

“Paper on Busbar Trunking System for Electrical Supply to Industrial & commercial Installation”

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Abstract : - Busbar Trunking System is a prefabricated electrical distribution system consisting of busbars in a protective enclosure, including straight lengths, fittings, devices and accessories.

Keywords: – Busbar Trunking System, Wires, Modular Devices (MCB, ELCB, ELMCB, DB), HVAC control, Access control, Energy Monitoring System, Tap-off Unit.

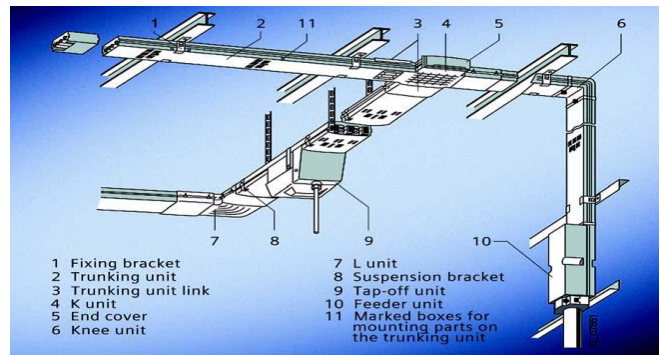
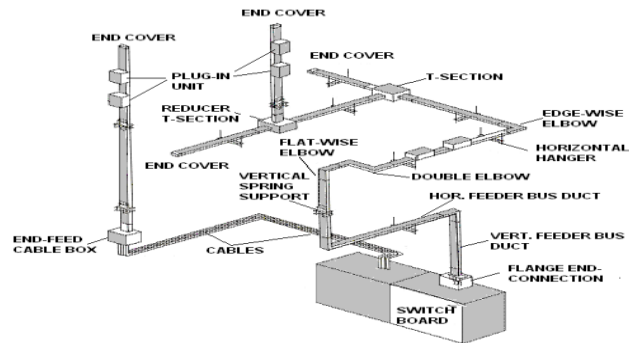
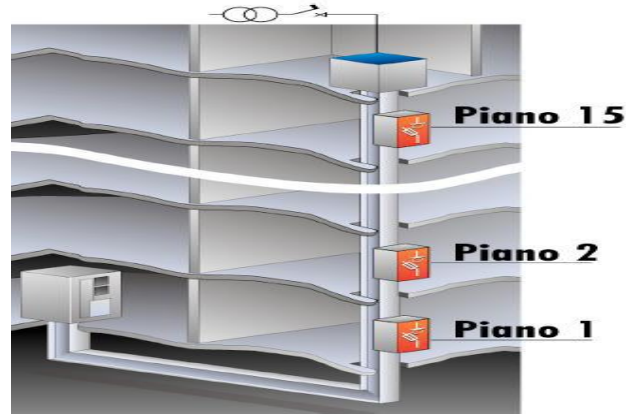
I. INTRODUCTION

Busbar trunking system (BBT), performs the function of transporting current from one point to the other. Traditionally cables were used for this function. BBT goes beyond what cables do. BBT can tap off power to switchgear for further distribution using tap of boxes. In comparison to cables, BBT can thus serve as distribution panels at different stages (at floors of a building). BBT thus continues as single systems to replace cables as well as distribution boards at floor level for building (commercial or industrial). Introduces world-class sandwich Busbar Trunking System (BBT) under the brand Megaduct to its valued all customers. The BBT is totally enclosed, non-ventilated design busbar and is fully insulated using halogen free fire retardant epoxy insulation. Megaduct BBT system offer a superior alternative to cables and other bus trunking options through this compact and scalable range of system thus providing an enhanced solution to power transmission and distribution in buildings as well as industry[1].



I. BUSBAR TRUNKING SYSTEM

Busbar trunking system in compact design is the most efficient, safe and ideal system for electricity supply to industrial installations and high rise structures, offering a wide current range from 125A to 2000A in type CBC (Copper conductor) and 160A to 1250A in type CBA (Aluminium conductor) with possibility of feeding loads upto 400A with standard plug-in boxes. The system has provision of 4 Plug-in outlets per meter, which can be fitted quickly and provide total flexibility for any change in distribution layout at a later stage. The system has been designed especially for installations and projects where power supply has to be made available rapidly. These are most suitable for applications where exact location and power consumption is not sure and possible changes in physical distribution of loads are envisaged [4].



II. MEGADUCT BUSBAR TRUNKING SYSTEM

Megaduct busbar trunking system is of sandwich construction, totally enclosed, well insulated design. It is used (as feeder busbar) for interconnection between transformer/generator to power distribution centers and as plug-in (busbar risers) in building power systems. Cast resin busduct are also available for outdoor application. These busducts are suitable for operation in a 600/1000V system [2].



The diagram below familiarizes you with Megaduct busbar trunking system.



- 1) Flange End
- 2) Straight Busduct
- 3) Single Bolt Bridge Joint
- 4) Elbow
- 5) Tap-off Unit
- 6) Terminal End Cover

II. COMPONENTS OF BUSBAR TRUNKING SYSTEM

Flange End



Flange End is the incoming unit of a busbar trunking system. The power is fed at the flange End to energise the busbar trunking system. Flange End is provided with sufficient space for direct cable connections by nuts and bolts. (Details can be given on request)



III. STRAIGHT BUSDUCT

These straight bus duct run along the length of connection and the body of the bus trunking system.

Types of straight busduct are:

- a) **Feeder type:-** Straight busbar trunking unit with no tap off facility.
- b) **Plug in type:-** Straight busbar trunking unit having tap off points on one or many faces.
- c) **System Voltage:-** 600V and up to maximum 1000V / 3P / 50 Hz or 60 Hz constructed in various configurations of 3 phase 3 wire or 3 phase 4 wire with or without 50% integral housing ground and separate earth bar. The earth bar (50% or 100%) can be installed. To counter excessive harmonic effects, 200% neutral can also be provided on request.
- d) **Current Ratings:-** Wide range of current rating from 100A to 6300A for Copper Conductor and upto 5000A for Aluminium Conductors.

Single Bolt Bridge Joints

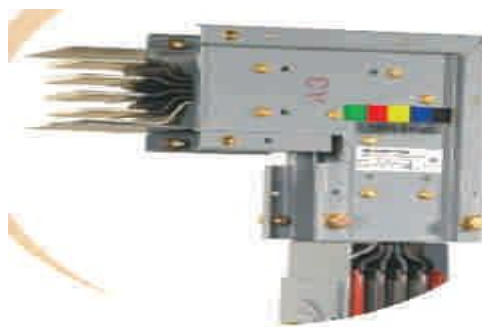


The straight bus ducts are expected to carry their full rated current for required lengths and in order to overcome extreme rugged conditions at site, the new Megaduct joint has been designed precisely and manufactured using the highest quality of materials to minimize all possible problems and enhance system performance.

Benefits of Single Bolt Bridge Joint:

- Incorporates a 5mm thermal expansion and movement at every joint.
- Allows $\pm 15\text{mm}$ of lateral adjustment (total 30mm) to correct site measurement inaccuracies.
- Ability to tilt at an angle of $\pm 5^\circ$ (total 10° along Single axis)
- Longer overlapping length ($>40\text{ mm}$) to increase contact area.
- Single bolt bridge joint system.
- Bolts and nuts can be stainless steel, galvanized or chromed black High Tensile Steel
- Entire System is designed and tested for protection of IP 42 / IP55 / IP 66 / IP 67.
- Easy to remove / install joints without removing the main busduct.
- Water / Chemical Resistant DMC / SMC insulation Plates.
- Optional shear off twin headed bolts to required torque of 70Nm

Elbow:



Busbar Trunking elbows are angle units which enable the Busbar Trunking system to change directions. Various types of elbows can be provided as per customers requirement. Like,

- Flatwise Elbow (Horizontal Elbow)
- Edgewise Elbow (Vertical Elbow)

- Edgewise offset (Double Elbow)
- Combination Elbow (Combines Vertical & Horizontal)

Tap-Off Units (TOU):



Tap-Off Units are required to tap power from the straight bus ducts. Typically, Tap-Off units are used in plug in type busbar trunking systems (vertical risers). TOUs are installed at specified intervals for tapping power from a bus trunking system. TOU is provided with non-fused circuit breakers (MCCB) or SDFs of various current ratings. Generally, 2 tap-off units per side are installed. Provision of up to five tap-off units per length of 3M busduct can be given depending upon the size of MCCBs.

Features of Tap-Off Units:



- All Tap-Off units can be interlocked to prevent removal when outgoing device is in 'ON' position.
- When the tap-off unit cover is 'OPEN', it is interlocked such that MCCB cannot be turned 'ON'.
- Tap-Off units are suitable for all types of MCCBs ie. 3 pole / 4 pole of ratings from 16A to 1600A.
- Tap-Off units can also be used with MCBs and Fuse Switch Breaker.
- Metering facility can be provided on request.
- Bolt-on type plug-in units is available for MCCB ratings >600A.

Terminal End Cover:



Component for sealing the last bus bar trunking unit in the system. Typically, one such end cover would be required for termination of one run of the system.

Supports:



Required for spacing Busbar Trunking System horizontally and vertically. Horizontal hanger supports are required for Horizontal installations and Vertical rigid/ spring supports for vertical installations.

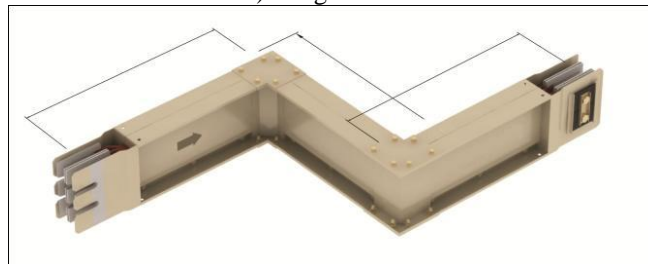
IV. TYPES OF BUSBAR TRUNKING SYSTEM

1) **Sandwich Type** : Epoxy or Cast Resin type Sandwich Busbar trunking system is preferred widely due to its advantages over Air insulated busbars as well as cables, some of which are mentioned below [2].

- Up-to Maximum 1000V and
- 400 A to 6300 A Current Capacities
- Epoxy Insulated

1.1 Sandwich Busbar Trunking System Components:

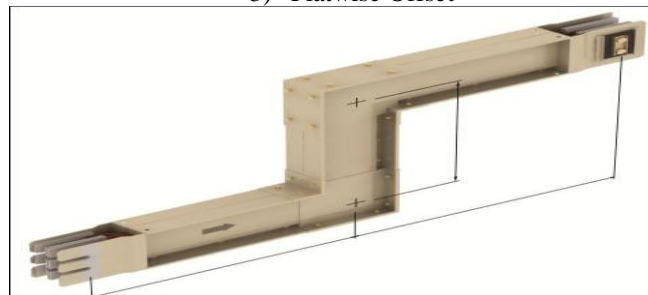
1) Edgewise Offset



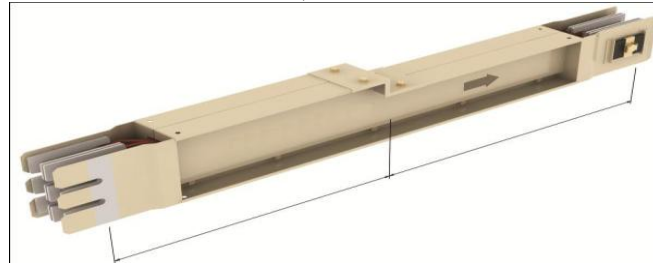
2) Combination Elbow



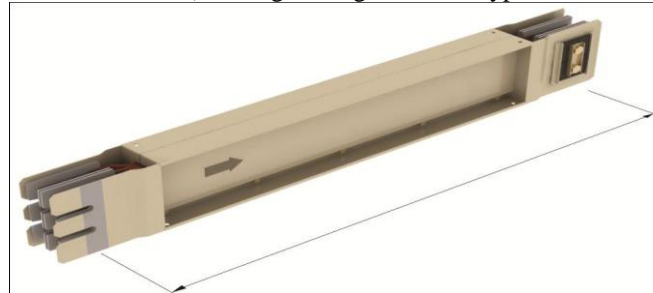
3) Flatwise Offset



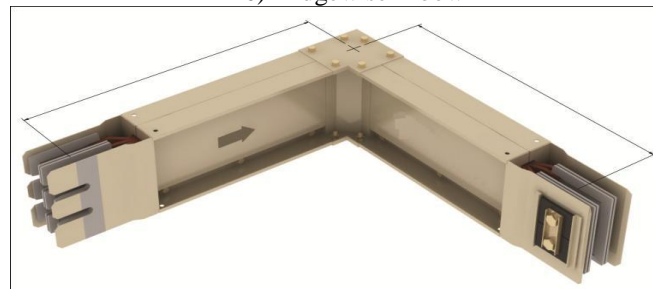
4) Reducer



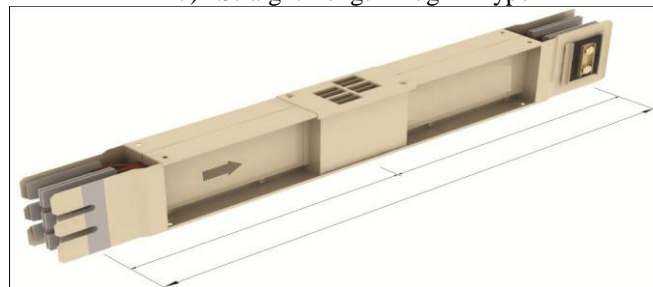
5) Straight Length Feeder Type



6) Edgewise Elbow

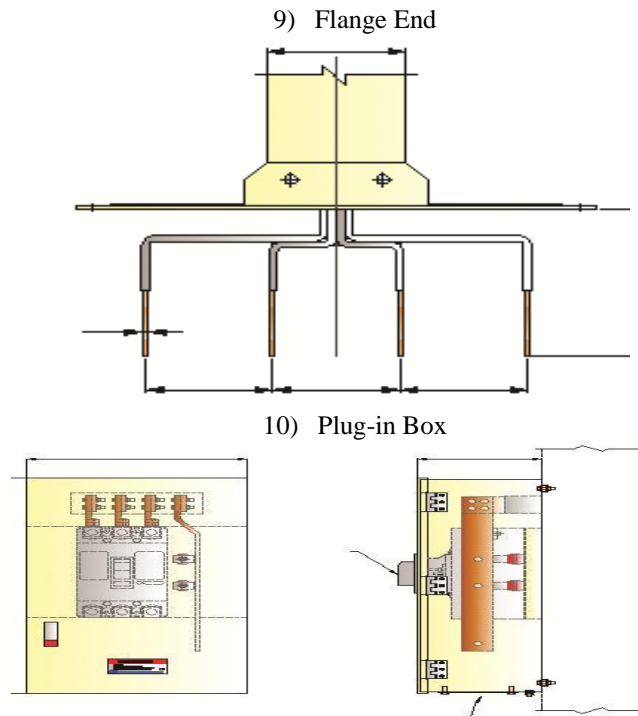


7) Straight Length Plug-in Type



8) Flatwise Elbow





1.2 Benefits of Sandwich Construction:

Compactness: Sandwich construction render to the BBT system more compact than air insulated bus bar system, thus making them a preferred choice in plant room and building applications [1].

Energy efficiency: Compactness of sandwich construction results in higher efficiency due to lower Voltage drop and impedance. This ensures all connected equipment run cooler.

Flexible: Additions of floor to a building or any expansion to an existing system is extremely simple with sandwich BBT. They are scalable & elegant.

Safe & Sure: Higher mechanical strength over long runs, better electrical conductivity and lower mV drop which ensures high reliability. Ability to withstand high short circuit currents makes them doubly safe.

Fire retardant: Sandwich construction do not have air gap due to which natural progression of fire is inhibited. Epoxy insulation, being flame retardant provides better resistance to spread of fire.

Economical: Inherently flexible design ensures easy installation and maintenance thus resulting in lower installation and maintenance costs.

1.3 Technical Specification of Sandwich Type Busbar

Parameters	Specifications
Rated Operating Condition	Up-to 1000 V, 50Hz or 60Hz
Rated Current	400A to 6300 A
Rated Insulation Voltage	1000 V
Fault Level for 1 Sec	Up-to 600A 25 kA
	800A-1000A 50kA
	1250A-1600 A 65 kA
	2000A-6300A 100 kA
Design Ambient Temperature	50C
Degree of Protection (IP)	54, 55, 66, 67 & 68
Relevant Standard	IEC –60439 –1 & 2
Enclosure	1.6mm GI or 2mm Aluminum with Epoxy Coating
Conductor Material	Copper & Aluminum
Configuration	3P3W, 3P4W, 3P5W (combination available with/without Integral earth)
Joint	Single Bolt
Insulation	Class –F Epoxy

2) Conventional Busbar Trunking System:

2.1. Conventional Busbar Trunking System Components:

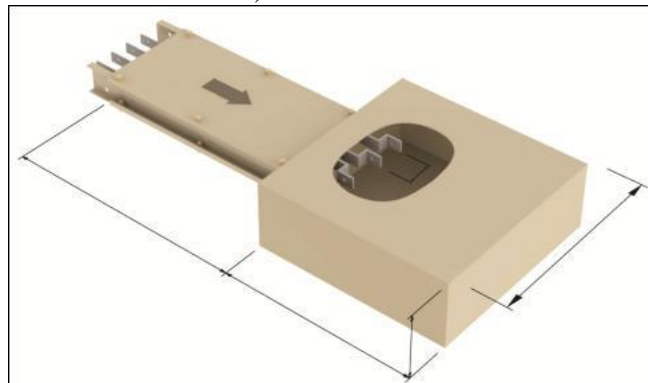
1) Straight Length



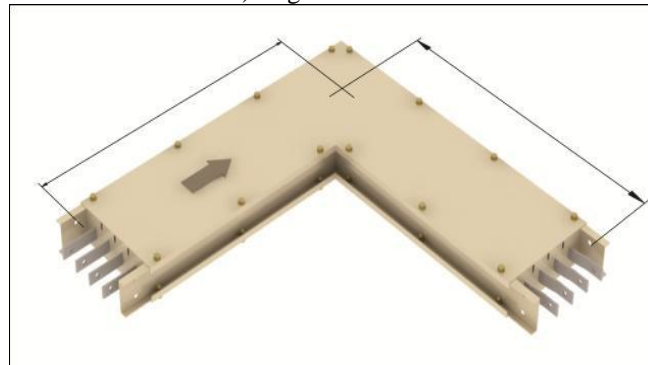
2) Flatwise Elbow



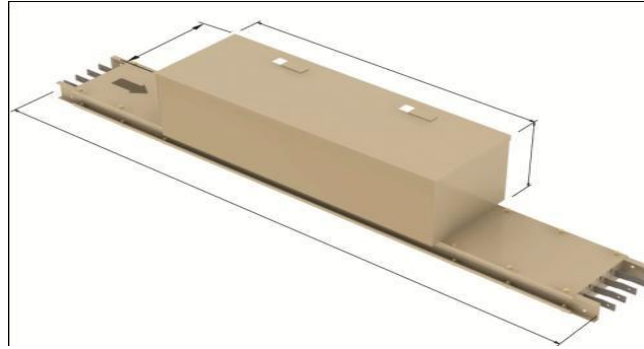
3) End-Feed Box



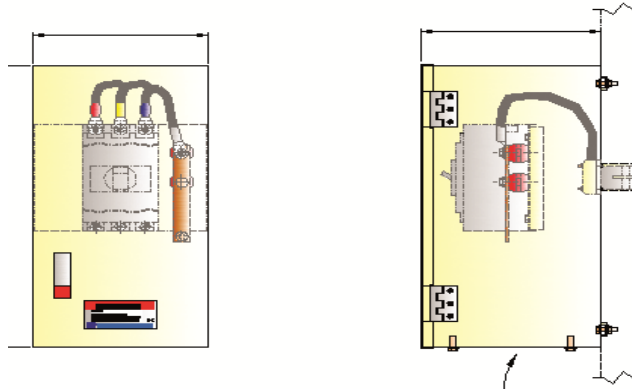
4) Edgewise Elbow



5) Centre-Feed Box



6) Plug-in Box



2.2. Technical Specification of Conventional Type Busbar

Parameters	Specifications
Rated Operating Voltage	Up-to 415 V
Rated Current	100 A to 400 A
Impulse withstand Voltage	10 kV
System Frequency	50 Hz & 60 Hz
Design Ambient Temp.	50C
Degree of Protection (IP)	54
Relevant Standard	IEC –60439 –1&2
Enclosure	1.6mm GI with epoxy coating
Conductor Material	Copper
Configuration	3P4W, 3P5W (both combination available with /without Integral earth)
Joint	Multiple Bolt
Insulation Class	Class –H, SMC

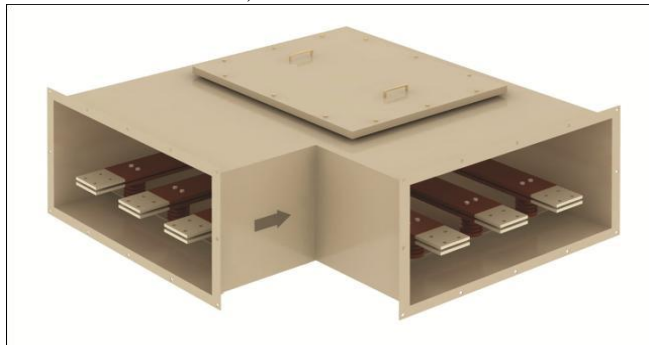
V. MEDIUM VOLTAGE BUSBAR TRUNKING SYSTEM

3.1. Medium Voltage Busbar Trunking System Components:

1) Straight Length



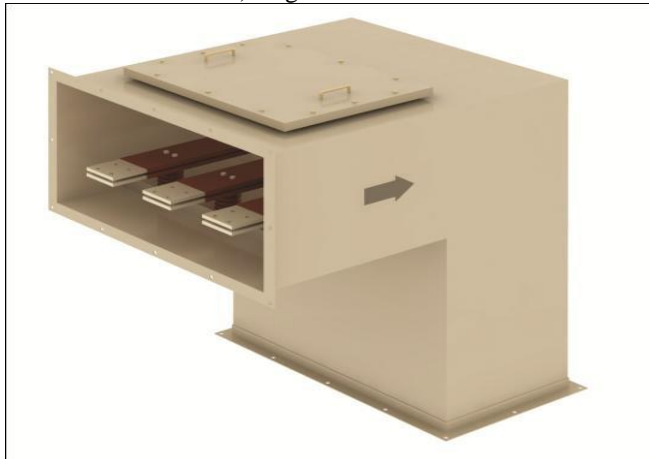
2) Flatwise Elbow



3) Phase Transposition Box



4) Edgewise Elbow



3.2. Technical Specification of Medium Voltage Busbar:

Parameters	Specifications
Rated Operating Voltage	3.6kV to24 kV
Rated Current	400 A to5000 A
Impulse withstand Voltage	10 kV
System Frequency	50 Hz & 60 Hz
Degree of Protection (IP)	54, 55&65
Relevant Standard	IEC –62271 –200
Enclosure	GI, Stainless Steel & Aluminum
Enclosure Coating	Epoxy
Conductor Material	Copper &Aluminum
Configuration	3P3W
Joint	Splice plate multiple Bolt

VI. EPOXY INSULATION

All Busbars have Class H -180°C standard epoxy coating as insulation material which provides 100% water proofing and high mechanical strength. This insulation has been tested in accordance with IEC 60-439-2 and BS 5486 [1].

Benefits of using epoxy coating as insulation

- Withstands glitch and spikes in electrical system so that system is stable & runs reliably.
- Provides rooms for expansion/contraction during peak and off-peak hours to avoid tracking in surface of insulation.
- Capable of withstanding heat shock thus minimizing chances of failure due to spark or excess heat.
- High mechanical strength so that insulation damage by accidental impact is reduced.
- High thermal conductivity to provide uniform distribution of heat, hence system runs cooler.
- Water and chemical resistant which makes it suitable for use in corrosive and humid environment.

VII. CONCLUSION

Interlocking systems prevent mounting errors and reduce inspection times. Work is carried out safely without exposure to live connections. Live parts in tap-off units are not accessible. Tap-off units can be added and removed with the trunking energised. Interlocking devices eliminate connection errors.

The PE conductor is connected before the phase and neutral conductors to enhance protection. Prefabricated design ensures smooth work flow. Installation times can be precisely planned in advance and, if plans must be changed, a fast and effective solution is always available with the adaptable and upgradeable this system. The result is improved productivity. Electrical equipment can be moved or a machine added easily and quickly. That is the type of service that customers appreciate. With cables, the same modification could take over a day. That can become a real problem if another job has already been scheduled. What is more, customers today expect this type of service at no extra cost the worksite remains clean, with no cable ends or waste scattered about. Stand out from the crowd and gain customer recognition by installing modern upgradeable systems.

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