



CSI SECTION 271123

CABLE MANAGEMENT

The purpose of this document is to provide documentation to cabling professionals interested in providing their customer a standard specification applicable to commercial building structured cabling applications.

The documentation includes: Product specifications, minimum product performance, structured cabling design considerations and installation guidelines.

The information contained in this document is based on our experience to date and is believed to be reliable. It is intended as a guide for use by persons having technical skill and is to be used with their own discretion and risk. We do not guarantee favorable results or assume any liability in connection with its use. Dimensions contained herein are for reference purposes only. For specific dimensional requirements consult the factory. This publication is not to be taken as a license to operate under, or a recommendation to infringe any existing patents. This supersedes and voids all previous literature, etc.

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SECTION 271123 - COMMUNICATIONS CABLE MANAGEMENT AND LADDER RACK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 0 & 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Telecommunications mounting elements, ladder rack and cable management.
- B. Related Sections:
 - 1. Section 270500 "Common Work Results for Communications"
 - 2. Section 271323 "Communications Optical Fiber Backbone Cabling"
 - 3. Section 271315 "Communications Copper Horizontal Cabling"
 - 4. Section 260526 "Grounding and Bonding for Communications Systems"
 - 5. Section 260536 "Pathways for Communications Systems"

1.3 SUBMITTALS

- A. Coordinate with Division 0 & 1.
- B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- C. Shop Drawings: For communications equipment room fittings. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled by a qualified testing agency, and marked for intended location and application.
- B. Product Warranty
 - 1. Refer to Section 270500 "Common Work Results for Communications"

- C. Comply with the National Electrical Code and the National Building Code..
- D. Grounding: Comply with ANSI-J-STD-607-A and the National Electrical Code.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install equipment frames and cable trays until spaces are enclosed and weather-tight, wet work in spaces is complete and dry, and work above ceilings is complete.

1.6 COORDINATION

- A. Refer to Divisions 0 and 1.
- B. Coordinate layout and installation of communications equipment with Owner's telecommunications and LAN equipment and service suppliers. Coordinate service entrance arrangement with local exchange carrier.
 - 1. Meet jointly with telecommunications and LAN equipment suppliers, local exchange carrier representatives, and Owner to exchange information and agree on details of equipment arrangements and installation interfaces.
 - 2. Record agreements reached in meetings and distribute them to other participants.
 - 3. Adjust arrangements and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.
 - 4. Adjust arrangements and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in the equipment room.

PART 2 - PRODUCTS

- 2.1 Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:
 - a. PANDUIT

2.2 PATHWAYS within the Data Center, Network Center, IDFs and Net Pops.

- A. Refer to Division 26, Section 260536 "Cable Trays For Electrical Systems"
- B. General Requirements: Comply with TIA/EIA-569-B, the National Building Code and the National Electrical Code.

- C. Cable Support: NRTL labeled. Cable support brackets shall be designed to prevent degradation of cable performance and pinch points that could damage cable. Cable tie slots fasten cable ties to brackets.
1. Comply with the National Electrical Code and UL 2043 for fire-resistant and low-smoke-producing characteristics.
 2. Support brackets with cable tie slots for fastening cable ties to brackets.
 3. Lacing bars, spools, J-hooks, and D-rings.
 4. Straps and other devices.
- D. Ladder Rack: (Cable Runway):
1. Ladder Rack Materials: Ladder rack shall be of tubular steel construction:
 - a. Ladder Cable Trays: Nominally 18 inches wide, with a rung spacing of 9 inches.
 - b. Color: Black Enamel
 - c. Straight sections of ladder rack shall be provided in 10 ft. standard lengths.
 - d. Stringers (Side rails to be 1-1/2" deep x 3/8" wide)
- E. Optical Fiber Routing System (Fiber Runner):
1. The optical fiber routing system shall be used to route, segregate and protect fiber optic communication cabling.
 - a. UL Listed (UL2024A)
 - b. Size: 6" x 4" and 4" x 4" (Per Drawings)
 - c. 2" minimum bend radius through-out pathway.
 - d. Impact Resistant and flame retardant material. (UL94-V0 Flammability).
 - e. Color: Yellow
 - f. Will include all mounting hardware, waterfalls, directional fittings and other accessories required for installation
- F. Vertical Wire Manager Cage with a door (Per Drawings)
1. Physical characteristics
 - a. Color: Black
 - b. Wide: 6", 8", 10" (Per Drawings)
 - c. Deep: 13"
 - d. High: 7'
- G. Vertical Wire Manager Cage without door (Per Drawings)
1. Physical characteristics
 - a. Color: Black
 - b. Wide: 6", 8", 10" (Per Drawings)
 - c. Deep: 13"
 - d. High: 7'
- H. Horizontal Cable Management for Equipment Frames:
1. Physical Characteristics:
 - a. Color: Black
 - b. Wide: 19"
 - c. Deep: 6.76
 - d. Rack Units High: 2
 2. Metal, with integral wire retaining fingers.

3. Baked-polyester powder coat finish.
4. Vertical cable management panels shall have front and rear channels, with covers.



5. Provide horizontal crossover cable manager at the top of each rack, with a minimum height of two rack units each.

D. Wall or Backboard Mounted Cable Management

1. Hinged Cover Wiring Duct

A wide slotted wiring duct or solid wall wiring duct shall be used to route, protect and contain horizontal or cross-connect cabling around or near communications equipment that is wall-mounted. A snap-on hinged cover shall be used to prevent cover loss and provide easy access to the channel for moves, adds or changes. A selection of bend radius control accessories shall be available for routing cabling around inside corners and to feed in or out of the channel.

2. Slotted Hinged Wiring Duct Base

Part Number	Description	Color	Dimensions W x H (in.)
H1.5X2BL6	Type H Slotted Wall Base- 6 foot	Black	1.75 x 1.92
H1.5X3BL6	Type H Slotted Wall Base- 6 foot	Black	1.75 x 3.00
H2X2BL6	Type H Slotted Wall Base- 6 foot	Black	2.17 x 1.92
H2X3BL6	Type H Slotted Wall Base- 6 foot	Black	2.17 x 3.00
H2X4BL6	Type H Slotted Wall Base- 6 foot	Black	2.17 x 4.00
H3X3BL6	Type H Slotted Wall Base- 6 foot	Black	3.25 x 3.00
H3X4BL6	Type H Slotted Wall Base- 6 foot	Black	3.25 x 4.00
H4X4BL6	Type H Slotted Wall Base- 6 foot	Black	4.25 x 4.00

3. Solid Hinged Wiring Duct Base

Part Number	Description	Color	Dimensions W x H (in.)
HS2X2BL6NM	Type H Solid Wall Base-6 foot	Black	2.17 x 1.92
HS4X4BL6NM	Type H Solid Wall Base-6 foot	Black	4.25 x 4.00

5. Cover for Hinged Wiring Duct

Part Number	Description	Color	Dimensions W x H (in.)
HC1.5BL6	Type H 1.5" Hinged Cover-6 foot	Black	—
HC2BL6	Type H 2" Hinged Cover-6 foot	Black	—
HC3BL6	Type H 2" Hinged Cover-6 foot	Black	—
HC4BL6	Type H 2" Hinged Cover-6 foot	Black	—

Other colors: Replace BL in part number with LG for Light Gray or WH for White.
NM= provided without mounting holes.

6. Hinged Wiring Duct Accessories

Part Number	Description	Color	For Duct Height
CSC1LG6	Cut-to-size 6 foot corner strip with a 1" bend radius	Light Gray	All sizes (Cut to size)
CSC1BL6		Black	
TRC2HDBL	Bend Radius Control Trumpet for 2" height Type H Duct	Black	2"
WR2H-C	Wire Retainer for 2" duct width	Black	-
WR3-C	Wire Retainer for 3" duct width	Black	-
WR4-C	Wire Retainer for 4" duct width	Black	-

E. J-MOD™ Cable Support System

Open top cable supports shall be utilized as a pathway for communication cabling. The J Hook cable supports shall be manufactured from a non-conductive material suitable for use in air-handling spaces. The cable support must maintain complete horizontal and vertical 1" bend radius control and must manage up to 50, 0.24" O. D. cables. The system must allow for the ability to add future cable routing capacity. The cable support must provide the ability to retain the cable bundle with TAK-TY® Hook & Loop Cable Ties.

Part Number	Description	Material*
JMJH2W-X20	J Hook for wall mount applications	Nylon
JMJH2-X20	J Hook for use with brackets	Nylon
JMCB-X	Chaining Bracket	Galvanized Steel
JMCMB25-1-X	Ceiling Mount Bracket – 1 level	Galvanized Steel
JMCMB25-3-X**	Ceiling Mount Bracket – 3 level	Galvanized Steel
JMDWB-1-X	Drop Wire Bracket – 1 level	Galvanized Steel
JMDWB-3-X**	Drop Wire Bracket – 3 level	Galvanized Steel
JMTRB38-1-X	Threaded Rod Bracket – 1level	Galvanized Steel
JMTRB38-3-X**	Threaded Rod Bracket – 3level	Galvanized Steel



JMSBCB87-1-X	Screw-on Beam Clamp Bracket – 1 level	Galvanized Steel
JMSBCB87-3-X**	Screw-on Beam Clamp Bracket – 3 level	Galvanized Steel

** Not for use with chaining brackets

* Suitable for use in air handling spaces per UL 2043.

Listed in accordance with CAN/ULC S102.2 when mounted as single units or in pairs.

Minimum spacing of 4 ft. (1220mm) required between mount points.

(Flame Spread Rating = 0, Smoke Developed Classification = 30)

Maximum Cable Capacity

Part Number	Category 6A (0.300")	Category 6 (0.240")	Category 5e (0.225")
JMJH2W or JMJD2	30	46	55

J-PRO™ Cable Support System

Open top cable supports shall be utilized as a pathway for communication cabling. The J Hook cable supports shall be manufactured from a non-conductive material suitable for use in air-handling spaces. The pre-ripped J Hook assemblies must maintain complete horizontal and vertical 1" bend radius control. The cable support must provide the ability to retain the cable bundle with *TAK-TY®* Hook & Loop Cable Ties.

Part Number	Part Description	Bundle Capacity (In)	Material*	Max. Cable Capacity	
				Cat 6 (0.240")	Cat 5e (0.225")
JP75CM-L20	J Hook with ceiling mount bracket that has one 3/16" (M5), 1/4" (M6) and 3/8" (M10) mounting hole.	0.75	Nylon 6.6 J Hook with metal attachments	8	10
JP75CP-L20	J Hook with c-purlin clip for use with vertical flanges up to 1/4" thick.	0.75	Nylon 6.6 J Hook with metal attachments	8	10
JP75DW-L20	J Hook with clip for use with #12 wire, threaded rod up to 3/8" in diameter, or 1/8" – 3/8" thick flanges.	0.75	Nylon 6.6 J Hook with metal attachments	8	10
JP75HBC25R-L20	J Hook with hammer-on beam clamp for use with flanges 1/8" – 1/4" thick. Rotates 360 degrees.	0.75	Nylon 6.6 J Hook with metal attachments	8	10
JP75HBC50R-L20	J Hook with hammer-on beam clamp for use with flanges 5/16" – 1/2" thick. Rotates 360 degrees.	0.75	Nylon 6.6 J Hook with metal attachments	8	10
JP75HBC75R-L20	J Hook with hammer-on beam clamp for use with flanges 9/16" – 3/4" thick. Rotates 360 degrees.	0.75	Nylon 6.6 J Hook with metal attachments	8	10
JP75SBC50-L20	J Hook with screw-on beam clamp for use with flanges up to 1/2" thick.	0.75	Nylon 6.6 J Hook with metal attachments	8	10
JP75SBC50R-L20	J Hook with screw-on beam clamp for use with flanges up to 1/2" thick. Rotates 360 degrees.	0.75	Nylon 6.6 J Hook with metal attachments	8	10



JP75SBC87-L20	J Hook with screw-on beam clamp for use with flanges up to 3/4" thick.	0.75	Nylon 6.6 J Hook with metal attachments	8	10
JP75SBC87R-L20	J Hook with screw-on beam clamp for use with flanges up to 3/4" thick. Rotates 360 degrees.	0.75	Nylon 6.6 J Hook with metal attachments	8	10
JP75UF100-L20	J Hook with under floor pedestal support clamp for use with pedestal support up to 7/8" sq. or 1 1/8" - 1 3/8" in diameter.	0.75	Nylon 6.6 J Hook with metal attachments	8	10
JP75W-L20	J Hook for wall mount applications. One 1/4" (M6) mounting hole for user supplied screw.	0.75	Nylon 6.6	8	10
JP75WP2-L20	J Hook for powder actuated installation on walls. One 5/32" (M4) mounting hole and one 1/4" (M6) mounting hole for user supplied fasteners.	0.75	Nylon 6.6 J Hook with metal attachments	8	10
JP75ZP-L20	J Hook with z-purlin clip for use with angled flanges up to 1/4" thick.	0.75	Nylon 6.6 J Hook with metal attachments	8	10
JP131CM-L20	J Hook with ceiling mount bracket that has one 3/16" (M5), 1/4" (M6) and 3/8" (M10) mounting hole.	1.31	Nylon 6.6 J Hook with metal attachments	25	29
JP131CP-L20	J Hook with c-purlin clip for use with vertical flanges up to 1/4" thick.	1.31	Nylon 6.6 J Hook with metal attachments	25	29
JP131DW-L20	J Hook with clip for use with #12 wire, threaded rod up to 3/8" in diameter, or 1/8" – 3/8" thick flanges.	1.31	Nylon 6.6 J Hook with metal attachments	25	29
JP131HBC25R-L20	J Hook with hammer-on beam clamp for use with flanges 1/8" – 1/4" thick. Rotates 360 degrees.	1.31	Nylon 6.6 J Hook with metal attachments	25	29
JP131HBC50R-L20	J Hook with hammer-on beam clamp for use with flanges 5/16" – 1/2" thick. Rotates 360 degrees.	1.31	Nylon 6.6 J Hook with metal attachments	25	29
JP131HBC75R-L20	J Hook with hammer-on beam clamp for use with flanges 9/16" – 3/4" thick. Rotates 360 degrees.	1.31	Nylon 6.6 J Hook with metal attachments	25	29
JP131SBC50-L20	J Hook with screw-on beam clamp for use with flanges up to 1/2" thick.	1.31	Nylon 6.6 J Hook with metal attachments	25	29
JP131SBC50R-L20	J Hook with screw-on beam clamp for use with flanges up to 1/2" thick. Rotates 360 degrees.	1.31	Nylon 6.6 J Hook with metal attachments	25	29
JP131SBC87-L20	J Hook with screw-on beam clamp for use with flanges up to 3/4" thick.	1.31	Nylon 6.6 J Hook with metal attachments	25	29
JP131SBC87R-L20	J Hook with screw-on beam clamp for use with flanges up to 3/4" thick. Rotates 360 degrees.	1.31	Nylon 6.6 J Hook with metal attachments	25	29



JP131UF100-L20	J Hook with under floor pedestal support clamp for use with pedestal support up to 7/8" sq. or 1 1/8" - 1 3/8" in diameter.	1.31	Nylon 6.6 J Hook with metal attachments	25	29
JP131W-L20	J Hook for wall mount applications. One 1/4" (M6) mounting hole for user supplied screw.	1.31	Nylon 6.6	25	29
JP131WP2-L20	J Hook for powder actuated installation on walls. One 5/32" (M4) mounting hole and one 1/4" (M6) mounting hole for user supplied fasteners.	1.31	Nylon 6.6 J Hook with metal attachments	25	29
JP131ZP-L20	J Hook with z-purlin clip for use with angled flanges up to 1/4" thick.	1.31	Nylon 6.6 J Hook with metal attachments	25	29
JP2CM-L20	J Hook with ceiling mount bracket that has one 3/16" (M5), 1/4" (M6), and 3/8" (M10) mounting hole.	2	Nylon 6.6 J Hook with metal attachments	46	55
JP2CP-L20	J Hook with c-purlin clip for use with vertical flanges up to 1/4" thick.	2	Nylon 6.6 J Hook with metal attachments	46	55
JP2DW-L20	J Hook with clip for use with #12 wire, threaded rod up to 3/8" in diameter, or 1/8" - 3/8" thick flanges.	2	Nylon 6.6 J Hook with metal attachments	46	55
JP2HBC25R-L20	J Hook with hammer-on beam clamp for use with flanges 1/8" - 1/4" thick. Rotates 360 degrees.	2	Nylon 6.6 J Hook with metal attachments	46	55
JP2HBC50R-L20	J Hook with hammer-on beam clamp for use with flanges 5/16" - 1/2" thick. Rotates 360 degrees.	2	Nylon 6.6 J Hook with metal attachments	46	55
JP2HBC75R-L20	J Hook with hammer-on beam clamp for use with flanges 9/16" - 3/4" thick. Rotates 360 degrees.	2	Nylon 6.6 J Hook with metal attachments	46	55
JP2SBC50-L20	J Hook with screw-on beam clamp for use with flanges up to 1/2" thick.	2	Nylon 6.6 J Hook with metal attachments	46	55
JP2SBC50R-L20	J Hook with screw-on beam clamp for use with flanges up to 1/2" thick. Rotates 360 degrees.	2	Nylon 6.6 J Hook with metal attachments	46	55
JP2SBC87-L20	J Hook with screw-on beam clamp for use with flanges up to 3/4" thick.	2	Nylon 6.6 J Hook with metal attachments	46	55
JP2SBC87R-L20	J Hook with screw-on beam clamp for use with flanges up to 3/4" thick. Rotates 360 degrees.	2	Nylon 6.6 J Hook with metal attachments	46	55
JP2UF100-L20	J Hook with under floor pedestal support clamp for use with pedestal support up to 7/8" sq. or 1 1/8" - 1 3/8" in diameter.	2	Nylon 6.6 J Hook with metal attachments	46	55
JP2W-L20	J Hook for wall mount applications. One 1/4" (M6) mounting hole for user supplied screw.	2	Nylon 6.6	46	55



JP2WP2-L20	J Hook for powder actuated installation on walls. One 5/32" (M4) mounting hole and one 1/4" (M6) mounting hole for user supplied fasteners.	2	Nylon 6.6 J Hook with metal attachments	46	55
JP2ZP-L20	J Hook with z-purlin clip for use with angled flanges up to 1/4" thick.	2	Nylon 6.6 J Hook with metal attachments	46	55
JP4CM-X20	J Hook with ceiling mount bracket that has one 3/16" (M5), 1/4" (M6) and 3/8" (M10) mounting hole.	4	Nylon 6.6 J Hook with metal attachments	180	200
JP4CP-X20	J Hook with c-purlin clip for use with vertical flanges up to 1/4" thick.	4	Nylon 6.6 J Hook with metal attachments	180	200
JP4HBC25R-X20	J Hook with hammer-on beam clamp for use with flanges 1/8" - 1/4" thick. Rotates 360 degrees.	4	Nylon 6.6 J Hook with metal attachments	180	200
JP4HBC50R-X20	J Hook with hammer-on beam clamp for use with flanges 5/16" - 1/2" thick. Rotates 360 degrees.	4	Nylon 6.6 J Hook with metal attachments	180	200
JP4HBC75R-X20	J Hook with hammer-on beam clamp for use with flanges 5/16" - 1/2" thick. Rotates 360 degrees.	4	Nylon 6.6 J Hook with metal attachments	180	200
JP4SBC50-X20	J Hook with screw-on beam clamp for use with flanges up to 1/2" thick.	4	Nylon 6.6 J Hook with metal attachments	180	200
JP4SBC50R-X20	J Hook with screw-on beam clamp for use with flanges up to 1/2" thick. Rotates 360 degrees.	4	Nylon 6.6 J Hook with metal attachments	180	200
JP4SBC87-X20	J Hook with screw-on beam clamp with flanges up to 3/4" thick.	4	Nylon 6.6 J Hook with metal attachments	180	200
JP4SBC87R-X20	J Hook with screw-on beam clamp with flanges up to 3/4" thick. Rotates 360 degrees.	4	Nylon 6.6 J Hook with metal attachments	180	200
JP4UF100-X20	J Hook with under floor pedestal support clamp for use with pedestal support up to 7/8" sq. or 1 1/8" - 1 3/8" in diameter.	4	Nylon 6.6 J Hook with metal attachments	180	200
JP4W-X20	J Hook for wall mount applications. One 1/4" (M6) mounting hole for user supplied screw.	4	Nylon 6.6	180	200
JP4WP2-X20	J Hook for powder actuated installation on walls. One 5/32" (M4) mounting hole and one 1/4" (M6) mounting hole for user supplied fasteners.	4	Nylon 6.6 J Hook with metal attachments	180	200
JP4ZP-X20	J Hook with z-purlin clip for use with angled flanges up to 1/4" thick.	4	Nylon 6.6 J Hook with metal attachments	180	200

* Suitable for use in air handling spaces in accordance with Sec. 300.22 (c) and (d) of the National Electrical Code when mounted as single units or in pairs. JP4 family of parts suitable for use in single unit configurations only. Listed in accordance with CAN/ULC S102.2 when mounted as single units or in pairs. Maximum spacing of 4' (1220mm) required between mount points. (Flame Spread Rating = 0, Smoke Developed Classification = 20)



PART 3 - EXECUTION

3.1 ENTRANCE FACILITIES

- A. Cut standard straight sections of materials to length in the field.
- B. De-bur and file all rough cable tray and ladder rack edges at any cut sections.
- C. Cable runway locations shown on the drawings are approximate unless dimensioned.
- D. Install cable runway as shown on the drawings.
- E. All cable runways shall be accessible.
- F. Maintain minimum 6-inch clearance between cable runway and piping. Locate cable runway at least 12 inches away from electrical or heat sources such as parallel runs of flues, steam or hot water pipes, and heating appliances.
- G. Run exposed and concealed cable runway parallel or perpendicular to walls, structural members, or intersections of vertical planes to maintain headroom and provide a neat appearance.
- H. Passageways shall not be obstructed.
- I. Install appropriate cable runway bends, dropouts, and other accessories to protect minimum cable bend radius and provide adequate support at all locations where cable direction changes occur.

3.2 INSTALLATION

- A. Installation shall be in compliance with the National Build Code and the National Electrical Code.
- B. Install aerial pathways complying with recommendations in TIA/EIA-569-B, "Entrance Facilities" Article.
- C. Comply with all drawings and BICSI TDMM for layout and installation of communications equipment rooms.
- D. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

END OF SECTION 271123

Компания «Life Electronics» занимается поставками электронных компонентов импортного и отечественного производства от производителей и со складов крупных дистрибьюторов Европы, Америки и Азии.

С конца 2013 года компания активно расширяет линейку поставок компонентов по направлению коаксиальный кабель, кварцевые генераторы и конденсаторы (керамические, пленочные, электролитические), за счёт заключения дистрибьюторских договоров

Мы предлагаем:

- Конкурентоспособные цены и скидки постоянным клиентам.
- Специальные условия для постоянных клиентов.
- Подбор аналогов.
- Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.
- Приемлемые сроки поставки, возможна ускоренная поставка.
- Доставку товара в любую точку России и стран СНГ.
- Комплексную поставку.
- Работу по проектам и поставку образцов.
- Формирование склада под заказчика.
- Сертификаты соответствия на поставляемую продукцию (по желанию клиента).
- Тестирование поставляемой продукции.
- Поставку компонентов, требующих военную и космическую приемку.
- Входной контроль качества.
- Наличие сертификата ISO.

В составе нашей компании организован Конструкторский отдел, призванный помогать разработчикам, и инженерам.

Конструкторский отдел помогает осуществить:

- Регистрацию проекта у производителя компонентов.
- Техническую поддержку проекта.
- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.



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