



PRODUCT STANDARD
PROJECT ENGINEERING & SYSTEMS DIVISION
HYDERABAD

PY55321

Rev No. 02

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TECHNICAL SPECIFICATIONS FOR FRP CABLE TRAYS.

1. SCOPE :

This specification governs the quality requirements of design, manufacture, testing, assembling, and packing at manufacturers work and delivery to project site as per bid enquiry.

2. APPLICABLE STANDARDS:

Below mentioned applicable standards to be followed by bidders

IS- 4249 (1967)	Self Extinguishing Test	
IS -10192 (1982)	Specific Gravity Test	
IS-1731-Part II, (1986)	Fire Retardancy Test	
IS- 14399, Part-1	Glass Content Test	
IS 6746-1994	Unsaturated Polyester Resin systems for low pressure fibre reinforced plastics.	
NEMA FGI1984 & Rev 1993	Fiberglass Tray System -Loading Characteristics	
IS-6746-Appendix-K/UL 94	Flame Retardant	Low Flammability/vo
ASTM-D-2863	Oxygen Index	30%
ASTM-D.-635	Flame Spread (Extent of burning)	20 mm
ASTM-D-638	Tensile Strength at break	4000 - 8000 Kg/Cm2
ASTM-D-638	Tensile Modulus	2.5-4.8 x 10000Kg/Cm2
ASTM-D-790	Flexural Strength at break	2500 -10000 Kg/Cm2
ASTM-D-790	Flexural Modulus	3-5 x 10000Kg/Cm2
ASTM-D-256	Izod Impact Strength	130 Kg/ Cm2
ASTM-D-695	Compressive Strength	2500 - 5000 Kg/ Cm2
ASTM-D-695	Compressive Modulus	2.5 -4.5 Kg/ Cm2
ASTM-D-149	Electric Strength shori term in Oil	
	a) Dielectric strength	Axial: 30-45 Kv/25mm
	b) Dielectric strength	Radial: 10-15 Kv/25mm
	c) Arc Resistance	≥ 120 Seconds
ASTM-D-570	Water absorption	≤0.1-0.25%

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Ref. Doc

Revisions :

Refer to record of revisions :

Prepared :

- Sd/ -
K V NAGENDRA


Checked :

- Sd/ -
SURESH P


Approved :


- Sd/ -
J K Pattanaik

Date :**28/07/18**

TD-201 Rev No. 001	Form No.	 <p style="text-align: center;">PRODUCT STANDARD PROJECT ENGINEERING & SYSTEMS DIVISION HYDERABAD</p>	<p style="text-align: center;">PY55321</p> <p style="text-align: center;">Rev No. 02</p> <p style="text-align: center;">Page 2 of 16</p>
<p style="text-align: center;">3. SPECIFIC CONSTRUCTIONAL REQUIREMENTS:</p> <p>All materials and hardwares to be supplied by the contractor shall be new, unused and of best quality and it shall confirm to the latest specifications of Bureau of Indian Standards</p> <ol style="list-style-type: none"> a) Fiberglass cable trays, fittings and accessories shall be manufactured in accordance with NEMA FG1 and ASTM E-84 standards. b) All cable trays, fittings and accessories shall be made of the fiberglass and shall be corrosion resistant and fire retardant (Class 1, Fire rating) in accordance with the latest ASTM E-84. An additive material shall be mixed with the fiberglass to make them resistant to ultraviolet light. c) Cable trays of Ladder/ Perforated types and all the associated accessories such as coupler plates, tees, elbows, horizontal cross and etc shall be fabricated from FRP Pultruded sections. <p>The Trays shall be supplied along with suitable MS Cleats (Angles), where in one side of the MS cleat shall be bolted to the side rail of FRP Tray with suitable Bolts & Nuts and other side of angle shall be welded to the Support.</p> <p>Bidder shall include supply of MS Cleat (Angle) of suitable size bolted to the side rails of trays at an interval of 1500mm suitable to height of tray sidewalls.</p> <p>Further details shall be as per enclosed sectional drawings.</p> <ol style="list-style-type: none"> d) All the jointing accessories like Nuts, Bolts, Rivets, Washers and etc shall be of SS 316 (Stainless Steel). e) The cable trays shall be supplied in standard length of 3000 mm with min. outside width of 50/150/300/600/750mm as specified in the attached sectional drawings. FRP trays shall have horizontal array of holes of 4 mm diameter at every 300 mm of tray length for cable clamping purpose. Gaps between holes shall be less than 40 mm. f) All the finished cable trays and accessories shall be free from sharp edges, corners, burrs and unevenness. g) The sizes of side runner rails and slotted rungs shall be as shown in the enclosed sectional drawings, unless otherwise specified else where in this specification. h) Cable trays & Covers of width up to 100mm shall be of 4mm thickness , above 100mm and upto 300mm width shall be of 5 mm thickness, above 300mm 			
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<p>COPYRIGHT AND CONFIDENTIAL</p> <p>The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.</p>		<p>width Trays & covers shall be made out of Min 6mm thick FRP Sheets. The thickness of trays mentioned in this clause are final and any another dimensions mentioned anywhere else in the specification shall be ignored. Further details shall be as per enclosed sectional drawings.</p> <p>Notes:</p> <ul style="list-style-type: none"> i) No deviation is allowed on the above mentioned technical requirements and Bidder shall furnish clause wise confirmation to all the points listed above. ii) For sectional, dimensional & constructional details of Perforated type Cable Trays and accessories: Refer attached Sectional Drawings. iii) Bidder shall submit all relevant sectional details (drawings) of main cable trays and all associated accessories like bends, elbows, tees, cross and etc along with the Technical Bid for owner’s evaluation. Technical bids without the above details will not be evaluated and is likely to be rejected technically. iv) Bidder shall also submit continuous satisfactory service of FRP cable trays for at least 4000 hrs in the previously executed projects. v) After award of PO bidder shall furnish all the required drawings for owner’s approval. Bidder shall necessarily obtain Manufacturing Clearances on the drawings from owner, before taking up manufacturing activities. <p>4. Spares: Vendor shall supply 20% additional hardware such as nuts, bolts, splice/connector plate for each type and size of cable trays and accessories. These shall be properly wrapped and packed separately, clearly marked as “spare hardware” for cable trays and shipped along with trays. Packing list shall be furnished so that the parts can be handled without uncrating.</p> <p>5. TEST REQUIREMENTS:</p> <p>Testing of cables trays shall include but not limited to the following</p> <ul style="list-style-type: none"> i) Tests for Mechanical, Electrical and Fire Retardant Properties as per relevant ASTM standard ii) Destruction Load Test as per NEMA FG1 iii) Deflection Test as per NEMA FG1. iv) Flammability Test as per ASTM D635 <p>All relevant Type Tests and Routine Tests Certificates shall be submitted by Bidder for</p>	
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<div style="display: flex; justify-content: space-between;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: small;"> <p>COPYRIGHT AND CONFIDENTIAL</p> <p>The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.</p> </div> <div style="flex-grow: 1;"> <p>Purchaser's review including the followings (In 6 Sets):</p> <ul style="list-style-type: none"> i) Fire Retardant Test Certificates. ii) Reports on Glass Fiber Contents. iii) Internal Load Test Reports. iv) One time weather ability test Reports. <p>6. INSPECTION:</p> <ul style="list-style-type: none"> a) Visual inspection for conformance of dimensional details and materials and etc. shall be carried out at Manufacturer's works in presence of Owner's representatives before dispatch of Materials. b) Inspection call shall be given to owner 15 days in advance for witnessing the inspection. c) It shall be bidder's responsibility to obtain owner's Final approval (without any comments) on the drawings before inspection call is given to owner. d) Quantitative check to ensure that all items with accessories are present according to order and the packing list. e) Assembly check shall be done with fitting of coupler plate along with nuts, bolts and washers on one sample tray. <p>7. PACKING:</p> <p>The offered cable trays along with their accessories shall be shipped to site packed in wooden crates. They shall be wrapped with polythene sheets, before being placed in the crates to prevent damage to finish. Crates shall have skid bottom for handling.</p> <p>8. PRE BID TECHNICAL DOCUMENTS:</p> <p>Two sets of all relevant drawings, technical particulars, routine and type test Certificates, catalogues, shall be furnished along with the technical bid.</p> <p>9. GENERAL:</p> <p>Quantities mentioned are tentative requirement. Based on the actual requirement, quantity can be increased or decreased by about 10% on overall qty. Final BOQ will be informed before price bid opening. Unit rates shall be applicable for the revised BOQ also.</p> </div> </div>				
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10. STANDARD FORMATS

a) CHECK LIST FOR BIDDER

Enquiry No. Date :
Name of the Bidder :
Project :
Specification No : PY 55321,Rev-02
Item : FRP Cable Trays & Covers

S.No	Check point description	Bidder Compliance
1.0	Deviation schedule enclosed (Format-9 (b))	Yes/No
2.0	Filled in Technical data sheets enclosed (Format-9 (c))	Yes/No
3.0	Test Certificates as per clause 5.0	Yes/No
4.0	Duly Signed & stamped Technical Specification (Mandatory)	Yes

* Bidder shall strictly fill up the check list as applicable and submit along with technical offer. Otherwise offer shall not be considered for evaluation.

(Signature of the Bidder with Seal)



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b) DEVIATION SCHEDULE (TECHNICAL)

Enquiry No. Date :
Name of the Bidder :
Project :
Specification No : PY 55321 REV-02
Item : FRP Cable Trays

1. Deviation to tender documents, if any, shall be indicated only in this schedule.
2. Deviation listed elsewhere will be summarily rejected and shall be ignored.
3. Attach more sheets in this format, if required.
4. If there are no deviations the same shall be mentioned in the format and submitted.
5. Bidder may give a consolidated list of deviations in this form only.
6. Bidder shall state reason for the deviations in the remark column.
7. Only the deviations listed herein, in conjunction with the original tender, shall constitute the contract document for the award of the job to the Bidder.

Sl.No.	Cl.No./Page No./Sec No.	Description as specified	Deviation taken	Remarks

(Signature of the Bidder with Seal)



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c) TECHNICAL DATA SHEET FOR FRP CABLE TRAYS:

- 1. Type of cable trays : FRP material perforated tray type
- 2. Material of cable trays : Antistaic & ultra violet resistant FRP
- 3. Manufacturing process : Pultrusion using automated pultrusion machines
- 4. Glass content in cable trays : 45 to 60%
- 5. Resin to be used : Corrosion & ultra violet resistant, Flame Retardant polyester resin.
- 6. Side runner for the cable trays : Pultruded FRP channel of 150x45x45mm
- * Ladder type : Height shall be 150mm
- * Perforated type : 600mm(W) trays height shall be-75mm
: 300mm(W) trays height shall be-75mm
: 150mm(W) trays height shall be -50mm
: 50mm(W)- trays height shall be-30mm
- 7. Support span : 3.0 meters
- 8. Rungs and spacing of rungs : Size of rung shall be 50x20mm or 25x25 square hollow tube.
Pultruded section free of any sharp rojections to avoid damage to cable and joined to the side runner channel and rigid mechanical locking and suitable to withstand specified loading.
Rung spacing shall be 300mm and shall be Provided with slots for clamping the cables.
- 9. Loading on the cable trays :

Ladder Type Cable Trays		
Cable Tray Width	Loading	Point Load at Mid Span
750 mm	120 Kg/Mtr	80 Kg
600 mm	90 Kg/Mtr	
450 mm	75 Kg/Mtr	
300 mm	60 Kg/Mtr	



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Perforated Type Cable Trays		
Cable Tray Width	Loading	Point Load at Mid Span
600 mm	90 Kg/Mtr	70 Kg With as safety factor of 2 shall be considered
300 mm	60 Kg/Mtr	
150 mm	30 Kg/Mtr	
50 mm	7.5 Kg/Mtr	

10. Standard Length of cable tray : Single Stroke 3Mtr
11. Fire retardancy : Shall be very low flammability as per IS-6746 Appendix-K
12. Oxygen index test : Oxygen Index should be minimum 30 as per ASTM-D-2863.
13. Hardware for fixing two successive length of cable trays (such as splicer/coupler plates) : as per cl.no 3d
14. Permissible deflection under test (For Cantilever loading at mid point) : Shall not exceed L/200mms or 10mm which ever is less
15. Mechanical properties of FRP Pultruded Sections:
- a) Ultimate tensile strength : 4000-8000Kg/cm²
 - b) Tensile modulus : 2.5-4.8×10000Kg/cm²
 - c) Flexural modulus : 2500-10000Kg/cm²
 - d) Izod impact : 3-5×10000Kg/cm²
 - e) Izod impact : 130Kg/cm/cm of notch
 - f) Compressive strength : 2500-5000kg/cm²
 - g) Compressive modulus : 2.5-4.5kg/cm²
 - h) Bar col thickness : 50-65
16. Electrical properties of FRP Pultruded Sections:
- a) Dielectric strength : Axial:30-45Kv/25mm
 - b) Dielectric strength : Radial:10-15Kv/mm
 - c) Arc resistance : ≥120 seconds
17. Water absorption : ≤0.1-0.25%

(Signature of the Bidder with Seal)



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11. PACKAGE EXECUTION SCHEDULE

Sl. No.	Event	Schedule of Vendor Drawings
1*	Drawings/Datasheet submission	Within 1 week from P.O. dates
2	BHEL Comments	Within 1 week from receipt of the "Drawings in line with Specification"
3*	Revised Drawings submission	Within 1 week from BHEL's comments date
4	BHEL Comments / Approval for Manufacture Clearance	Within 1 week from receipt of the revised Drawings

* However, it's vendor responsibility to ensure the cycle time reduction for the initial submission of drawings/revised drawings.

12. MATERIAL CODES

Sl. no	Description	Material code
1	600MM(W),3000mm Length,6mm thick Perforated FRP Cable Tray & CP's	PY9755321012
2	300MM(W),3000mm Length, 5mm thick Perforated FRP Cable Tray & CP's	PY9755321020
3	150MM(W),3000mm Length, 5mm thick Perforated FRP Cable Tray & CP's	PY9755321039
4	50MM(W),3000mm Length, 4mm thick Perforated FRP Cable Tray & CP's	PY9755321071
5	Cover for 600MM (W), 3000mm Length, 6mm thick Perforated FRP Cable Tray	PY9755321047
6	Cover for 300MM (W), 3000mm Length, 5mm thick Perforated FRP Cable Tray	PY9755321055
7	Cover for 150MM (W), 3000mm Length, 5mm thick Perforated FRP Cable Tray	PY9755321063
8	Cover for 50MM (W), 3000mm Length, 4ssmm thick Perforated FRP Cable Tray	PY9755321080

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FRP PERFORATED TYPE CABLE TRAYS



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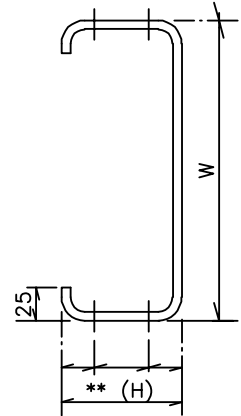
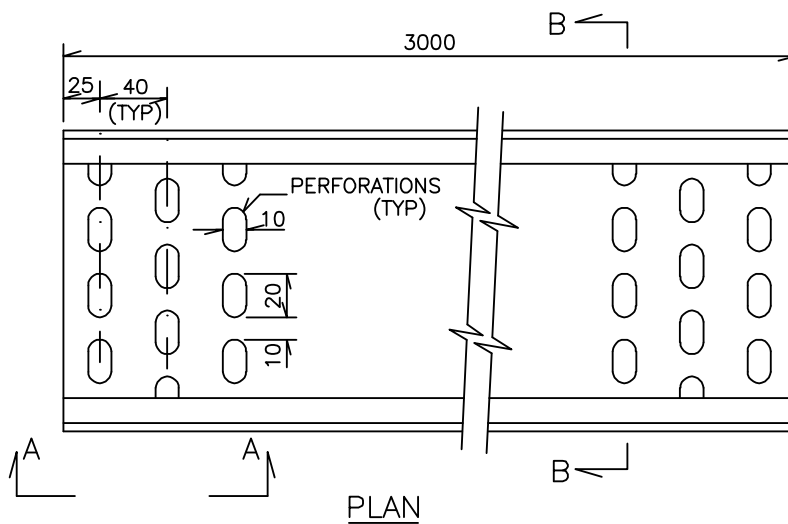
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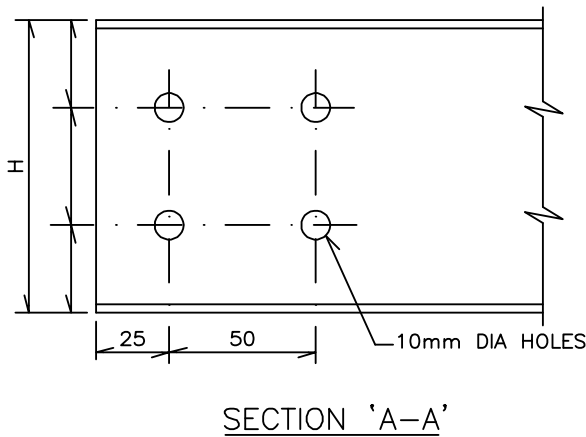
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TYPICAL ARRANGEMENT FOR PERFORATED TYPE STRAIGHT RUN CABLE TRAY
ALONG WITH ACCESSORIES & COUPLER PLATES

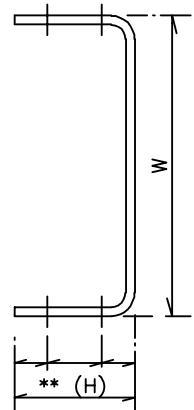


SECTION 'B-B'
FOR 600mm, 300mm,
FOR 150mm TRAYS



DESCRIPTION	HEIGHT(H)	THICKNESS
600mm(W) CABLE TRAY	75mm	6mm
300mm(W) CABLE TRAY	75mm	5mm
150mm(W) CABLE TRAY	50mm	5mm
50mm(W) CABLE TRAY	30mm	4mm

*- THICKNESS SHALL BE ASPER THIS TABLE



SECTION 'B-B'
FOR 50MM TRAY

NOTES

1. HEIGHT & THICKNESS OF TRAY SIDE WALLS ARE INDICATED IN THE TABLE. BIDDER MAY PLEASE INDICATE THE SAME AS PER THEIR STANDARD PRODUCTS AVAILABLE , SUITABLE FOR TRAYS OF 50/150/300/600MM.
2. BHEL RESERVES THE RIGHT TO DECIDE THE HEIGHT OF SIDE RAILS AND SAME TO BE INCORPORATED BY BIDDERS.
3. STRAIGHT RUN FOR PERFORATED TYPE CABLE TRAY, SHALL INCLUDE 2 Sets OF COUPLER PLATES ALONG WITH ACCESSORIES LIKE NUTS, BOLTS AND WASHERS.
4. ALL DIMENSIONS ARE IN mm. PLEASE NOTE THAT NEGATIVE TOLERANCE IN ANY DIMENSIONS, ARE NOT ACCEPTABLE. HOWEVER A POSITIVE TOLERANCE OF +2mm CAN BE ACCEPTED.
5. MATERIAL CODES FOR VARIOUS PERFORATED TYPE STRAIGHT RUN CABLE TRAY ARE GIVEN IN THE FOLLOWING PAGE.
6. THE DETAILS SHOWN IN THE DRAWING ARE TYPICAL FOR PERFORATED TYPE CABLE TRAYS.

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MATERIAL CODES FOR PERFORATED TYPE STRAIGHT RUN CABLE TRAY
ALONG WITH ACCESSORIES AND COUPLER PLATES

SL NO	DESCRIPTION	MATERIAL CODE
01	600 mm WIDTH,6mm THICK PERFORATED TYPE STRAIGHT RUN CABLE TRAY ALONG WITH ACCESSORIES INCLUDING COUPLER PLATES	PY9755321012
02	300 mm WIDTH,5mm THICK PERFORATED TYPE STRAIGHT RUN CABLE TRAY ALONG WITH ACCESSORIES INCLUDING COUPLER PLATES	PY9755321020
03	150 mm WIDTH,5mm THICK PERFORATED TYPE STRAIGHT RUN CABLE TRAY ALONG WITH ACCESSORIES INCLUDING COUPLER PLATES	PY9755321039
04	50 mm WIDTH,4mm THICK PERFORATED TYPE STRAIGHT RUN CABLE TRAY ALONG WITH ACCESSORIES INCLUDING COUPLER PLATES	PY9755321071

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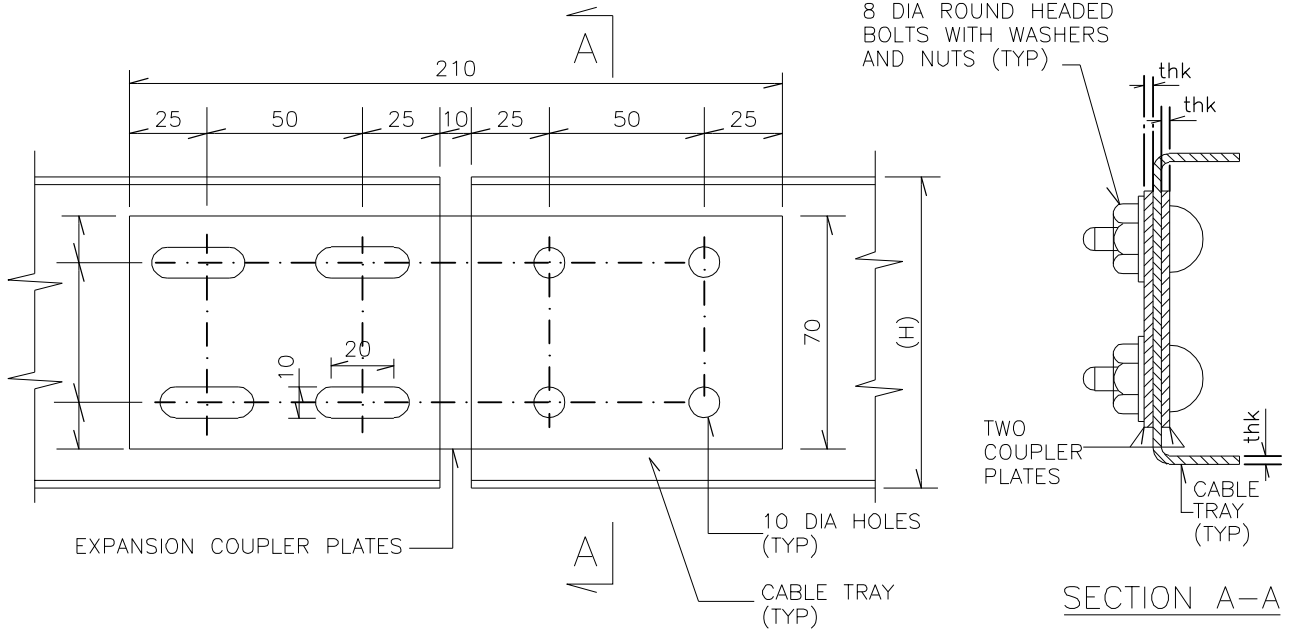
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TYPICAL ARRANGEMENT FOR COUPLER PLATE SET ALONG WITH ACCESSORIES
FOR PERFORATED TYPE CABLE TRAYS



NOTES

1. ALL DIMENSIONS ARE IN mm. PLEASE NOTE THAT NEGATIVE TOLERANCE IN ANY DIMENSIONS, ARE NOT ACCEPTABLE. HOWEVER A POSITIVE TOLERANCE OF +2mm CAN BE ACCEPTED.
2. TWO COUPLER PLATES TO BE PROVIDED ONE EACH ON EITHER SIDE OF TRAY.
3. ONE SET OF COUPLER PLATE WITH ACCESSORIES SHALL INCLUDE 2No. OF COUPLER PLATES 8No. OF NUTS, BOLTS AND WASHERS AS SHOWN IN THE DRAWING

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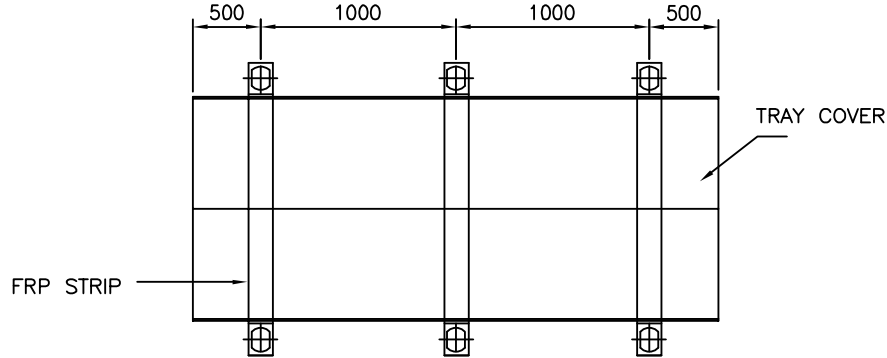
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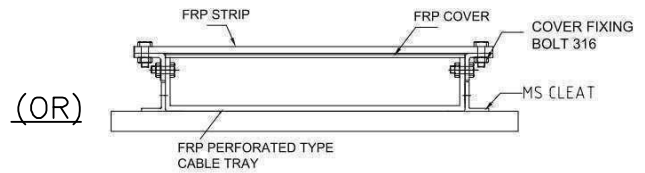
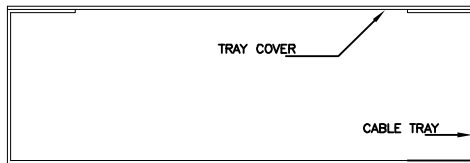
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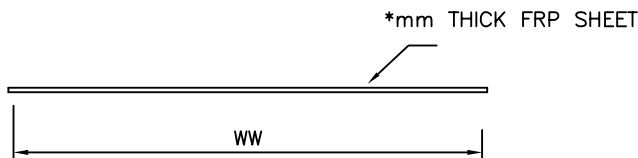
TYPICAL ARRANGEMENT FOR CABLE TRAY COVER ALONG WITH ACCESSORIES
FOR PERFORATED TYPE CABLE TRAYS



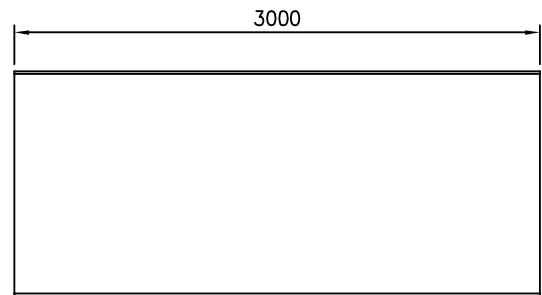
CABLE TRAY COVER WITH ACCESSORIES-PLAN



CABLE TRAY COVER WITH ACCESSORIES-ELEVATION



CABLE TRAY COVER-ELEVATION



CABLE TRAY COVER-PLAN

CABLE TRAYS COVERS OF WIDTH UP TO 100MM SHALL BE OF 4MM THICKNESS, ABOVE 100MM AND UPTO 300MM WIDTH SHALL BE OF 5 MM THICKNESS, ABOVE 300MM WIDTH TRAYS & COVERS SHALL BE MADE OUT OF MIN 6MM THICK FRP SHEETS.

NOTES

1. CABLE TRAY COVER SHALL INCLUDE 1 No OF TRAY COVER OF 3000 mm LENGTH ALONG WITH 3Nos OF TOP CLAMP STRIP, 3Nos OF BOTTOM CLAMP STRIP AND 6Nos OF BOLTS ALONG WITH NUTS AND WASHERS. IF FLAT COVERS ARE SUGGESTED BY MANUFACTURER THEN ARRANGEMENT SHALL BE SUBMITTED ALONG WITH MOUNTING AND FIXING DETAILS DURING TECHNICAL BID SUBMISSION FOR PURCHASER REVIEW/ACCEPTANCE.
2. ALL DIMENSIONS ARE IN mm. PLEASE NOTE THAT NEGATIVE TOLERANCE IN ANY DIMENSIONS, ARE NOT ACCEPTABLE. HOWEVER A POSITIVE TOLERANCE OF +2mm CAN BE ACCEPTED.
3. ALL THE ACCESSORIES EXCEPT NUTS AND BOLTS SHALL BE FABRICATED FROM FRP SHEET THICKNESS MENTIONED ABOVE.
4. MATERIAL CODES FOR CABLE TRAY COVERS WITH ACCESSORIES FOR VARIOUS TYPE OF PERFORATED TYPE CABLE TRAYS, ARE GIVEN IN THE FOLLOWING PAGE.
5. THE DETAILS SHOWN IN THE DRAWING ARE TYPICAL FOR PERFORATED TYPE CABLE TRAYS.

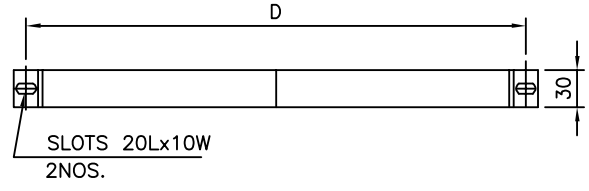
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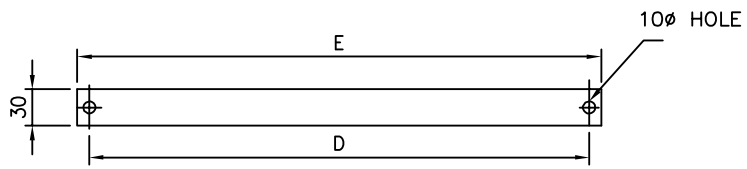
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TOP CLAMP STRIP-PLAN



BOTTOM CLAMP STRIP-ELEVATION

DESCRIPTION	WW	D	E	H
COVER FOR 600mm TRAY	600	638	668	25
COVER FOR 300mm TRAY	300	338	368	25
COVER FOR 150mm TRAY	150	188	218	25
COVER FOR 50mm TRAY	50	88	118	25

MATERIAL CODES FOR TRAY COVERS ALONG WITH ACCESSORIES
FOR PERFORATED TYPE CABLE TRAYS

SL NO	DESCRIPTION	MATERIAL CODE
05	COVER ALONG WITH ACCESSORIES FOR 600 mm WIDTH PERFORATED TYPE CABLE TRAY (6mm THICK)	PY9755321047
06	COVER ALONG WITH ACCESSORIES FOR 300 mm WIDTH PERFORATED TYPE CABLE TRAY (5mm THICK)	PY9755321055
07	COVER ALONG WITH ACCESSORIES FOR 150 mm WIDTH PERFORATED TYPE CABLE TRAY (5mm THICK)	PY9755321063
08	COVER ALONG WITH ACCESSORIES FOR 50 mm WIDTH PERFORATED TYPE CABLE TRAY (4mm THICK)	PY9755321080

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