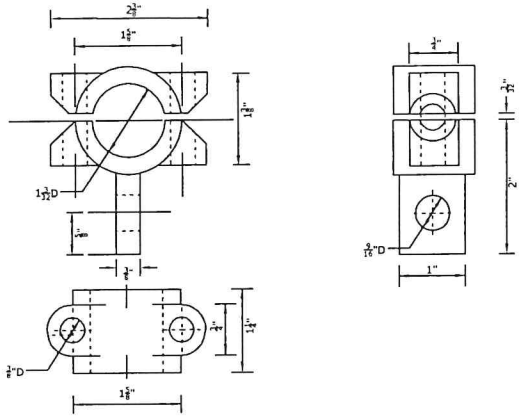
DETAILS OF EXPANSION RIGID CLAMPS FOR 76mm. O.D. Cu TUBES

SCALE : FULL SIZE

SHEET 8

K.P.&L CO. LTD.

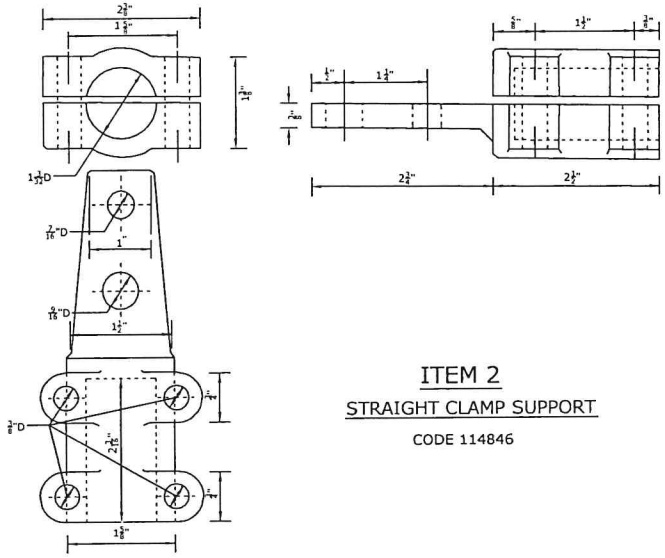
SK.NO.08605



ITEM 1

CONNECTOR CLAMP

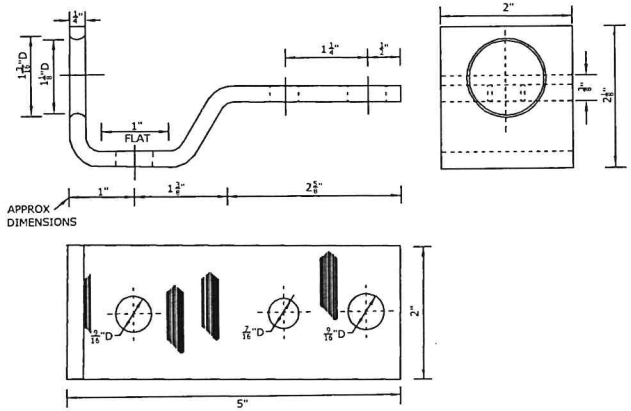
CODE 114847



ITEM 2

STRAIGHT CLAMP SUPPORT

CODE 114846



ITEM 3

STRAIGHT EXPANSION SUPPORT

CODE 114850

NOTES

ITEMS 1 AND 2

BRONZE CASTINGS EACH ITEM TO BE CAST IN ONE UNIT. BOLT HOLE DRILLED. LARGE DIAMETER HOLE MACHINED TO $\frac{13}{32}$ INCH DIA. AND THEN SQUARE THREADED WITH A PITCH OF APPROX $\frac{1}{32}$ INCH AND A DEPTH OF APPROX $\frac{15}{1000}$ INCH BEFORE CUTTING INTO TWO UNITS

ITEMS 1 AND 2

2 INCH $\frac{1}{4}$" HARD DRAWN H.C COPPER

SUITABLE FOR 1 INCH I.D X GAUGE COPPER TUBE AND L.E.L SIZE 2 INSULATOR SWITCHES

	DATE	SIGN
APPROVED		
CHECKED ENGINEER I/C		
CHECKED HEAD D'MAN		
CHECKED H/SURVEYOR		
DRAWN	MARCH 2011	DENNIS .W
SURVEYED		
TRACED		

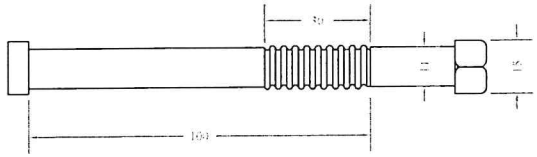
REF	REVISION	DATE	SIGN	CHECKED	SIGN
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2					
3					
4					
5					
6					

BUS BAR FITTINGS FOR 1"CU TUBE

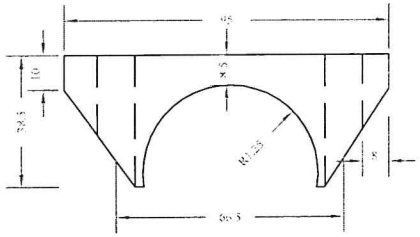
SHEET 9

K.P.&L CO. LTD.

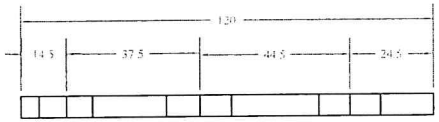
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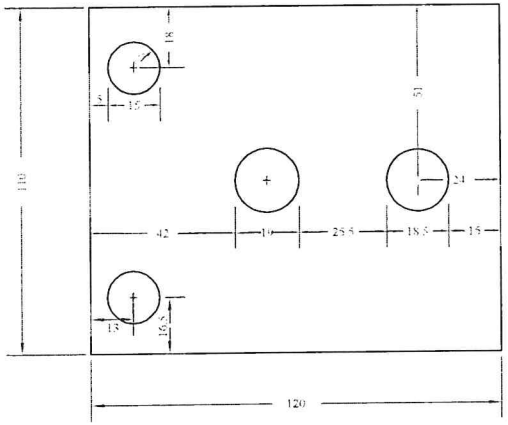


BOLT & NUT

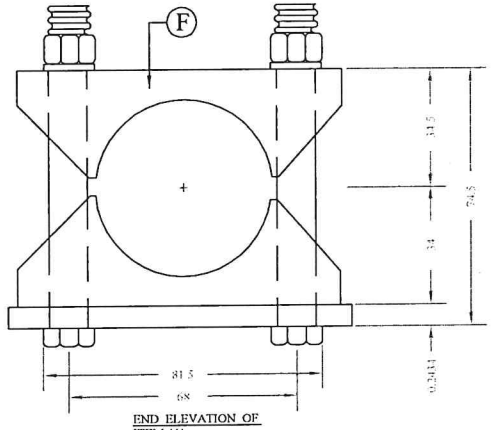


DETAIL 'F' PART OF ITEM A
END ELEVATION





PLAN - CLAMP FOR 2" OD.CU TUBES
CODE NO.



END ELEVATION OF
ITEM 'A'

	DATE	NAME	SIGN
APPROVED			
CHECKED ENGINEER I/C			
CHECKED PRINCIPAL D'MAN			
DRAWN			
TRACED			

REF	REVISION	DATE	SIGN	CHECKED	DATE
1					
2					
3					
4					
5					
6					

DETAILS FOR 2" OD Cu. TUBES CLAMPS.

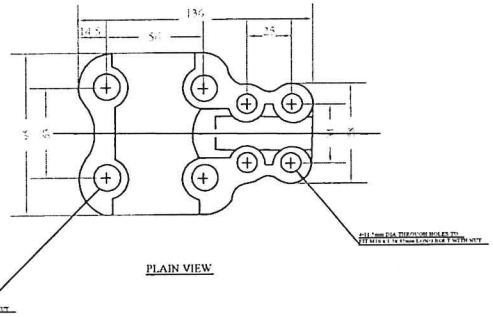
SHEET 10

K.P.&L.Co. Ltd.

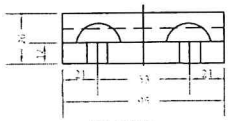
SK. No. 08605

NOTES
. ALL DIMENSIONS IN MM
PART NOs 1,2 & 3 TO BE OF TIN PLATED COPPER MATERIAL TO B5
. ALL BOLTS NUTS & WASHERS TO BE OF ALUMINIUM ALLOY AND OF HIGH TENSION

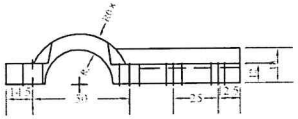
CODE. 2" 114829
CODE. 3" 114828



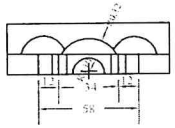
PLAIN VIEW



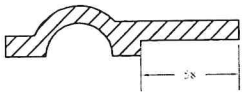
END VIEW A



FRONT ELEVATION



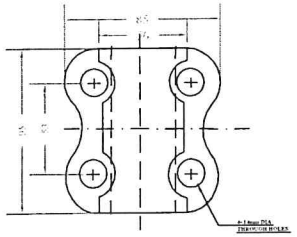
END VIEW B



SECTION X-X

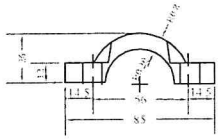
PART NO: 1

NOTES
-ALL CONDUCTOR SIZE TO FIT 2" AND 3" CLAMPS FOR Cu. TUBES.
-R=23 FOR 2" COPPER TUBE.
-R=35.5 FOR 3" COPPER TUBE.

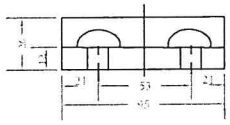


SECTION X-X

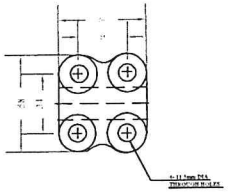
PART NO: 2



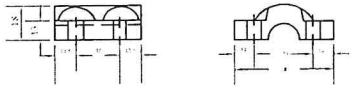
SECTION X-X

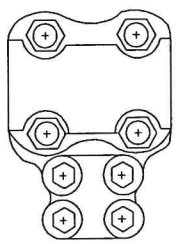


SECTION X-X

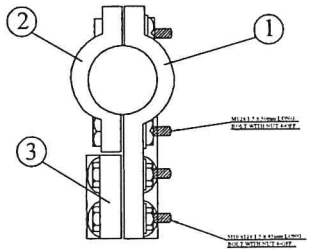


PART NO: 3





CONDUCTOR
SIZE 150-300 SQMM



ASSEMBLY

	DATE	NAME	SIGN
APPROVED			
CHECKED ENGINEER I/C			
CHECKED PRINCIPAL D'MAN			
DRAWN			
TRACED			

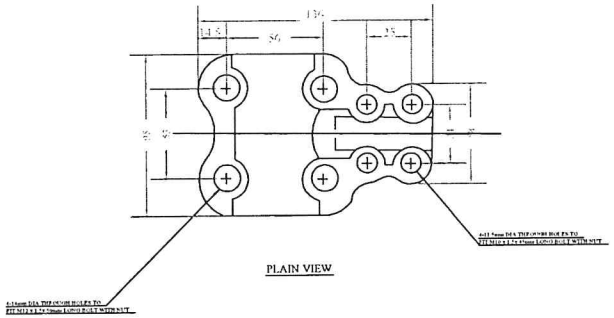
REF	REVISION	DATE	SIGN	CHECKED	DATE
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6					

DETAILS OF TEE CLAMP FOR 2" (50mm) & (75mm) COPPER TUBE & STRANDED CONDUCTOR

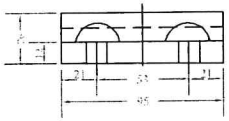
K.P.&L.Co. Ltd.
SK. No. 08605

SHEET 11

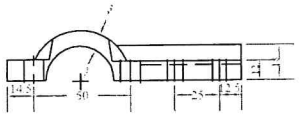
NOTES
. ALL DIMENSIONS IN MM
PART NOs 1,2 & 3 TO BE OF TIN PLATED COPPER MATERIAL TO B5
. ALL BOLTS NUTS & WASHERS TO BE OF ALUMINIUM ALLOY AND OF HIGH TENSION



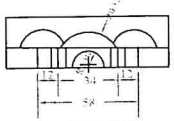
PLAIN VIEW



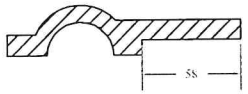
END VIEW A



FRONT ELEVATION

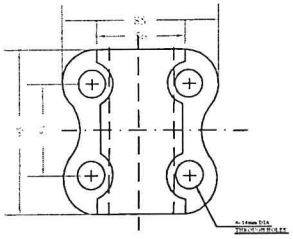


END VIEW B



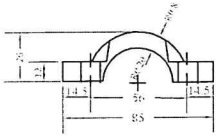
SECTION X-X

PART NO: 1

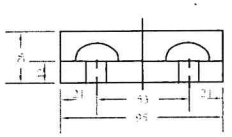


SECTION X-X

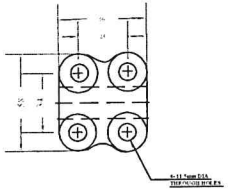
PART NO: 2



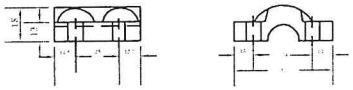
SECTION X-X

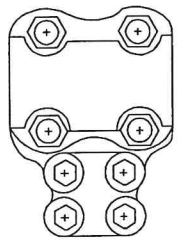


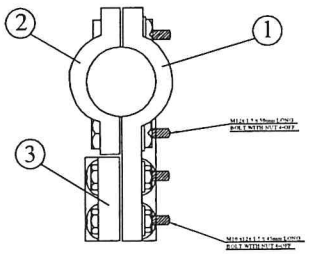
SECTION X-X



PART NO: 3







ASSEMBLY

	DATE	NAME	SIGN
APPROVED			
CHECKED ENGINEER I/C			
CHECKED PRINCIPAL D'MAN			
DRAWN			
TRACED			

REF	REVISION	DATE	SIGN	CHECKED	DATE
1					
2					
3					
4					
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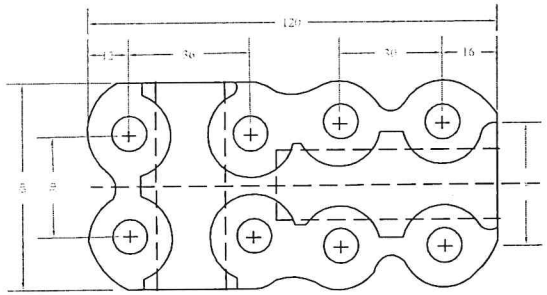
DETAILS OF TEE CLAMP FOR 1 $\frac{1}{2}$" (38.1mm) COPPER TUBE & 150 mm STRANDED CONDUCTOR

CODE 114830

K.P.&L.Co. Ltd.

SK. No. 08605

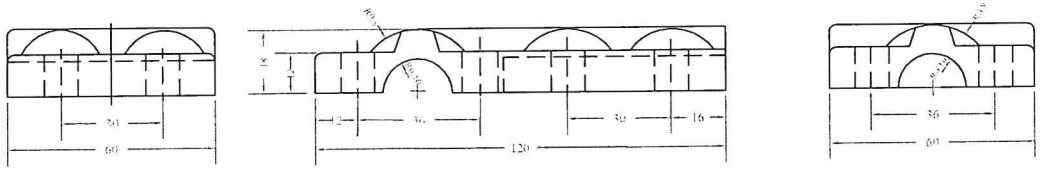
SHEET 11/A

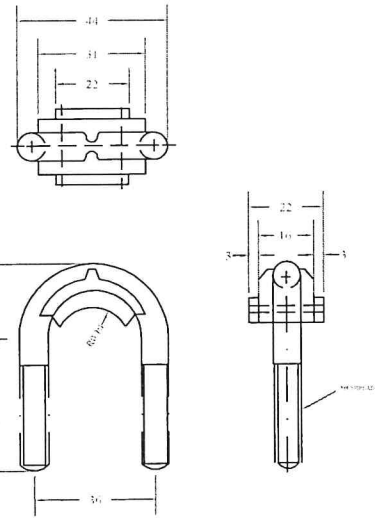


PART NO 1

CONDUCTOR PLATE (1 OFF)

MATERIAL: TIN PLATE COPPER

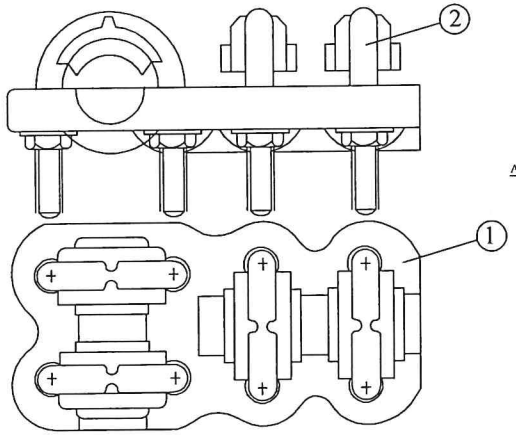




PART NO 2

U - BOLT (4 - OFF)

MATERIAL: ALLUMINIUM ALLOY
HIGH TENSILE



ASSEMBLY

NOTES:
DIMENSIONS IN MM
CLAMP TO BE USED FOR STRANDED CONDUCTOR OF DIA. 12-19mm
APPROPRIATE NUTS FOR U-BOLTS TO BE SIMILAR MATERIAL
SPLIT WASHERS OF SIMILAR MATETIAL TO BOLTS TO BE USED WITH ACCOMPANING NUTS.

	DATE	NAME	SIGN
APPROVED			
CHECKED ENGINEER I/C			
CHECKED PRINCIPAL D'MAN			
DRAWN			
TRACED			

REF	REVISION	DATE	SIGN	CHECKED	DATE
1					
2					
3					
4					
5					
6					

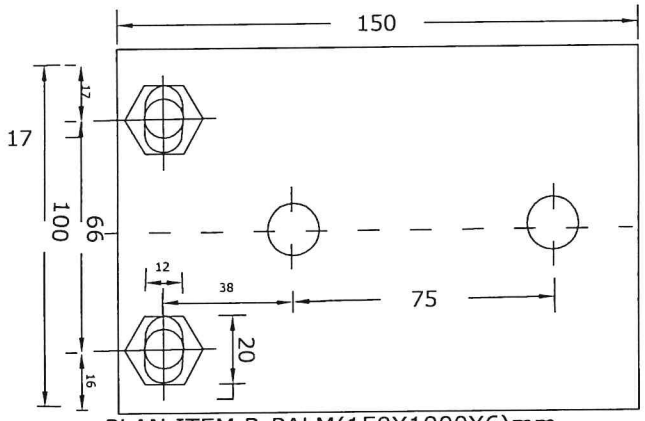
DETAILS OF TEE CLAMP FOR STRANDED CONDUCTORS. (U - BOLT TYPE)

CODE: 1114827

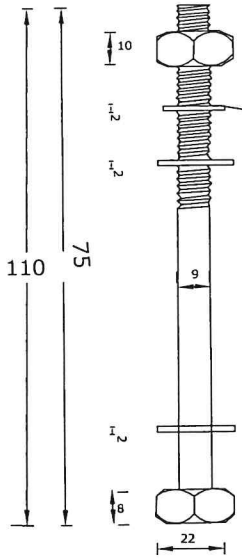
SHEET 12

K.P.&L.Co. Ltd.

SK. No. 08605

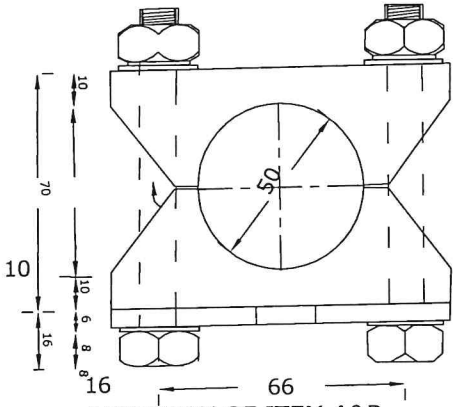


PLAN ITEM B-PALM(150X1000X6)mm
MATERIAL COPPER PLATE-ELECTR-TINNED

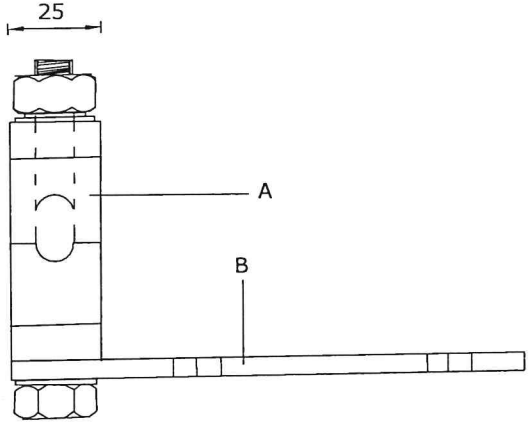


SPLIT STRING WASHER

M/O
BOLT OF ITEM
MATERIAL MILD GALVANIZED
BOLTS,NUTS, WASHER&SPLIT SPRING WASHERS

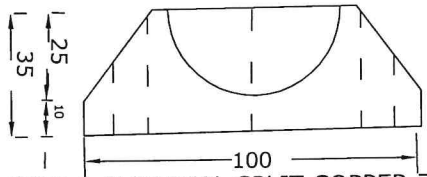


ASSEMBLY OF ITEM A&B



ASSEMBLY OF ITEM A&B
MATERIAL
END ELEVATION

ITEM NO.9



ITEM A-MATERIAL SPLIT COPPER ZINC ALLOY 90X70X50(TINNED)

	DATE	NAME	SIGN
APPROVED			
CHECKED ENGINEER I/C			
CHECKED PRINCIPAL DMAN			
DRAWN	REBEKCAH	APRIL 2011	
TRACED			

REVISION	DATE	SIGN	CHECKED	DATE

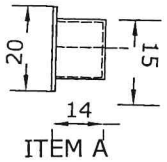
SHEET 15

RIGID-BUS BAR CLAMP FOR 2" COPPER TUBE

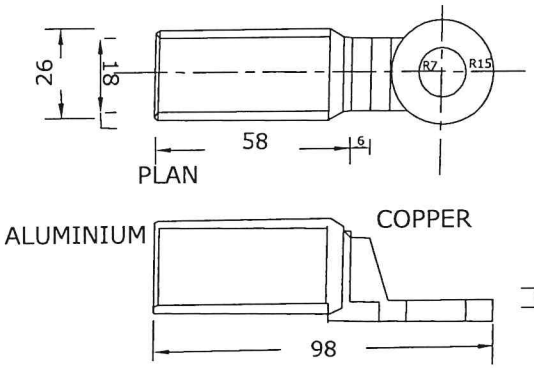
(SCALE: FULL SIZE)

K.P.&L.Co. Ltd.

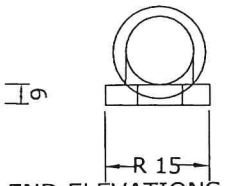
SK. No. 08605



ITEM A



SIDE ELEVATIONS



END ELEVATIONS

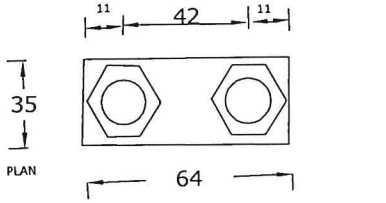
ITEM 12
COMPRESSION LUG FOR 300MM² FOR STRANDED COPPER CONDUCTOR
MATERIAL- COPPER AND ALUMINIUM
CODE 124149

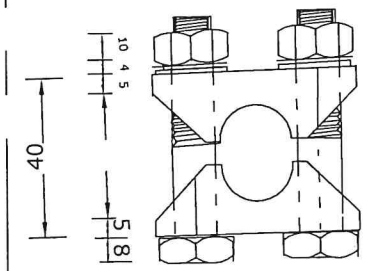
CODE 124149

COMPRESSIO LUG FOR
CU.STRANDED CONDUCTOR
300MM² CU X 22.5 00

ITEM NO.7

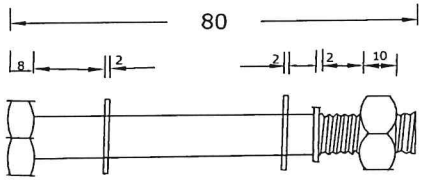
TENDERER TO PROVIDE DRAWING FOR APPROVAL





BUSBAR CLAP FOR
1" COPPER TUBE
MATERIAL -COPPER ALLOY

ITEM B



BOLT AND WASHERS-ITEM A



ASSEMBLY OF ITEM A&B
END ELEVATIONS

TINNED

ITEM 10

	DATE	NAME	SIGN
APPROVED			
CHECKED ENGINEER IAC			
CHECKED PRINCIPAL D/MAN			
DRAWN	REBECCAH	APRIL 2011	
TRACED			

REVISION	DATE	SIGN	CHECKED	DATE

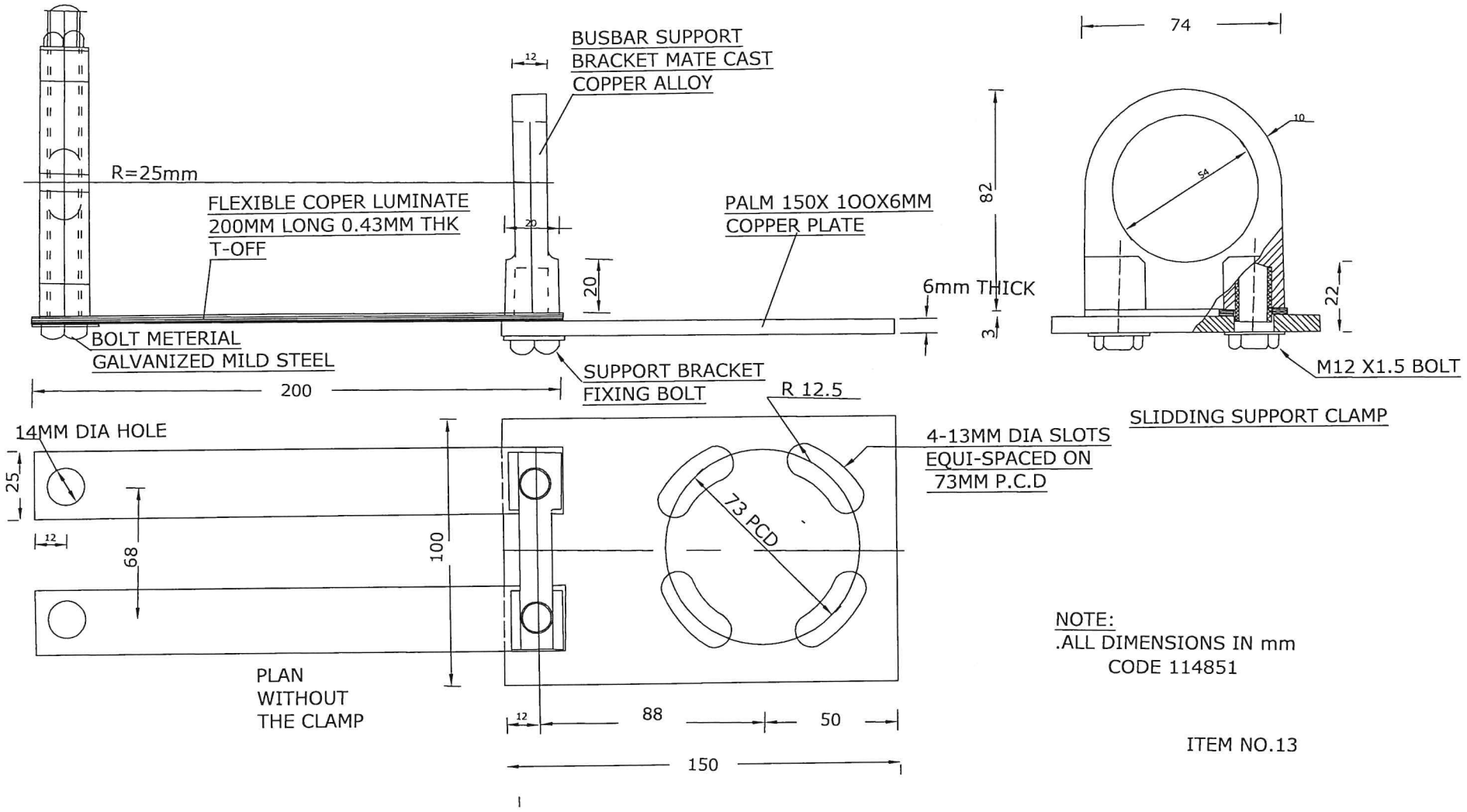
DETAILS OF BIMETAL LUG, COMPRESSION LUG AND 1" BUSBAR

(SCALE: FULL SIZE)

K.P.&L.Co. Ltd.

SK. No. 08605

SHEET 16



NOTE:
.ALL DIMENSIONS IN mm
CODE 114851

ITEM NO.13

	DATE	NAME	SIGN
APPROVED			
CHECKED ENGINEER I/C			
CHECKED PRINCIPAL D'MAN			
DRAWN	REBEQGAH	APRIL 2011	
TRACED			

REVISION	DATE	SIGN	CHECKED	DATE

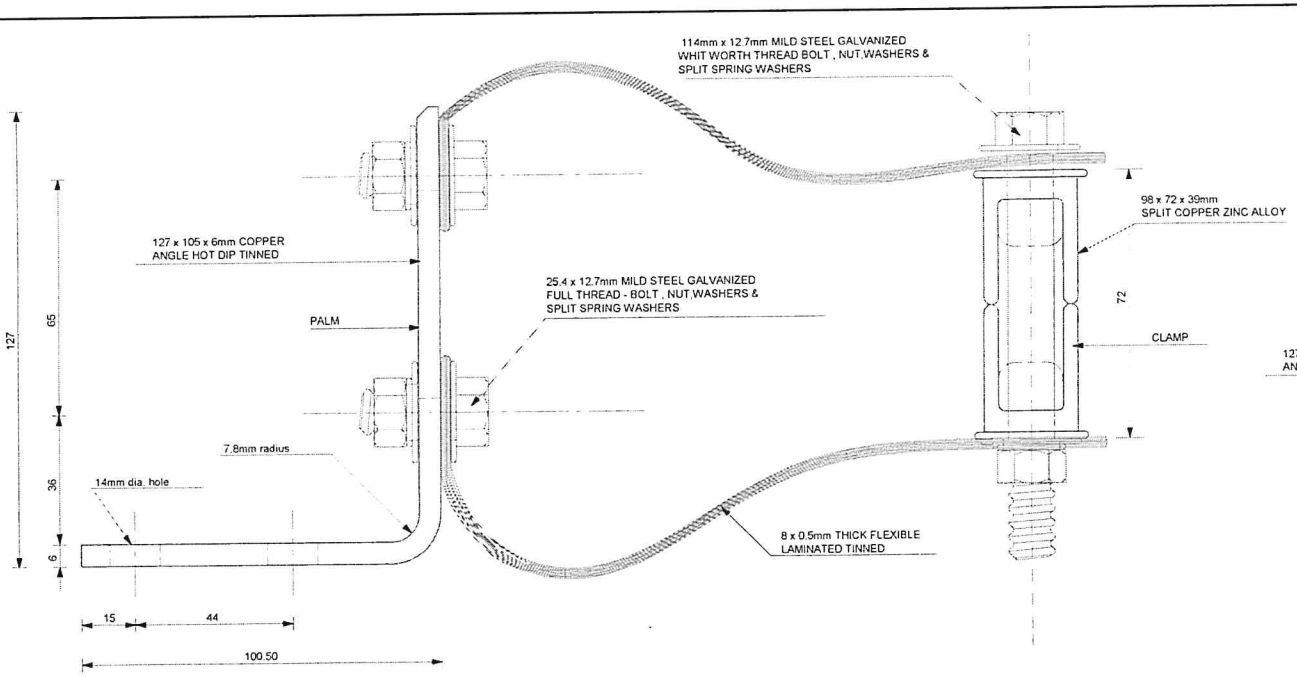
2" DIA EXPANSION CLAMP

(SCALE: FULL SIZE)

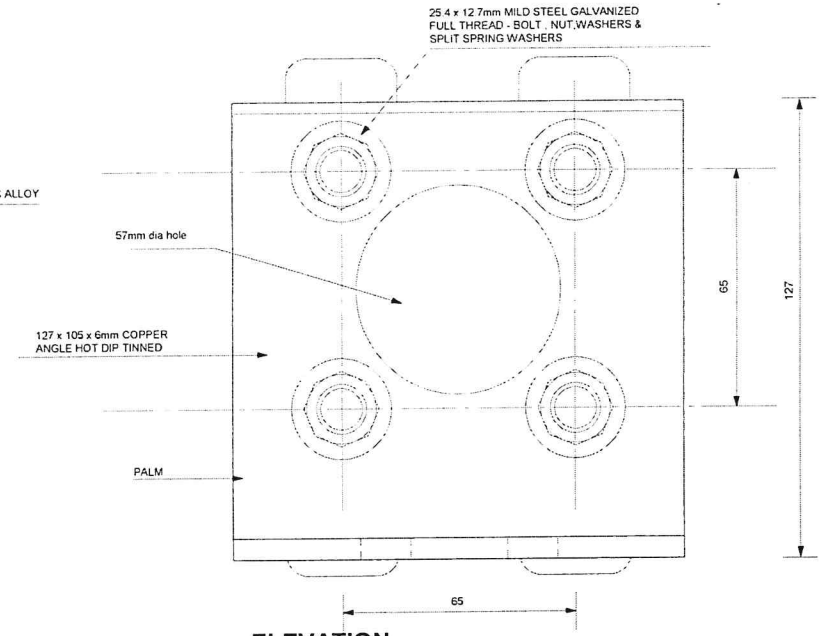
SHEET 17

K.P.&L.Co. Ltd.

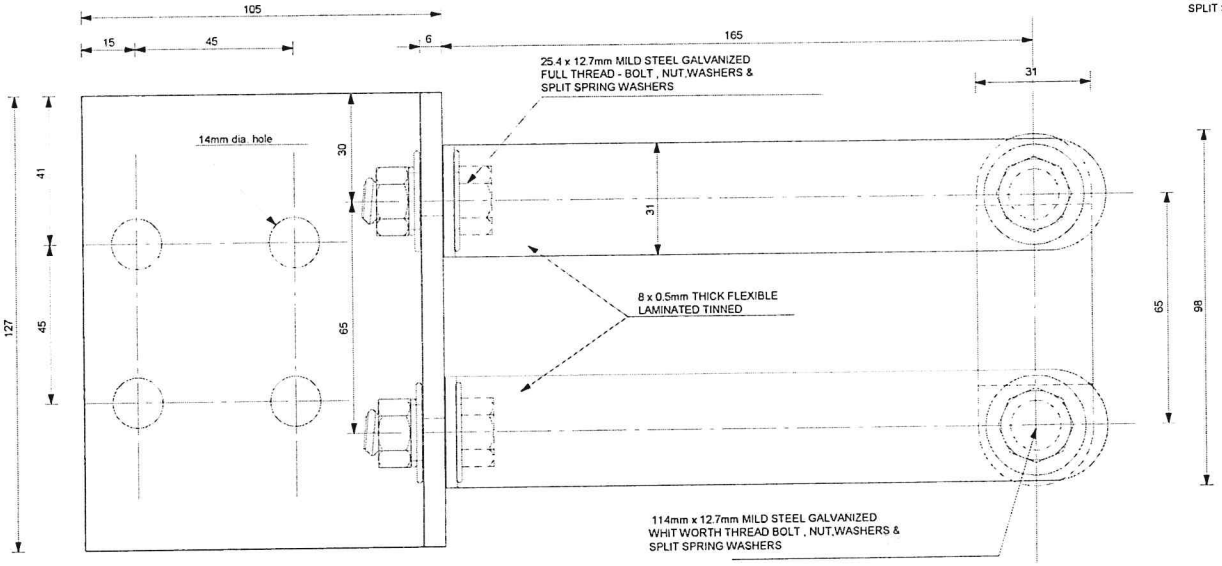
SK. No. 08605



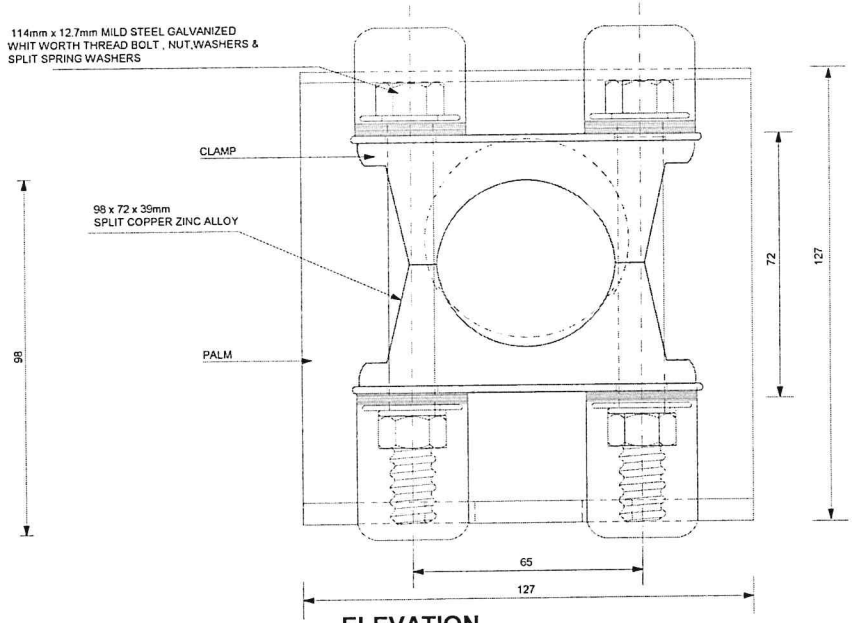
ELEVATION



ELEVATION



PLAN



ELEVATION

CODE : 114823

ITEM 14

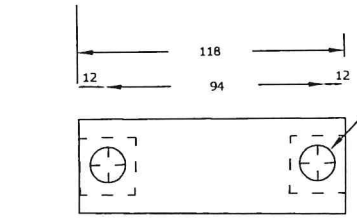
CHECKED BY :	
DRAWN BY :	J.M.KAHARE
DATE :	6 / DEC. / 2000
SCALE :	

DETAILS OF 2" BUS - BAR ANGLE EXPANSION CLAMP

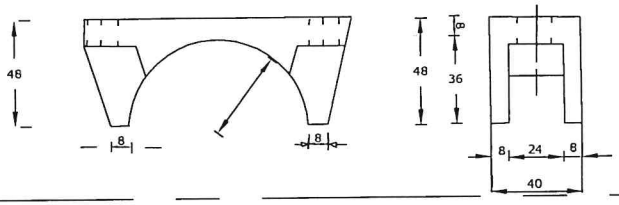
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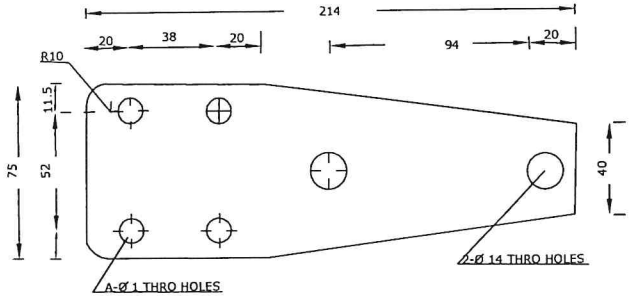
K.P.L.Co. LTD

SK. No. 08605 / 18

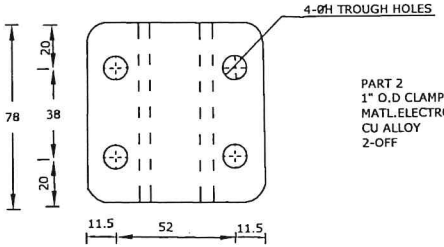


PART 1
3" O.D CLAMP COVER
MATL.ELECTRO TINNED
CU ALLOY
2-OFF

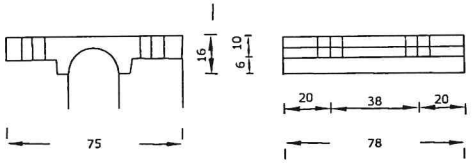




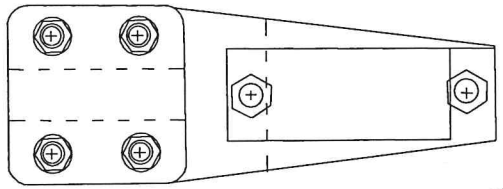
PART 3
CLAMP BODY
MATL ELECTRO-TINNED
CAST CU ALLOY
1 OFF



PART 2
1" O.D CLAMP COVER
MATL.ELECTRO TINNED
CU ALLOY
2-OFF

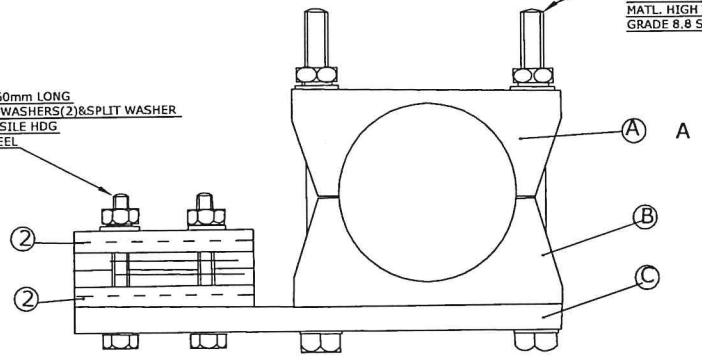


NOTES
-ALL DIMENSOIN IN mm U.O.S



2NO X M 12X2X140mm LONG
HEX . BOLT+NUTS,2 FLAT WASHERS
&SPLIT WASHER
MATL. HIGH TENSILE HDG
GRADE 8.8 STEEL

4NOXM9X1.5 X60mm LONG
HEX BOLT, NUT WASHERS(2)&SPLIT WASHER
MALT HIGH TENSILE HDG
GRADE 8.8 STEEEL



TEE-CLAMP ASSEMBLY

	DATE	NAME	SIGN
APPROVED			
CHECKED ENGINEER I/C			
CHECKED PRINCIPAL D'MAN			
DRAWN	REBECCAH	APRIL 2011	
TRACED			

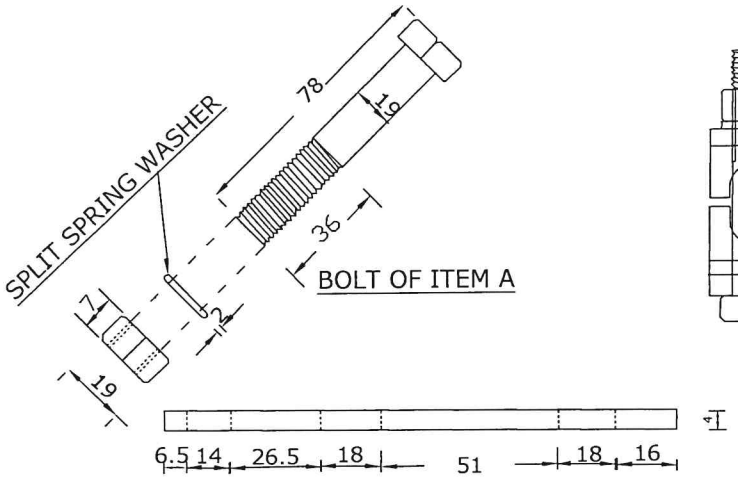
REVISION	DATE	SIGN	CHECKED	DATE

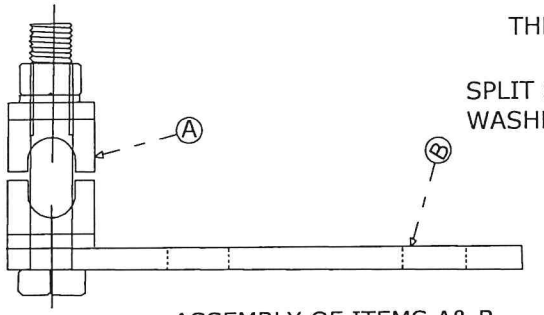
1" OD-3" O.D TEE CLAMP
(CODE NO 114889)
(SCALE: FULL SIZE)

K.P.&L.Co. Ltd.

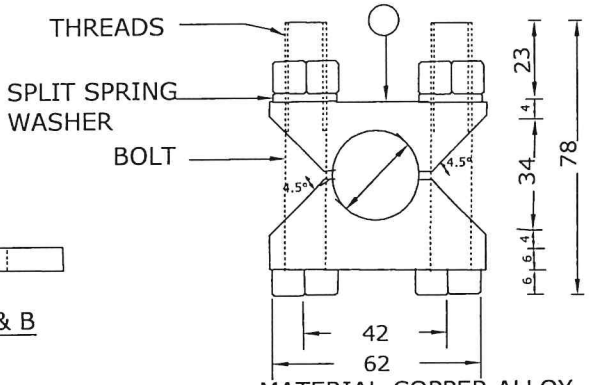
SK. No. 08605

SHEET 19

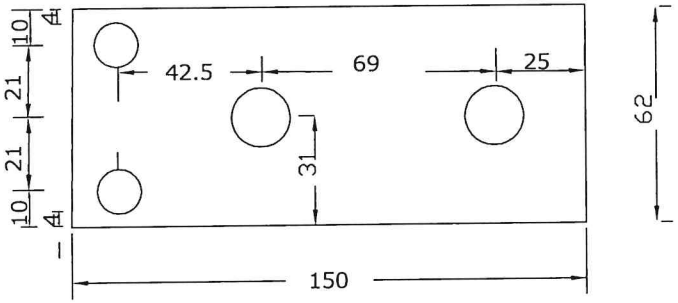




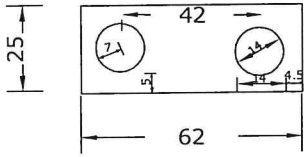
ASSEMBLY OF ITEMS A& B
END ELEVATIONS



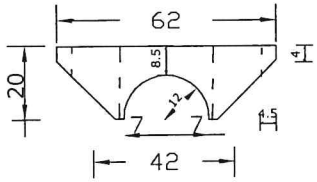
MATERIAL-COPPER ALLOY
END ELEVATION OF END A



MATERIAL COPPER SILVER COATED
PLAN OF ITEM `B '



PLAN OF DETAIL `C '
PART OF ITEM `A '



END ELEVATION
PART OF ITEM `A '

NB
-DIMENSIONS SHOWN IN MM U.O.S

	DATE	NAME	SIGN
APPROVED			
CHECKED ENGINEER I/C			
CHECKED PRINCIPAL D'MAN			
DRAWN	REBECCAH	APRIL 2011	
TRACED			

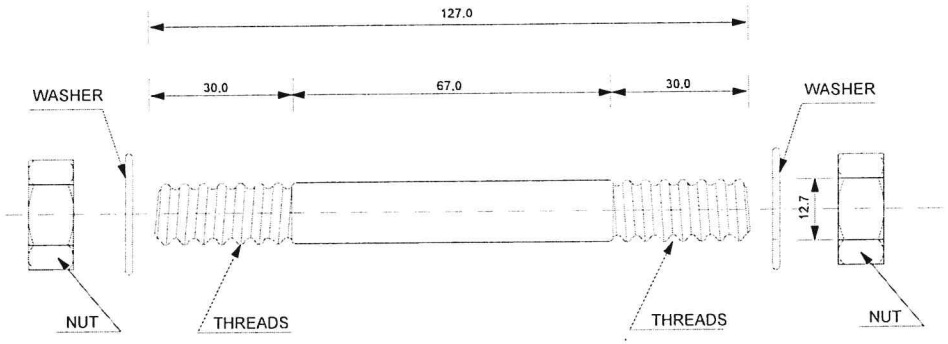
REVISION	DATE	SIGN	CHECKED	DATE

DETAILS OF RIGID CLAMP
FOR 1" CU TUBES(CODE Nos 199160)
(SCALE: FULL SIZE)

SHEET 20

K.P.&L.Co. Ltd.

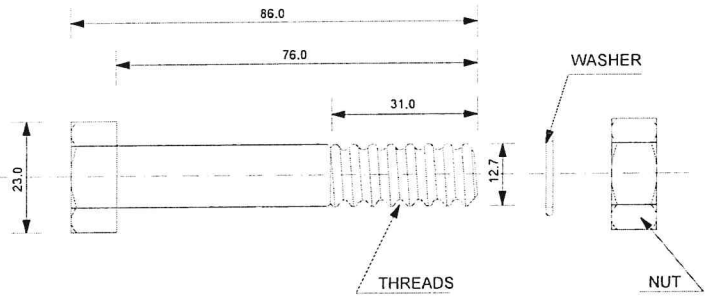
SK. No. 08605



ITEM : 1 - 127mm x 12.7mm (5" - ½") (30mm WHEATWORT THREAD)

MILD STEEL GALVANIZED DOUBLE THREADED **(ITEM 1)**

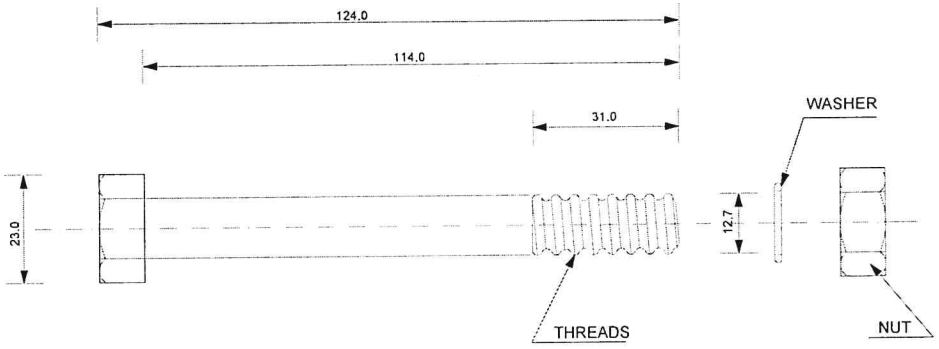
CODE : 180734



ITEM : 2 - 76mm x 12.7mm (3" - ½")

MILD STEEL GALVANIZED WHEAT WORTH THREAD - BOLT & NUT **(ITEM 2)**

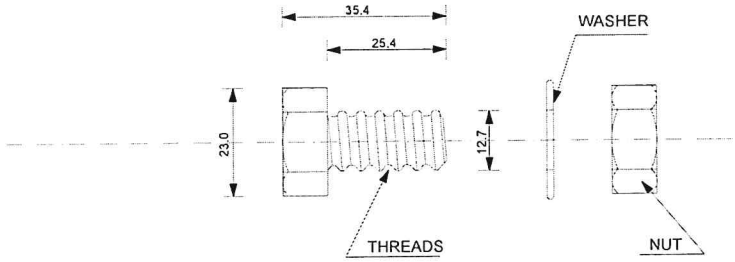
CODE : 180735



ITEM : 3 - 114mm x 12.7mm (4 ½" - ½")

MILD STEEL GALVANIZED WHEAT WORTH THREAD **(ITEM 3)**

CODE : 180738



ITEM : 4 - 25.4mm x 12.7mm (1" - ½")

MILD STEEL GALVANIZED FULL THREAD - BOLT & NUT **(ITEM 4)**

CODE : 180732

CHECKED BY :	**DETAILS OF MILD STEEL GALVANIZED BOLTS & NUTS**	**K.P.L.Co. LTD**
DRAWN BY : J.M.KAHARE		
DATE : 4 / DEC. / 2000		**SK. No. 08605 / 13**
SCALE : 1 : 1		