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**FIPS PUB 174**

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FEDERAL INFORMATION PROCESSING STANDARDS PUBLICATION  
(Former Draft Federal Standard 1090)

**FEDERAL BUILDING TELECOMMUNICATIONS  
WIRING STANDARD**

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CATEGORY: TELECOMMUNICATIONS STANDARD      SUBCATEGORY: CABLES AND WIRING

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## FEDERAL BUILDING TELECOMMUNICATIONS WIRING STANDARD

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## Foreword

The Federal Information Processing Standards Publication Series of the National Institute of Standards and Technology (NIST) is the official publication relating to standards and guidelines adopted and promulgated under the provisions of Section 111(d) of the Federal Property and Administrative Services Act of 1949 as amended by the Computer Security Act of 1987, Public Law 100-235. These mandates have given the Secretary of Commerce and NIST important responsibilities for improving the utilization and management of computer and related telecommunications systems in the Federal Government. The NIST, through its Computer Systems Laboratory, provides leadership, technical guidance, and coordination of Government efforts in the development of standards and guidelines in these areas.

Comments concerning Federal Information Processing Standards Publications are welcomed and should be addressed to the Director, Computer Systems Laboratory, National Institute of Standards and Technology, Gaithersburg, MD 20899.

James H. Burrows, Director  
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## Abstract

This standard, by adoption of ANSI/EIA/TIA-568-1991, Commercial Building Telecommunications Wiring Standard, specifies minimum requirements for telecommunications wiring within a building and between buildings in a campus environment. It specifies a wiring system with a recommended topology and recommended distances. It specifies copper and optical-fiber transmission media by parameters that determine performance, and specifies connectors and their pin assignments to ensure interconnectability. This standard recognizes a background precept of fundamental importance: to have a building successfully designed and provisioned for telecommunications, it is imperative that the telecommunications wiring design be incorporated during the preliminary architectural design phase.

**Key words:** copper wire; data processing equipment; Federal Information Processing Standard; fiber optic cable; interoperability; outlet connectors; telecommunications wiring.

# Federal Information Processing Standards Publication 174

1992 August 21

## Announcing the Standard for

### FEDERAL BUILDING TELECOMMUNICATIONS WIRING STANDARD

Federal Information Processing Standards Publications (FIPS PUBS) are issued by the National Institute of Standards and Technology (NIST) after approval by the Secretary of Commerce pursuant to Section 111(d) of the Federal Property and Administrative Services Act of 1949 as amended by the Computer Security Act of 1987, Public Law 100-235.

**1. Name of Standard.** Federal Building Telecommunications Wiring Standard (FIPS PUB 174) (Former Draft Federal Standard 1090).

**2. Category of Standard.** Telecommunications Standard; cables and wiring.

**3. Explanation.** This standard, by adoption of ANSI/EIA/TIA-568-1991, Commercial Building Telecommunications Wiring Standard, specifies minimum requirements for telecommunications wiring within a building and between buildings in a campus environment. It specifies a wiring system with a recommended topology and recommended distances. It specifies copper and optical-fiber transmission media by parameters that determine performance, and specifies connectors and their pin assignments to ensure interconnectability. This standard recognizes a background precept of fundamental importance: to have a building successfully designed and provisioned for telecommunications, it is imperative that the telecommunications wiring design be incorporated during the preliminary architectural design phase.

**4. Approving Authority.** Secretary of Commerce.

**5. Maintenance Agency.** National Communications System, Office of Technology and Standards.

**6. Related Documents.**

a. Federal Information Resources Management Regulations subpart 201-20.303, Standards, and subpart 201-39.1002, Federal Standards.

b. Federal Standard 1037B, Glossary of Telecommunications Terms.

c. Federal Information Processing Standards Publication (FIPS PUB) 175, Federal Building Standard for Telecommunications Pathways and Spaces (Former Draft Federal Standard 1091).

d. Federal Information Processing Standards Publication (FIPS PUB) 176, Residential and Light Commercial Telecommunications Wiring Standard (Former Draft Federal Standard 1092).

e. Future Federal Information Processing Standards Publication (FIPS PUB), Grounding and Bonding Requirements for Telecommunications in Federal Buildings (Draft Federal Standard 1093).

f. Future Federal Information Processing Standards Publication (FIPS PUB), Administration Standard for the Telecommunications Infrastructure of Federal Buildings (Draft Federal Standard 1094).

At the time of publication of this standard, the editions indicated above were valid. All publications are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of these publications.

**7. Objectives.** The purpose of this standard is to facilitate interoperability and transportability among telecommunication facilities and systems of the Federal Government and compatibility of this facilities and systems at the computer-communications interface with data processing equipment (systems) of the Federal Government by specifying standard characteristics for building telecommunications wiring. This



standard defines a generic, functional telecommunications wiring system for Federal buildings that will support a multiproduct, multivendor environment. The further purpose of this standard is to enable the planning and installation of building wiring with little knowledge of the telecommunications products that subsequently will be installed. Installation of wiring systems during building construction or major renovation is significantly less expensive and less disruptive than after the building is occupied. This standard establishes performance and technical criteria for various wiring system configurations for interfacing and connecting their respective elements. To attain a multiproduct wiring system, a review of the performance requirements for most telecommunications services was conducted during preparation of the American National Standard. The diversity of telecommunications services currently available, coupled with the continual addition of new services, means that there may be cases where limitations to desired performance occur. To understand any such limitations, the user is advised to consult standards associated with the desired services.

**8. Applicability.** American National Standard/EIA/TIA-568-1991 shall be used (with the deletion of the optional specification as noted in Section 9) by all departments and agencies of the Federal Government in the planning and design of all office buildings, when FIPS 176 is not selected. This includes both the wiring of new buildings and the upgrading of existing plant. Building telecommunications wiring defined by this standard is intended to support a wide range of different Federal building sites. This includes sites with a geographical extent up to 3,000 m (9,840 ft), up to 1,000,000 square meters (approximately 10,000,000 square feet) of office space, and with a population of up to 50,000 individual users. Telecommunications wiring systems defined by this standard are intended to have a useful life in excess of 10 years. This standard applies to the telecommunications wiring for Federal buildings that are office oriented. (The term "commercial enterprises" is used in ANSI/EIA/TIA-568-1991 to differentiate between office buildings and buildings designed for industrial enterprises.) This standard is not intended to hasten the obsolescence of building wiring currently existing in the Federal inventory; nor is it intended to provide systems engineering or applications guidelines.

**9. Specifications.** This FIPS adopts ANSI/EIA/TIA-568-1991 *with one important change to the industry standard*: in the interest of optimizing transportability, the ANSI/EIA/TIA-568 *optional* eight-position jack pin/pair assignments for the 100-ohm UTP telecommunications work-area outlet specified in Figure 11-2 (and referenced in paragraph 2 of Section 11.2.1) shall *not* be used.

**10. Implementation.** The use of this standard by Federal departments and agencies is compulsory and binding for the acquisition of new equipment and services, effective March 1, 1993, except as noted in Section 8.

Adherence to a standard that specifies standardized building wiring contributes to the economic and efficient use of resources by avoiding proliferation of local or vendor-unique standards, and is necessary to facilitate development of interoperable inter- and intrabuilding telecommunications systems. Specification of minimum acceptable values for basic performance parameters provides assistance to the user in multi-vendor procurement. For the user requiring state-of-the-art systems performance, these values may serve as benchmarks for use in cost/performance analyses when evaluating alternate transmission media whose specifications exceed those of this standard.

**11. Waivers.** Under certain exceptional circumstances, the heads of Federal departments and agencies may approve waivers to Federal Information Processing Standards (FIPS). The head of such agency may redelegate such authority only to a senior official designated pursuant to Section 3506(b) of Title 44, U.S. Code. Waivers shall be granted only when:

- a. Compliance with a standard would adversely affect the accomplishment of the mission of an operator of a Federal computer system or related telecommunications system, or
- b. Cause a major adverse financial impact on the operator which is not offset by Governmentwide savings.

Agency heads may act upon a written waiver request containing the information detailed above. Agency heads may also act without a written waiver request when they determine that conditions for meeting the standard cannot be met. Agency heads may approve waivers only by a written decision which explains the basis on which the agency head made the required finding(s). A copy of each such decision, with procurement sensitive or classified portions clearly identified, shall be sent to: National Institute of Standards and Technology; Attn: FIPS Waiver Decisions, Technology Building, Room B-154; Gaithersburg, MD 20899.

In addition, notice of each waiver granted and each delegation of authority to approve waivers shall be sent promptly to the Committee on Government Operations of the House of Representatives and the Committee on Government Affairs of the Senate and shall be published promptly in the *Federal Register*.

When the determination on a waiver applies to the procurement of equipment and/or services, a notice of the waiver determination must be published in the *Commerce Business Daily* as a part of the notice of solicitation for offers of an acquisition or, if the waiver determination is made after the notice is published, by amendment to such notice.

A copy of the waiver, any supporting documents, the document approving the waiver and any supporting and accompanying documents, with such deletions as the agency is authorized and decides to make under 5 U.S.C. Sec. 552(b), shall be part of the procurement documentation and retained by the agency.

**12. Special Information.** This standard has been reviewed by the Metrication Operating Committee of the Interagency Committee on Metric Practice, for consistency with accepted metric practice only, and is designated an *accepted metric standard*. Use of this standard in its area of applicability complies with the provision of the Omnibus Trade and Competitiveness Act of 1988 (Pub. L. 100-418, section 5164) that requires Federal agencies, with certain limitations and exceptions, to use the metric system of measurement in procurements, grants, and other business-related activities. (See also 15 CFR Part 19 as amended February 1, 1991).

**Metric Data.** Where this standard contains dual dimensions, the metric data shall be controlling, and the inch-pound data shall be understood to be for information only. Nothing in this standard shall be interpreted, however, as requiring any departure from standard trade sizes, as for conduit and electrical conductors, in common use in the United States.

**Exception.** The following is substituted for Section 10.2.1.1.5, *Breaking Strength*, of the industry standard:

The ultimate breaking strength of the completed cable, measured in accordance with ASTM D 4565 (Ref. B1.35), shall be 400 newtons (41 kgf).

NOTE: The maximum pulling tension should not exceed 110 newtons (10.3 kgf) to avoid stretching the conductor.

**13. Where to Obtain Copies.** Copies of this publication are for sale by the National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161. (Sale of the included specifications document is by arrangement with the Electronic Industries Association.) When ordering, refer to Federal Information Processing Standards Publication 174 (FIPSPUB174), and the title. Payment may be made by check, money order, purchase order, credit card, or deposit account.



## APPENDIX

By adoption of ANSI/EIA/TIA-568-1991 (with the modification noted below), this document provides Federal departments and agencies with a generic, standardized wiring system for office buildings and building complexes. This standardization, in conjunction with Federal Information Processing Standard 175 (Former Draft FED-STD-1091), which provides architectural specification of telecommunications pathways and spaces, will facilitate systems compatibility and transportability of terminals for Federal users. The use of these two standards will assure a quality of performance consistent with existing industry capabilities and will provide a cost-effective basis for competitive procurement.

The industry standard adopted by this Federal Information Processing Standard (Former Draft FED-STD-1090) is ANSI/EIA/TIA-568-1991, Commercial Building Telecommunications Wiring Standard, and is the result of an effort by the Telecommunications Industry Association (TIA)<sup>1</sup>, in response to concern expressed by the Computer and Communications Industry Association (CCIA) over the lack of a standard on building telecommunications wiring.

This Federal Information Processing Standard adopts ANSI/EIA/TIA-568-1991 with one important change to the industry standard: in the interest of optimizing transportability, the ANSI/EIA/TIA-568-1991 vendor-specific *optional* eight-position jack pin/pair assignments for the 100-ohm UTP telecommunications work-area outlet connector specified in Figure 11-2 (and referenced in paragraph 2 of Section 11.2.1) of the industry standard shall *not* be used. The pin-pair assignments (and color coding) of the primary wiring scheme, illustrated in Figure 11-1, are fully compatible with terminal equipment manufactured by a majority of North American manufacturers. These assignments are fully compatible also with the *single* specification of eight-position outlet connector pin/pair assignments of the parallel building-wiring standard developed by the Canadian Standards Association, CSA-529. Tracking the ANSI/EIA/TIA-568 standard, the U.S. connector industry has adopted a connector designation of "T-568A" for this primary wiring scheme.

The use of the *optional* pin/pair assignments of Figure 11-2 in wiring a building would result in equipment inoperability when transporting any terminal equipment from this building to any building wired to the primary specification of Figure 11.1 above.

The inverse is also true; only equipment of proprietary design (of a single manufacturer) will be operable in a building wired to the optional specification. This resultant problem of interoperability when transporting equipment could be addressed only by (a) providing adapters for all relocated terminal equipment, or (b) rewiring of the destination building (at the main distribution frame or elsewhere).

Paragraph 3, Section 11.2.1 of the industry standard states: "These jack and pin-pair assignments [referring to both the primary and optional wiring schemes] are compatible with the requirements described in ISDN BRI (ISO 8877)." This is true but misleading; ISO 8877 describes which pins are to be paired, but does not specify assignment of pin/pair circuits or color coding. Thus, ISO 8877 compliance assures only mechanical compatibility.

This Federal Information Processing Standard has a special relationship to the ANSI/EIA/TIA-569-1991, Commercial Building Standard for Telecommunications Pathways and Spaces, (adopted as Federal Information Processing Standard 175, Former Draft FED-STD-1091). This latter standard addresses the reality that building wiring cannot be standardized without standardizing also the architecture of the building itself into which building wiring systems are to be installed.

Another companion standard, ANSI/EIA/TIA-570-1991, Residential and Light Commercial Telecommunications Wiring Standard, is adopted as Federal Information Processing Standard 176 (Former Draft FED-STD-1092).

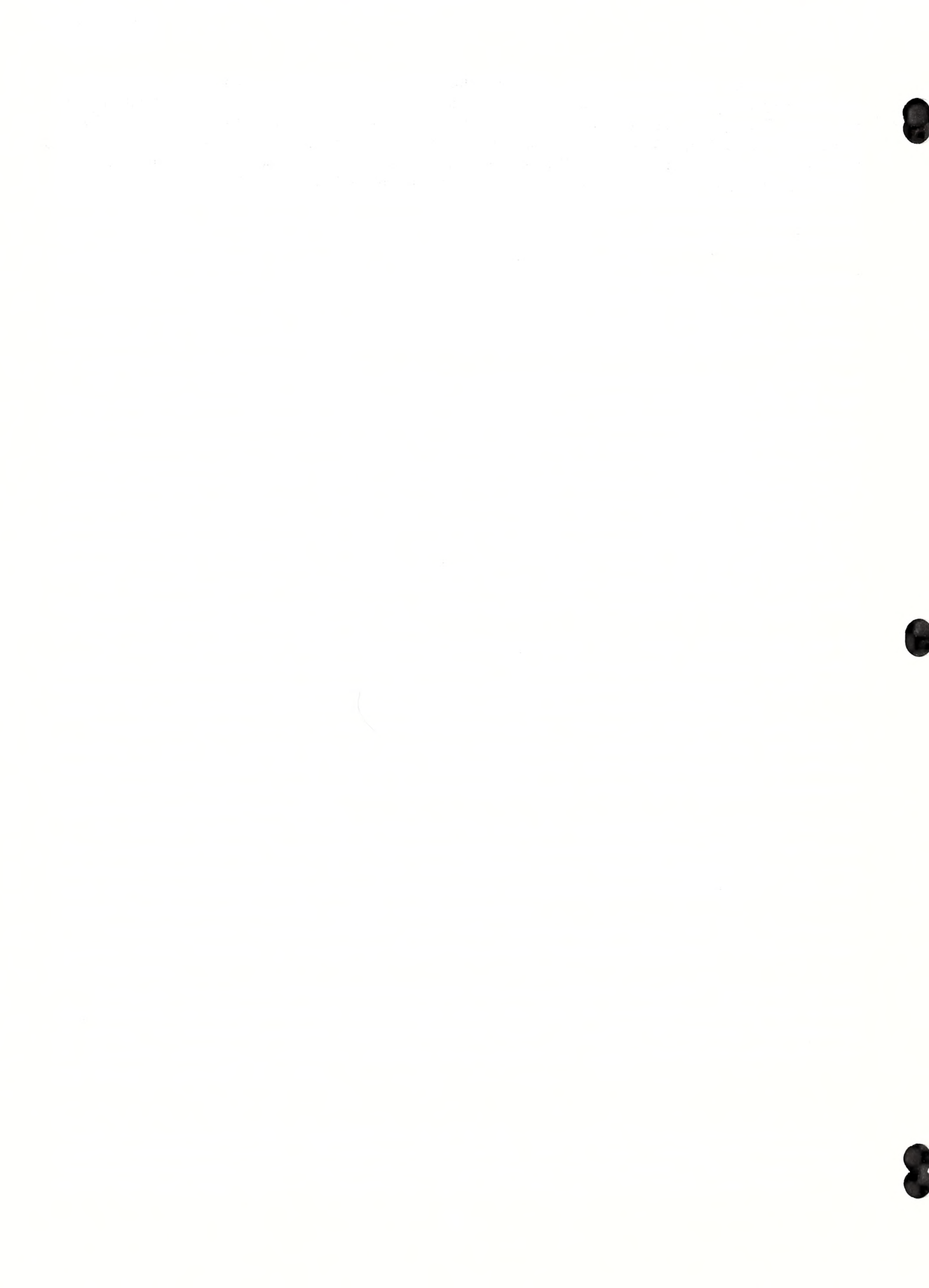
During the development of this family of building telecommunications standards, significant concern was expressed, by both Government and industry, about the need for specification of electronic system grounding. This concern resulted in proposed ANSI/TIA/EIA-607, Grounding and Bonding Requirements for Telecommunications in Commercial Buildings (to be adopted as a future Federal Information Processing Standard, Draft FED-STD-1093).

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<sup>1</sup> In 1988, the Telecommunications sector (specifically, the TR- and FO- Technical Committees, Subcommittees, and Working Groups) of the Electronic Industries Association (EIA) became a part of the Telecommunications Industry Association (TIA). TIA conducts the standard-developing activities, and EIA continues to publish the resultant standards, which bear the prefix "EIA/TIA," as well as "ANSI" for those documents adopted by the American National Standards Institute. Beginning in 1992, the prefix reads "TIA/EIA."



The complex telecommunications building infrastructure addressed by this family of standards requires continuing documentation of all building wiring and the related pathways and spaces that contain that wiring. Recognizing the need for a standardized method of telecommunications administration, TIA is developing ANSI/TIA/EIA-606, Administration Standard for the Telecommunications Infrastructure of Commercial Buildings, to expedite collecting and updating of such information. This standard is to be adopted as a future Federal Information Processing Standard (Draft FED-STD-1094).





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