



01420

References (Non-Regulatory)

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A. Information Available to Designers

1. Central Campus Floor Numbering Standards
2. Central Campus Room Numbering Standards
3. Request for Extension of Utilities
4. Yale Accessibility Guidelines
5. [Yale CAD Standards](#)
6. Yale Security Standards
7. Yale University Electrical Acronyms
8. Yale Standard Detail 16000-1, Electrical Plans Standard Symbols
9. Yale Standard Detail 16000-2, Electrical Diagrams Standard Symbols
10. Yale Electrical Distribution Master Plan
11. Yale University Exterior Lighting Manual
12. Yale University Plant Engineering Department website:
<http://www.facilities.yale.edu/Work/Work.asp>



B. General Regulatory and Directive Standards

1. Accessible Design Handbook (1991)
2. ADA Compliance Guide (1991) (Contains Minimum Guidelines and Requirements for Accessible Design, 1982, from Federal Register)
3. American Society of Mechanical Engineers (ASME)
4. ANSI/ASHRAE/IESNA, Standard 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings
5. American National Standards Institute (ANSI)
6. American Society for Testing and Materials (ASTM)
7. Environmental Protection Agency (EPA)
8. Factory Mutual (FM)
9. National Electric Manufacturers Association (NEMA)
10. National Fire Protection Association (NFPA)
11. NFPA, Life Safety Code 101 with Connecticut Supplement
12. Occupational Safety and Health Administration (OSHA)
13. Practical Guide to Seismic Restraint (ASHRAE)
14. Underwriters Laboratories (UL)

C. Site Construction

1. **Water Distribution**
 - a. ANSI A21.4
 - b. ANSI A21.10
 - c. ANSI A21.11
 - d. ANSI A21.51
 - e. ASTM D1556
 - f. AWWA C-205
 - g. AWWA C-600



2. Chilled Water Distribution

- a. ASME
- b. AWWA
- c. ASTM A53
- d. ASTM D1556

3. Steam Distribution

- a. ANSI B31.1
- b. ASME Section IX
- c. ASTM A53 or A106
- d. ASME B16.5
- e. ASTM D1556

4. Storm Sewerage Systems

- a. AASHTO M294
- b. ASTM A48
- c. ASTM C76
- d. ASTM D1556
- e. ASTM D3034

5. Sanitary Sewerage Systems

- a. ASTM A48
- b. ASTM D3034
- c. ASTM D1556



D. Architectural Regulatory and Directive Standards

1. Masonry

- a. ASTM C67—Methods of Sampling and Testing Brick and Structural Clay Tile
- b. ASTM A82—Cold-Drawn Steel Wire for Concrete Reinforcement
- c. ASTM A153—Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- d. ASTM C90—Hollow Load-Bearing Concrete Masonry Units
- e. ASTM C144—Aggregate for Masonry Mortar
- f. ASTM C150—Portland Cement
- g. ASTM C207—Hydrated Lime for Masonry Purposes
- h. ASTM C216—Facing Brick
- i. ASTM C270—Mortar for Unit Masonry
- j. ASTM C476—Grout for Reinforced and Non-Reinforced Masonry
- k. ASTM C744—Prefaced Concrete and Calcium Silicate Masonry Units
- l. ASTM E119—Fire Tests of Building Construction and Materials

2. Woods and Plastics

- a. AWI—Architectural Woodwork Institute Quality Standards and Guide Specifications
- b. NWMA—National Wood Manufacturers Association
- c. PS 20—American Softwood Lumber Standard
- d. ANSI A156.9—American National Standard for Cabinet Hardware
- e. NEMA LD3—High Pressure Decorative Laminates



3. Thermal and Moisture Protection

- a. ASTM C516—Vermiculite Loose Fill Insulation
- b. ASTM C578—Preformed, Cellular Polystyrene Thermal Insulation
- c. ASTM E84—Surface Burning Characteristics of Building Materials
- d. ASTM C764—Mineral Fiber Loose Fill Insulation
- e. FS HH-558—Insulation, Board, Blanket, Felt, Sleeving (Pipe and Tube Coverings) and Pipe Cover Insulation
- f. ASTM E605—Test Method for Thickness and Density of Sprayed Fire-Resistive Materials Applied to Structural Members
- g. ASTM E736—Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members
- h. ASTM E759—Test Method for Effect of Deflection on Sprayed Fire-Resistive Materials Applied to Structural Members
- i. ASTM E760—Test Method for Effect of Impact on Bonding of Sprayed Fire-Resistive Material Applied to Structural Members
- j. ASTM E859—Test Method for Air Erosion of Sprayed Fire-Resistive Materials Applied To Structural Members
- k. ASTM E937—Test Method for Corrosion of Steel by Sprayed Fire Resistive Material Applied to Structural Members
- l. ASTM E119—Method for Fire Tests of Building Construction and Materials
- m. ASTM E 814—Fire Tests of Through-Penetration Fire Stops
- n. UL 723—Test for Surface Burning Characteristics of Building Materials
- o. UL 1479—Fire Tests of Through-Penetration Firestops
- p. ASTM A361—Sheet Steel, Zinc-Coated (Galvanized) by the Hot-Dip Process for Roofing and Siding
- q. ASTM D225—Asphalt Shingles Surfaced with Mineral Granules
- r. ASTM D226—Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
- s. ASTM D2822—Asphalt Roof Cement



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- t. ASTM D3018—Class A Asphalt Shingles Surfaced with Mineral Granules
- v. ASTM D3462—Asphalt Shingles Made From Glass Felt and Surfaced with Mineral Granules
- w. ASTM D4586—Asphalt Roof Cement, Asbestos-Free
- x. ASTM C728—Perlite Thermal Insulation Board
- y. ASTM D41—Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
- z. ASTM D312—Asphalt Used in Roofing
- aa. ASTM D1863—Mineral Aggregate Used on Built-Up Roofs
- ab. ASTM D2178—Asphalt Glass Felt Used in Roofing and Waterproofing
- ac. ASTM D2626—Asphalt Saturated & Coated Organic Felt Base Sheet used in Roofing
- ad. FS-HH-I-529—Insulation Board, Thermal (Mineral Aggregate)
- ae. FS-HH-I-1972—Insulation Board, Thermal-Faced, Polyurethane or Polyisocyanurate
- af. NRCA—The NRCA Roofing and Waterproofing Manual
- ag. PIMA—Technical Bulletin 281-1, Conditioning Procedures
- ah. ASTM D412—Rubber Properties in Tension
- ai. ASTM D4637—Vulcanized Rubber Sheet used in Single Ply Roof Membrane
- aj. ASTM D746—Brittleness Temperature of Plastics and Elastomers by Impact
- ak. FM Approval Guide—Equipment, Materials, Services for Conservation of Property
- al. FM Loss Prevention Data 1-28—Insulated Steel Deck
- am. FM Loss Prevention Data 1-49—Perimeter Flashing
- an. ASTM D746—Brittleness Temperatures of Plastics and Elastomers by Impact
- ao. FM Approval Guide—Equipment, Materials, Services for Conservation of Property



- ap. ASTM C177—Test Method for Steady-State Thermal Transmission Properties by Means of the Guarded Hot Plate
- aq. ASTM A526-90—Spec for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality
- ar. ASTM D226-89—Spec for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
- as. SMACNA—Architectural Sheet Metal Manual
- at. ASTM B32—Solder Metal
- au. ASTM A653-96—Spec for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- av. ASTM B209-93—Spec for Aluminum and Aluminum: Alloy Sheet and Plate
- aw. ASTM B209-93—Spec for Aluminum and Aluminum: Alloy Sheet and Plate
- ax. ASTM C790—Recommended Practices for Use of Latex Sealing Compounds
- ay. ASTM C804—Recommended Practice for Use of Solvent-Release Type Sealants
- az. ASTM C834—Latex Sealing Compounds
- ba. ASTM C920—Elastomeric Sealants
- bb. ASTM C1193—Standard Guide for Use of Joint Sealants

4. Doors and Windows

- a. ANSI A224.1—Test Procedure and Acceptance Procedure for Prime Painted Steel Surfaces
- b. ASTM A366—Steel Carbon, Cold-Rolled Sheet, Commercial Quality
- c. ASTM A653—Spec for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- d. ASTM E152—Methods of Fire Tests of Door Assemblies
- e. DHI (Door Hardware Institute)—The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames and Builder's Hardware



- f. SDI-100—Standard Steel Doors and Frames
- g. SDI-105—Recommended Erection Instructions for Steel Frames
- h. UBC 702 (1997)—Standard Methods of Testing Positive Pressure Fire Door Assemblies
- i. UL 10B—Standard for Safety for Fire Tests of Door Assemblies
- j. UL 10C—Standard for Positive Pressure Fire Tests of Door Assemblies
- k. AWI—Quality Standards of Architectural Woodwork Institute
- l. ITS (Warnock Hersey) —Certification Listings for Fire Doors
- m. NFPA 80—Fire Doors and Windows
- n. NFPA 252—Standard Methods of Fire Tests for Door Assemblies
- o. FSC—Forest Stewardship Council guidelines for environmentally certified wood doors
- p. ANSI A115 Series—American National Standards Institute: Door and Frame Preparation
- q. ANSI A156 Series—American National Standards Institute: Specific hardware items
- r. BHMA—Builder's Hardware Manufacturer's Association: Recommended Locations for Builder's Hardware
- s. NFPA 80—National Fire Protection Association; Standard for Fire Doors and Windows
- t. ANSI Z97.1—Safety Performance Specifications and Methods of Test for Safety Glazing Material Used in Buildings
- u. ASTM C1036—Specification for Flat Glass
- v. ASTM C1048—Specification for Heat Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass
- w. ASTM E773—Test Method for Seal Durability of Sealed Insulating Glass Units
- x. ASTM E774—Specification for Sealed Insulating Glass Units



- y. CPSC 16CFR-1201—Consumer Product Safety Commission, Safety Standard for Architectural Glazing Materials
- z. FS DD-M-411—Mirrors, Plate Glass, Framed and Unframed
- aa. Flat Glass Marketing Association (FGMA) Glazing Manual
- ab. Insulated Glass Certification Council (IGCC)

5. Finishes

- a. ASTM D2047—Static Coefficient of Friction of Polish-Coated Floor Surfaces
- b. ASTM D16—Definitions of Terms Relating to Paint, Varnish, Lacquer, and Related Products
- c. ASTM D4442—Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials
- d. PDCA—Architectural Specifications Manual; Painting and Decorating Contractors of America
- e. SSPC—Steel Structures Painting Manual; Steel Structures Painting Council

6. Specialties (Toilet Accessories, Toilet Partitions)

- a. ASTM A167—Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

7. Equipment

- a. ASTM A240—Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
- b. ASTM A366—Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality
- c. ASTM A167—Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
- d. ASTM E84—Test Method for Surface Burning Characteristics of Building Materials



8. Furnishings—None

9. Special Systems—None

10. Conveying Systems

- a. ANSI/ASME A17.1—Elevators, Escalators, and Moving Walks
- b. NSI/ANSI/ASME A17.2—Inspectors' Manual for Elevators and Escalators
- c. AASME A17.3—Safety Code for Existing Elevators and Escalators
- d. ANSI A117.1—Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People
- e. ADAAG—Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities

E. Mechanical Regulatory and Directive Standards

1. General Design References

- a. AABC National Standards
- b. Air Conditioning and Refrigeration Institute (ARI) standards
- c. American Gas Association (AGA)
- d. American Society of Heating, Ventilating and Air Conditioning Engineers (ASHRAE) Handbook:
 - Applications
 - Equipment
 - Fundamentals
 - Systems and Equipment
- e. ASHRAE—A Practical Guide to Noise and Vibration Control for HVAC Systems, Schaffer, Mark E.
- f. ASHRAE Green Guide
- g. ASHRAE Humidification and Dehumidification Controls Strategies
- h. ASHRAE Humidity Control Design Guide for Commercial and Institutional Buildings



- i. ASHRAE HVAC Design Manual for Hospital and Clinics
- j. ASHRAE Standard 15, Safety Code for Mechanical Refrigeration
- k. ASHRAE Standard 62, Ventilation for Acceptable Indoor Air Quality
- l. ASHRAE—Thermal Guidelines for Data Processing Environments
- m. ASHRAE—The HVAC Commissioning Process
- n. American Water Works Association (AWWA)
- o. American Conference of Governmental Industrial Hygienists, latest edition of the Industrial Ventilation Guide
- p. American Society of Plumbing Engineers (ASPE), Data Books
- q. American Society of Sanitary Engineers (ASSE)
- r. ASTM-E84—Fire Hazard Classifications
- s. Cameron Hydraulic Data
- t. Carrier Design Manual
- u. “The Commissioning Design Intent Narrative,” Ronald J. Wilkinson, P.E.
- v. Corrosion Control Handbook
- w. CSA standards
- x. Guidelines for Planning and Design of Biomedical Research Laboratories (published by ASHRAE)
- y. Hydraulic Institute standards
- z. Hydronic System Design and Operation, Erwin G. Hansen, New York: McGraw-Hill (1985)
- aa. Manufacturer's Standardization Society (MSS) of the Valve & Fittings Industry
- ab. MCAA(MSS) —Guideline for Quality Piping Installation
- ac. MSS SP 58(MSS)—Pipe Hangers and Supports Materials, Design and Manufacture
- ad. MSS SP 69—Pipe Hangers and Supports Selection and Application National Association of Plumbing/Heating/Cooling Contractors (PHCC)



- ae. National Environmental Balancing Bureau (NEBB)
- af. National Fire Protection Association (NFPA):
 - 72—National Fire Alarm Code
 - 90A—Installation of Air Conditioning and Ventilating Systems
 - 90B—Installation of Warm Air Heating & Air-Conditioning Systems
 - 92A—Recommended Practice for Smoke Control Systems
 - 92B—Guide for Smoke Management Systems in Malls, Atria, and Large Areas
 - 96—Ventilation Control and Fire Protection of Commercial Cooking Operations
- ag. NCPWB, Welding Procedure Specifications
- ah. Plumbing and Drainage Institute
- ai. Roadmap for Integrating Sustainable Design into Site-Level Operations, US Department of Energy (March 2000)
- aj. Sheet Metal and Air Conditioning Contractors National Association (SMACNA) design guides
- ak. Seismic Restraint Manual Guidelines for Mechanical Systems, 2nd edition SMACNA
- al. Thermal Insulation Manufacturers Association (TIMA)
- am. Trane Company:
 - Air-to-Air Energy Recovery Manual
 - Air Conditioning Manual
 - Rooftop/VAV System Design Applications Manual
 - Systems Design Manual
 - Variable Air Volume Duct Design
- an. “Understanding Owner Project Requirements Documentation (Design Intent),” Karl Stum, P.E., National Conference on Building Commissioning (2001)
- ao. US Green Building Council, Leadership in Energy & Environmental Design



2. Basic Materials and Methods

- a. ANSI Piping and Equipment Labeling Requirements
- b. ANSI/UL 674—Electric Motors and Generators for Use in Division I Hazardous (Classified)
- c. ASHRAE Standard C680—Standard Practice for Determining Heat Gain or Loss
- d. ASME PTC 8.2 and 9
- e. ASTM Standards for Thermal Insulation
- f. ASTM C930—Classification of Potential Health and Safety Concerns Associated With Thermal Insulation Materials and Accessories
- g. ASTM C1094—Standard Guide for Flexible, Removable Insulation Covers
- h. ASTM E413—Classification for Rating Sound Insulation
- i. CSA C22.2 No. 100-95—Motors and Generators
- j. IEEE Standard 112 Method B
- k. NEMA MG 10-2001—Energy Management Guide for Selection and Use of Fixed-Frequency Medium AC Squirrel-Cage Polyphase Industrial Motors
- l. NEMA MG 11-1977—Energy Management Guide for Selection and Use of Single-Phase Motors
- m. NEMA MG 1—Motors and Generators
- n. NEMA Standard MG-1-12.53a
- o. UL 1004—Electric Motors
- p. Yale Specification Section 15930—Insulation Jackets

3. Fire Protection Design References

- a. ANSI Elevator Code A17.1
- b. ANSI B31.1—B31.9
- c. NFPA Fire Prevention Handbook
- d. NFPA 10—Portable Fire Extinguishers



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- e. NFPA 13—Installation of Sprinkler Systems
- f. NFPA 14—Installation of Standpipe
- g. NFPA 20—Installation of Centrifugal Fire Pumps
- h. NFPA 24—Installation of Private Service Mains and Their Appurtenances
- i. NFPA 25—Inspection, Testing and Maintenance of Water-Based Fire Protection Systems
- j. NFPA 30—Flammable and Combustible Liquids Code
- k. NFPA 45—Fire Protection for Laboratories Using Chemicals
- l. NFPA 70—National Electric Code
- m. NFPA 72D—Protective Signaling Systems
- n. NFPA 72E—Automatic Fire Detectors
- o. NFPA 75—Protection of Electronic Computer/Data Processing Equipment
- p. NFPA 92A—Recommended Practice for Smoke Control Systems
- q. NFPA 92B—Guide for Smoke Management Systems in Malls, Atria, and Large Areas
- r. NFPA 96—Ventilation Control and Fire Protection of Commercial Cooking Operations
- s. Yale Specification Section 15310—Fire Protection

4. Piping

- a. ABMA, Boiler Water Limits and Steam Purity Recommendations for Water Tube Boilers
- b. ACGIH Threshold Limit Values for Chemical Substances
- c. ANSI/ASME B16.1—Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800
- d. ANSI/ASME B16.24—Cast Copper Alloy Pipe Flanges and Flanged Fittings
- e. ANSI/ASME B16.34—Valves-Flanged, Threaded, and Welding Ends
- f. ANSI/ASME PTC 25—Pressure Relief Devices



- g. ANSI/ASHRAE 41.2—Standard Methods for Laboratory Airflow Measurement
- h. ANSI/ASHRAE 41.3—Standard Method for Pressure Measurement
- i. ANSI/ASHRAE 41.1—Standard Method for Temperature Measurement
- j. ANSI/ASHRAE 41.8—Standard Methods of Measurement of Flow of Liquids in Pipes Using Orifice Flowmeters
- k. ANSI/Hydraulic Institute 8.1–8.5
- l. API 6D—Specification for Pipeline Valves (Gate, Plug, Ball and Check)
- m. API 598—Valve Inspection and Testing
- n. ASHRAE—Legionellosis Position Paper (1998)
- o. ASME PTC 19.5—Application of Fluid Meters
- p. ASME MFC-10M—Method for Establishing Installation effects on Flowmeters
- q. ASME Boiler and Pressure Code, Section VIII
- r. ASME—Consensus on Operating Practices for the Control of Feedwater and Boiler Water Chemistry in Modern Industrial Boilers (1994)
- s. ASME B31.1—Power Piping
- t. ASME B31.5—Refrigeration Piping and Heat Transfer Components
- u. ASME B31.9—Building Services Piping
- v. ASSE/ASTM 6030
- w. “The Analytical Control of Anticorrosion Water Treatment,” W.F. Langelier, 1936
- x. DOE—Non-Chemical Technologies for Scale and Hardness Control (1998)
- y. Ingersoll-Rand Compressed Air and Gas Data Book
- z. ISO 4126-1—Safety Valves, Part 1: General Requirements
- aa. NFPA 99—Health Care Facilities
- ab. Plumbing and Drainage Institute



5. Plumbing Fixtures and Equipment

- a. ANSI/ASHRAE 18—Methods of Testing for Rating Drinking Water Coolers with Self Contained Mechanical Refrigeration Systems
- b. ASME PTC 8.2 and 9
- c. ANSI Z-358.1
- d. ANSI/ASHRAE 118.1
- e. ANSI/UL 399—Drinking Water Coolers
- f. ARI-1010—Self Contained, Mechanically Refrigerated Drinking Water Coolers
- g. American Society of Sanitary Engineers
- h. ASSE 1016
- i. ASSE 1017
- j. CAN/CSA-C22.2 No. 110-94
- k. NSF/ANSI 5
- l. NSF/ANSI 61—Drinking Water System Components Health Effects
- m. UL Motor-Operated Water Pumps Standard
- n. UL 795
- o. UL 1453

6. Heat Generation Equipment

- a. ABMA—Packaged Boiler Engineering Manual
- b. ABMA—Boiler Water Limits and Achievable Steam Purity for Watertube Boilers
- c. ABMA—Boiler Water Requirements and Associated Steam Purity—Commercial Boilers
- d. ABMA—Operation and Maintenance Safety Manual
- e. ABMA— (Selected) Codes and Standards of the Boiler Industry
- f. ABMA—Combustion Control Guidelines
- g. ABMA—Utility and Boiler Terms and Phrases



- h. ACCA Manual CS—Commercial Applications Systems and Equipment, 1st ed.
- i. ASME—Boiler and Pressure Vessel Code
- j. ASME CSD-1—Control and Safety Devices for Automatically Fired Boilers
- k. ANSI/UL 343—Pumps for Oil-Burning Appliances
- l. ANSI Z21.13/CSA 4.9—Gas-Fired, Low-Pressure Steam and Hot Water Boilers
- m. ANSI/NFPA 8501—Single Burner Boiler Operations
- n. ANSI/NFPA 8502—Prevention of Furnace Explosions/Implosions in Multiple Burner Boilers
- o. ANSI/UL 834—Heating, Water Supply, and Power Boilers—Electric
- p. CSA ANSI Z83.3—Gas Utilization Equipment in Large Boilers
- q. CSA CAN 1-3—Industrial and Commercial Gas-Fired Package Boilers
- r. CSA B-51—Boiler, Pressure Vessel, and Pressure Piping Code
- s. CSA B 140.7.2—Oil-Fired Steam and Hot-Water Boilers for Commercial and Industrial Use
- t. Hydronics Institute IBR—Testing and Rating Standard for Heating Boilers
- u. UL 726—Oil-Fired Boiler Assemblies (1995)
- v. UL 795—Commercial/Industrial Gas Heating Equipment (1999)

7. Refrigeration Equipment

- a. AABC National Standards—Cooling Tower Testing
- b. ACGIH—Bioaerosols: Assessment and Control
- c. ACGIH—Threshold Limit Values for Chemical Substances
- d. ACCA Manual CS—Commercial Applications, Systems, and Equipment, 1st ed.
- e. ANSI/AHAM DH-1—Dehumidifiers
- f. ANSI/ASHRAE 15—Safety Standard for Refrigeration Systems
- g. ANSI/ASHRAE 30—Method of Testing Liquid-Chilling Packages
- h. ANSI/ASHRAE 34—Designation and Safety Classification of Refrigerants



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- i. ANSI/UL 474—Dehumidifiers
- j. CSA C22.2 No 92-1971—Dehumidifiers
- k. ARI 365-94—Commercial and Industrial Unitary Air-Conditioning Condensing Units
- l. ARI 410—Forced Circulation Air Cooling and Air Heating Coils
- m. ARI-440—Room Fan Coils and Unit Ventilators
- n. ARI 450—Water-Cooled Refrigerant Condensers, Remote Type
- o. ARI 460—Remote Mechanical-Draft, Air-Cooled Refrigerant Condensers
- p. ARI 560—Absorption Water-Chilling and Water-Heating Packages
- q. ARI 550—Centrifugal and Rotary Screw Water-Chilling Packages
- r. ARI 590—Positive-Displacement Compressor Water-Chilling Packages
- s. ASHRAE Guideline 3—Reducing Emission of Halogenated Refrigerants in Refrigeration and Air Conditioning Equipment and Systems
- t. ASME PTC 23—Atmospheric Water Cooling Equipment
- u. CSA C743—Performance Standard for Rating Packaged Water Chillers
- v. CTI ATC-128—Code for Measurement of Sound from Water Cooling Towers
- w. CTI PFM-143—Recommended Practice for Airflow Testing of Cooling Towers
- x. CTI STD-201—Certification Standard for Commercial Water Cooling Towers
- y. ISO 6718—Bursting Discs and Bursting Disc Devices
- z. NFPA 214—Water-Cooling Towers
- aa. UL 1995/C22.2 No. 236-95—Heating and Cooling Equipment
- ab. UL 2182—Refrigerants



8. HVAC Equipment

- a. ACCA Manual CS—Commercial Applications Systems and Equipment, 1st ed.
- b. ACCA Manual RS—Comfort, Air Quality, and Efficiency by Design
- c. ANSI/ASHRAE 62—Ventilation for Acceptable Indoor Air Quality
- d. ACCA Manual CS—Commercial Applications, Systems and Equipment, 1st ed.
- e. ACGIH—Bioaerosols: Assessment and Control
- f. ACGIH—Threshold Limit Values for Chemical Substances
- g. ANSI/ARI 430—Central Station Air Handling Units
- h. ASHRAE—A Practical Guide to Noise and Vibration Control for HVAC Systems,” Schaffer, Mark E. (1992)
- i. ANSI/ARI 640—Commercial and Industrial Humidifiers
- j. ANSI/ASHRAE 127-2001—Method of Rating Computer and Data Processing Room Unitary Air Conditioners
- k. ASME BPVC-2001—Boiler and Pressure Code, Section VIII, Division 1: Pressure Vessels
- l. ARI Compliance for Units with Capacities Less Than 135,000 Btuh (39.6 kW): ARI 210/240, Commercial and Industrial Unitary Air-Conditioning and Air-Source Heat Pump Equipment
- m. ARI Guideline B for Rooftop Unit Mounting
- n. ARI 410—Forced Circulation Air Cooling and Air Heating Coils
- o. CAN/CSA-C273.3-M91—Performance Standard for Split System Central Air Conditioners and Heat Pumps
- p. Hydronic Institute IBR—Testing and Rating Standard for Baseboard Radiation, 6th ed.
- q. Hydronic Institute IBR—Testing and Rating Standard for Finned-Tube (Commercial) Radiation
- r. NRCA Low-Slope Membrane Roofing Construction Details Manual, Illustration—Raised Curb Detail for Rooftop Air Handling Units and Ducts



- s. Sound Power Level Ratings: Comply with ARI 270, Sound Rating of Outdoor Unitary Equipment
- t. TEMA—Standards of Tubular Exchanger Manufacturers Association, 8th ed. (1999)
- u. UL/CSA 998/C22.2 No. 104—Humidifiers (2001)
- v. UL/CSA 1995/C22.2 No. 236—Heating and Cooling Equipment

9. Air Distribution

- a. ACCA Manual Q—Commercial Low Pressure, Low Velocity Duct System Design, 1st ed.
- b. ACCA Manual Q—Pressure, Low Velocity Duct System Design, 1st ed.
- c. ACGIH—Industrial Ventilation: A Manual of Recommended Practice, 24th ed.
- d. ACGIH—Selection of Air Filtration Equipment
- e. ADC-91—Flexible Duct Performance and Installation Standards, 3rd ed.
- f. AMCA 99—Standards Handbook
- g. AMCA 201—Fans and Systems
- h. AMCA 211—Certified Ratings Program: Air Performance
- i. AMCA-410—Recommended Safety Practices for Users and Installers of Industrial and Commercial Fans
- j. AMCA-2404—Drive Arrangements for Centrifugal Fans
- k. AMCA-2407—Motor Positions for Belt or Chain Drive Centrifugal Fans
- l. AMCA-2406—Designation of Rotation and Discharge of Centrifugal Fans
- m. AMCA-2410—Drive Arrangements for Tubular Centrifugal Fans
- n. ANSI S12.11—Methods for the Measurement of Noise Emitted by Small Air-Moving Devices
- o. ANSI/AMCA 210
- p. ANSI/AMCA 330



- q. ANSI/ASHRAE 51—Laboratory Methods of Testing Fans for Aerodynamic Performance Rating
- r. ANSI/ASHRAE 52.1—Gravimetric and Dust-Spot Procedures for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter
- s. ANSI/ASHRAE 52.2—Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size
- t. ANSI/ASHRAE 68—Laboratory Method of Testing to Determine the Sound Power in a Duct
- u. ANSI/ASHRAE 70—Method of Testing for Rating the Performance of Air Outlets and Inlets
- v. ANSI/ASHRAE 113—Method of Testing for Room Air Diffusion
- w. ANSI/ASHRAE 120—Method of Testing to Determine Flow Resistance in HVAC Ducts and Fittings
- x. ANSI/AWS D9.1-2000—Sheet Metal Welding Code
- y. ANSI/UL 705—Power Ventilators
- z. ANSI/UL 900—Air Filter Units
- aa. ARI 670—Fans and Blowers
- ab. ARI 850-93—Commercial and Industrial Air Filter Equipment
- ac. ARI 880—Air Terminals
- ad. ARI-885—Procedure for Estimating Occupied Sound Levels in the Application of Air Terminals and Air Outlets
- ae. ASC-A-7001A—Adhesives Standard for Duct Liner Adhesive & Sealant
- af. ASHRAE—A Practical Guide to Noise and Vibration Control for HVAC Systems, Schaffer, Mark E.
- ag. ASHRAE Standard 129 Schaffer Measuring Air Change Effectiveness
- ah. ASME PTC 11 Schaffer Fans
- ai. ASHRAE 51-1999 Schaffer Laboratory Methods of Testing Fans for Aerodynamic Performance Rating



- aj. ASHRAE 52-1999 Schaffer Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size
- ak. ASTM F1471 Schaffer Test Method for Air-Cleaning Performance of a High-Efficiency Particulate Air Filter System
- al. CSA C22.2 No. 113-M Schaffer Fans and Ventilators
- am. Industrial Ventilation: A Manual of Recommended Practice, 24th ed. (2001)
- an. SMACNA 2002—Accepted Industry Practices for Sheet Metal Lagging, 1st ed.
- ao. SMACNA—HVAC Air Duct Leakage Test Manual
- ap. SMACNA—HVAC Duct Construction Standards, Metal and Flexible
- aq. SMACNA—Rectangular Industrial Duct Construction Standards
- ar. SMACNA—Duct Design
- as. SMACNA—Round Industrial Duct Construction Standards
- at. SMACNA—Duct Liner Applications
- au. SMACNA—Mechanical Fasteners Standard
- av. SMACNA—HVAC Air Duct Leakage Test Manual, 1st ed.
- aw. SMACNA—HVAC Duct Systems Inspection Guide, 2nd ed.
- ax. SMACNA—Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems, 5th ed.
- ay. UL 181—Factory-Made Air Ducts and Air Connectors
- az. UL 181A—Closure Systems for Use with Rigid Air Ducts and Air Connectors
- ba. UL 181B—Closure Systems for Use with Flexible Air Ducts and Air Connectors
- bb. UL 507—Electric Fans (1999)
- bc. UL 555C—Ceiling Dampers
- bd. UL 555S—Smoke Dampers
- be. UL 585—High-Efficiency, Particulate, Air Filter Units
- bf. UL 710—Exhaust Hoods for Commercial Cooking Equipment
- bg. UL1046—Grease Filters for Exhaust Ducts



10. HVAC Instrumentation and Controls

- a. AABC National Standards, Chapter 12—Temperature Control Systems
- b. AMBA—Guideline for the Integration of Boilers and Automated Control Systems in Heating Applications
- c. ANSI/ASHRAE 111—Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems
- d. ANSI/ASHRAE 114-1986—Energy Management Control Systems Instrumentation
- e. ANSI/Hydraulic Institute 1.6—Centrifugal Pump Test
- f. ARI Guideline G—Mechanical Balance of Fans and Blowers
- g. Buildings Controls Group of the UK—Control Sensor Installation website
- h. Central Building Utilities Metering System (CBUMS) website:
<http://www.facilities.yale.edu/Work/Work.asp>
- i. Hydraulic Institute 9.1-9.6—Pumps: General Guidelines (including Measurement of Airborne Sound)
- j. Johnson Controls—Metasys Design Manual
- k. NEBB—Procedural Standards for Certified Testing of Cleanrooms, 2nd ed.
- l. NEBB—Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems, 6th ed.
- m. NEBB—Procedural Standards for Building Systems Commissioning, 1st ed. (1993)
- n. SMACNA—HVAC Systems Testing, Adjusting and Balancing, 3rd ed.



F. Electrical Regulatory and Directive Standards

1. General Design References

- a. ASHRAE 90.1—Energy-Efficient Design of New Buildings Except Low-Rise Residential Buildings
- b. ANSI/IEEE C2-1993—National Electrical Safety Code
- c. ANSI/IEEE 141-1986—Electric Power Distribution for Industrial Plants (Red Book)
- d. ANSI/IEEE 142-1991—Grounding of Industrial and Commercial Power Systems (Green Book)
- e. ANSI/IEEE 241-1990—Electric Power Systems in Commercial Buildings (Gray Book)
- f. ANSI/IEEE 242-1986—Protection and Coordination of Industrial and Commercial Power Systems (Buff Book)
- g. ANSI/IEEE 399-1990—Industrial and Commercial Power Systems Analysis (Brown Book)
- h. ANSI/IEEE 493-1990—Design of Reliable Industrial and Commercial Power Systems (Gold Book)
- i. ANSI/IEEE 602-1986—Electric Systems in Health Care Facilities (White Book)
- j. ANSI/IEEE 739-1984—Energy Conservation and Cost-Effective Planning in Industrial Facilities (Bronze Book)
- k. ANSI 117.1—Providing Accessibility and Usability for Physically Handicapped People
- l. ANSI Z117.1—Safety Requirements for Confined Spaces
- m. ANSI/IEEE 100-1988—Standard Dictionary of Electrical and Electronics Terms
- n. ANSI/IEEE 519-1992—Harmonic Control in Electrical Systems
- o. ANSI/IEEE 693-1984—Seismic Design of Substations
- p. ANSI/IEEE 946-1992—DC Auxiliary Power Systems for Generating Stations



- q. ANSI/IEEE 979-1984—Substation Fire Protection
- r. ANSI/IEEE 980-1987—Containment and Control of Oil Spills in Substations
- s. ANSI/IEEE 1001-1988—Interfacing Dispersed Storage and Generation Facilities with Electric Utility Systems
- t. ARI Guideline G—Mechanical Balance of Fans and Blowers
- u. ETL Directory (1987)
- v. IEEE 666-1991—Electric Power Service Systems for Generating Stations
- w. IEEE 1109-1990—Interconnection of User-Owned Substations to Electric Utilities
- x. IEEE 1127-1990—Design, Construction, and Operation of Safe and Reliable Substations for Environmental Acceptance
- y. Lineman's and Cableman's Handbook, 5th ed. (Bradley)
- z. National Electrical Safety Code Handbook
- aa. Switchgear and Control Handbook (Bradley)
- ab. UL Directories:
 - Electrical Appliance and Utilization Equipment (1990)
 - Electrical Construction Materials (1990)
 - Fire Protection Equipment (1990)
 - Hazardous Location Equipment (1990)
- ac. United Illuminating Company:
 - Company Energy Blueprint Program
 - Company Energy Opportunities Program
 - Electric Service Guidelines
 - Engineering and Construction Standards
 - Electric Service Guidelines (1992)



2. Power and Distribution

- a. Johnson Controls—Metasys Design Manual
- b. Robert Shaw Controls—Electronics Products Master Catalog
- c. ICEA S-19-81—Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
- d. ICEA S-61-402—Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
- e. NEMA OS1—Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports
- f. NEMA RN1—Polyvinyl-Chloride Externally Coated Galvanized Rigid Steel Conduit and Electrical Metallic Tubing
- g. NEMA TC2—Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80)
- h. NEMA TC3—PVC Fittings for Use with Rigid PVC Conduit and Tubing
- i. NEMA WD1—General-Purpose Wiring Devices
- j. NEMA WD2—Semiconductor Dimmers for Incandescent Lamps
- k. NEMA WD5—Specific-Purpose Wiring Devices
- l. Underwriters Laboratories (UL):
 - 1—Flexible Metal Electrical Conduit
 - 5—Surface Metal Electrical Raceways and Fittings
 - 6—Rigid Metal Electrical Conduit
 - 20—General-Use Snap Switches
 - 50—Electrical Cabinets and Boxes
 - 62—Flexible Cord and Fixture Wire
 - 83—Thermoplastic-Insulated Wires and Cables
 - 310—Electric Quick-Connect Terminals
 - 360—Liquid-Tight Flexible Steel Conduit, Electrical
 - 486A—Wire Connectors and Soldering Lugs for Use with Copper Conductors



- 486C—Splicing Wire Connectors
- 486E—Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors
- 498—Electrical Attachment Plugs and Receptacles
- 508—Electric Industrial Control Equipment
- 510—Insulating Tape
- 514A—Metallic Outlet Boxes, Electrical
- 514B—Fittings for Conduit and Outlet Boxes
- 651—Schedule 40 and 80 Rigid PVC Conduit
- 651A—Type EB and A Rigid PVC Conduit and HDPE Conduit
- 773A—Non-Industrial Photoelectric Switches for Lighting Control
- 797—Electrical Metallic Tubing
- 870—Electrical Wireways, Auxiliary Gutters, and Associated Fittings
- 886—Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations
- 943—Ground-Fault Circuit Interrupters
- 1059—Electrical Terminal Blocks
- 1242—Intermediate Metal Conduit
- 1449—Transient Voltage Surge Suppressors

3. Transmission and Distribution

- a. ANSI C84.1—Voltage Ratings for Electric Power Systems and Equipment
- b. IEEE 739—Energy Conservation and Cost-Effective Planning in Industrial Facilities (Bronze Book)
- c. IEEE 980—Containment and Control of Oil Spills in Substations
- d. IEEE S-135—Power Cable Ampacities
- e. NEMA TC3 and TC6—PVC Conduit and Tubing
- f. ANSI/NEMA 70—National Electric Code
- g. ICEA/NEMA S-61-402/WC 5, S-66-524/WC, and S-68-516/WC 8—600 Volt or Less Conductors



- h. UL 44 and 83—600 Volt or Less Conductors
- i. ANSI/NEMA FB1—Cast Metal Boxes and Conduit Bodies for Conduit and Cable Assemblies
- j. NFPA 70—National Electrical Code
- k. NECA 5055—Standard of Installation

4. Low-Voltage Distribution

- a. IEEE 446—Emergency and Standby Power Systems for Industrial and Commercial Applications (Orange Book)
- b. NEMA:
 - AB1—Molded Case Circuit Breakers
 - BU1—Busways
 - FU1—Low-Voltage Cartridge Fuses
 - ICS 1—General Standards for Industrial Control and Systems
 - ICS 2—Industrial Control Devices, Controllers, and Assemblies
 - ICS 3—Industrial Systems
 - KS1—Enclosed Switches
 - PB1—Panelboards
 - SG3—Low-Voltage Power Circuit Breakers
 - ST20—Dry-Type Transformers, for General Applications
 - TR27—Commercial, Institutional, and Industrial Dry-Type Transformers
- c. Underwriters Laboratories (UL):
 - 50—Electrical Cabinets and Boxes
 - 67—Electric Panelboards
 - 98—Enclosed Switches
 - 198C—High-Interrupting-Capacity Fuses, Current-Limiting Types
 - 198E—Class R Fuses
 - 489—Molded-Case Circuit Breakers and Circuit-Breaker Enclosures
 - 506—Specialty Transformers
 - 508—Electric Industrial Control Equipment
 - 845—Electric Motor Control Centers



- 857—Busways and Associated Fittings
- 943—Ground-Fault Circuit Interrupters
- 1008—Automatic Transfer Switches
- 1561—Large General Purpose Transformers

5. Lighting

- a. IES Lighting Handbook
- b. ANSI C78.1 (with supplements)—Dimensional and Electrical Characteristics of Fluorescent Lamps, Rapid Start Types
- c. ANSI C78.2 (with supplements)—Dimensional and Electrical Characteristics of Fluorescent Lamps, Preheat Start Types
- d. ANSI C78.20—Characteristics of Incandescent Lamps of A, G, PS, and Similar Shapes with E26 Medium Screw Bases
- e. ANSI C78.21—Characteristics of Incandescent Lamps of PAR and R Shapes
- f. ANSI C78.1350 through C78.1359—High-Pressure Sodium Lamps
- g. ANSI C78.1375 through C78.1381—Metal Halide Lamps
- h. ANSI C82.1—Specifications for Fluorescent Lamp Ballasts
- i. ANSI C82.2—Methods of Measurement of Fluorescent Lamp Ballasts
- j. ANSI C82.3, Specifications for Fluorescent Lamp Reference Ballasts
- k. ANSI C82.4 (with supplement) —Specifications for High-Intensity-Discharge and Low-Pressure Sodium Lamp Ballasts (Multiple-Supply Type)
- l. ANSI C82.5 (with supplement)—Specification for High-Intensity Discharge Lamp Reference Ballasts
- m. ANSI C82.6 (with supplement)—Methods of Measurement of High-Intensity Discharge Lamp Ballasts
- n. NEMA FA1—Outdoor Floodlighting Equipment
- o. NEMA LE1—Fluorescent Luminaires
- p. UL 924—Emergency Lighting and Power Equipment
- q. UL 935—Fluorescent-Lamp Ballasts

Yale University Design Standards

Section 01420: References (Non-Regulatory)



- r. UL 1029—High-Intensity-Discharge-Lamp Ballasts
- s. UL 1570—Fluorescent Lighting Fixtures
- t. UL 1571—Incandescent Lighting Fixtures
- u. UL 1572—High Intensity Discharge Lighting Fixtures

End of Section